# Biodiversity Development Assessment Report

## JINDERA SOLAR FARM

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NGH Environmental Pty Ltd (ACN: 124 444 622. ABN: 31 124 444 622)

www.nghenvironmental.com.au e: ngh@nghenvironmental.com.au

**Sydney Region**
18/21 mary st
surry hills nsw 2010 (t 02 8202 8333)

**Canberra - NSW SE & ACT**
8/27 yallourn st (po box 62)
fyshwick act 2609 (t 02 6280 5053)

**Bega - ACT and South East NSW**
89-91 auckland st (po box 470)
bega nsw 2550 (t 02 6492 8333)

**Newcastle - Hunter and North Coast**
2/54 hudson st
hamilton nsw 2303 (t 02 4929 2301)

**Wagga Wagga - Riverina and Western NSW**
suite 1, 39 fitzmaurice st (po box 5464)
wagga wagga nsw 2650 (t 02 6971 9696)

**Brisbane**
suite 4, level 5, 87 wickham terrace
spring hill qld 4000 (t 07 3129 7633)

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| **BAM** | |
| **BC Act** | *Biodiversity Conservation Act 2016* (NSW) |
| **BDAR** | Biodiversity Development Assessment Report |
| **Biosecurity Act** | *Biosecurity Act 2015* |
| **BOM** | Australian Bureau of Meteorology |
| **CEEC** | Critically endangered ecological communities |
| **CEMP** | Construction environmental management plan |
| **Cwth** | Commonwealth |
| **DBH** | Diameter at Breast Height |
| **EEC** | Endangered ecological community |
| **EPBC Act** | *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) |
| **EP&A Act** | *Environmental Planning and Assessment Act 1979* (NSW) |
| **GHG** | Greenhouse gases |
| **ha** | Hectares |
| **HBT** | Hollow-bearing trees |
| **ISEPP** | *State Environmental Planning Policy (Infrastructure) 2007* (NSW) |
| **km** | Kilometres |
| **LEP** | Local Environment Plan |
| **LRET** | Large-scale renewable energy target |
| **m** | Metres |
| **MNES** | Matters of National environmental significance under the EPBC Act (*c.f.*) |
| **MW** | Megawatt |
| **NSW** | New South Wales |
| **OEH** | (NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water |
| **PV** | Photovoltaic |
| **SAII** | Serious and Irreversible Impact |
| **SEARs** | Secretary's Environmental Assessment Requirements |
| **SEPP** | State Environmental Planning Policy (NSW) |
| **sp/spp** | Species/multiple species |
| **SSD** | State Significant Development |
| **TEC** | Threatened Ecological Community |
| **VIS** | Vegetation Integrity Score |

# EXECUTIVE SUMMARY

Green Switch Australia Pty Ltd is planning for the construction of a 150-megawatt direct current photovoltaic solar farm north of Jindera, NSW. The proposal would develop around 337 hectares of the 404 ha development site. This Biodiversity Development Assessment Report (BDAR) has been prepared by NGH Environmental on behalf of the proponent, Jindera Solar Farm Pty Ltd.

The aim of this BDAR is to address the biodiversity matters raised in the Secretary's Environmental Assessment Requirements (SEARs) and to address the requirements of the *Biodiversity Conservation Act 2016* (BC Act). This BDAR forms part of an Environmental Impact Statement (EIS) for the State Significant Development (SSD), prepared under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Biodiversity Assessment Methodology (BAM) is the required assessment methodology for SSDs that trigger the NSW Biodiversity Offsets Scheme, under the NSW *Biodiversity Conservation Act 2016*. This report follows the field work methodologies and assessment required by the BAM.

Comprehensive mapping and field surveys were completed in accordance with the requirements of the BAM. The majority of the development site has been cleared of native vegetation, and cultivated for agriculture, which is the dominant land use in the area. 340 ha of the development site is comprised of exotic vegetation. Around 60 ha of native vegetation occurs in the development site mainly comprised of scattered patches of remnant woodland and paddock trees of *PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion* and *PCT 9 - River Red Gum- Wallaby Grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion.*

PCT 277 is listed as an Endangered Ecological Community (EEC): White Box-Yellow Box-Blakely's Red Gum woodland under the BC Act. This community within the development site does not meet the criteria for the federally listed EEC, due to having a very degraded understory dominated by exotic annual grasses.

Consideration has been given to avoiding and minimising impacts to native vegetation throughout each phase of the proposal. Site design options have been assessed against key environmental, social and economic criteria. Larger patches of remnant woodland, creek lines and wetlands have been avoided by the development footprint. Mitigation and management measures would be put in place to adequately address impacts associated with the proposal, both direct and indirect.

For biodiversity impacts that are unavoidable, the proposal would require the removal of:

- 14.74 ha of PCT 277 - Blakely's Red Gum – Yellow Box Grassy Tall Woodland
- 2.73 ha of PCT 9 - River Red Gum – Wallaby Grass tall Woodland Wetland
- 33 paddock trees forming part of PCT 277 - Blakely's Red Gum – Yellow Box Grassy Tall Woodland

The removal of this native vegetation generated the following ecosystem credits

- PCT 277 - Blakely's Red Gum – Yellow Box Grassy Tall Woodland - **227 credits**
- PCT 9 - River Red Gum – Wallaby Grass tall Woodland Wetland – **26 credits**

One ecosystem species, Flame Robin (*Petroica phoenicea*) listed as Vulnerable under the BC Act was detected during the site surveys. This species is not considered to be breeding within the development site and is accounted for in the ecosystem credit requirements.

One species credit species, the Squirrel Glider (*Petaurus norfolcensis*) is known to occur in a remnant woodland patch in the development site. This woodland patch has been avoided by the development

footprint, however 9.09 ha of connected woodland would need to be removed to facilitate the installation of the solar panels.

Targeted surveys were undertaken for an additional 18 candidate credit species. None of these species were detected within the development site. Five species were unable to be surveyed for during the appropriate survey period and were assumed to be present within suitable habitat.

The removal of suitable habitat relating to these threatened species credit species generated the following species credits.

- Squirrel Glider (*Petaurus norfolcensis*) – **105 credits**
- Eastern Pygmy Possum (*Cercartetus nanus*) – **63 credits**
- Southern Myotis (*Myotis macropus*) – **7 credits**
- Small Scurf Pea (*Cullen parvum*) – **93 credits**
- Silky Swainson-pea (*Swainsona sericea*) – **53 credits**
- Small Purple-pea (*Swainsona recta*) – **53 credits**

The retirement of the credits generated will be carried out in accordance with the NSW Biodiversity Offsets Scheme under the BC Act. With the retirement of credits and effective implementation of the mitigation measures, the proposal would be consistent with the requirements of the BAM.

# 1 INTRODUCTION

The proposed Jindera Solar Farm is classified as State Significant Development (SSD) under the State and Regional Development State Environmental Planning Policy (SEPP) and therefore a 'major project'. This Biodiversity Development Assessment Report (BDAR) assesses the impacts of the proposed Jindera Solar Farm (the proposal) according to the NSW Biodiversity Assessment Methodology (BAM) as required by the Secretary's Environmental Assessment Requirements (SEARs) for the proposal. NGH Environmental has prepared this report on behalf of the proponent (Jindera Solar Farm Pty Ltd), a partnership with Green Switch Australia Pty Ltd.

The following terms are used in this document:

- **Development footprint** – The area of land that is directly impacted on by the proposal. Including, solar array design, perimeter fence, access roads, transmission line footprint and areas used to store construction materials. The development footprint is approximately 337 ha.
- **Development site** – The area of land that is subject to a proposed development. The development site is approximately 404 ha. The development site is the area surveyed for this assessment.
- **Subject land** – All land within the affected lot boundaries. The subject land is approximately 521ha.
- **Buffer area** – All land within 1500 m of the outside edge of the boundary of the development footprint.

## 1.1 THE PROPOSAL

Jindera Solar Farm would occupy around 337 hectares (ha) of the 521 ha subject land, retaining the majority of existing viable native vegetation remnants that occur on the array site. The proposal would have a total installed capacity of up to 150 MW (DC), enough to power approximately 65,000 homes in the Greater Hume area.

Key development and infrastructure components would include:

- Single axis tracker photovoltaic (PV) solar panels, mounted on steel frames over most of the site (around 400,000 PV solar panels) at about 3 m above ground level at maximum tilt.
- Battery Energy Storage System (BESS) with maximum capacity of 30MW/60MWh.
- Electrical cables and conduits.
- Inverter/transformer units.
- Weather station.
- On-site high voltage substation.
- Control room and storage facility.
- Site office, staff amenities, parking area, perimeter fencing, and CCTV.
- Electrical transmission infrastructure and overhead transmission line to connect the proposal to the existing Jindera substation.
- Internal access tracks.
- Access road entrances from public roads.
- Upgrade to existing roads.
- On-site vegetative screening.
- Other associated ancillary infrastructure.

Several transmission lines run through the development site including 3 Essential Energy 22 kV transmission lines and a TransGrid 330 kV transmission line which is part of the electricity transmission network that originates at TransGrid's Jindera Substation. The proposal would connect directly to the Jindera Substation via an overhead transmission line along Ortlipp Road.

Site access would occur along Urana Road and Walla Walla – Jindera Road.

In total, the construction phase of the proposal is expected to take 12 months and will commence in mid-2020. Jindera Solar Farm would be expected to operate for around 30 years. After the operating phase, the proposal would either be decommissioned, removing all above and below ground infrastructure and returning the site to its existing land capability, or upgraded with new photovoltaic equipment.

### *1.1.1 Site location*

The proposed location of Jindera Solar Farm is in the Greater Hume Local Government Area (LGA), around 4 km north of Jindera, and 13 km north of Albury as shown in Figure 1-1. The subject land includes

- Lots 70, 90, 133, 134, 135, 136, 138, 139, 140, 141, 147, 148, 153, 154 and 155 of DP 753342,
- Lot 2 DP 213465,
- Lots 1, 2, and 3 of DP 1080215,
- Lot 1 of DP 749584,
- Former Crown Road CADID 105306258.

These lots are owned by private landholders. The development site will be leased from the relevant landowners for the life of the proposal, with subdivision of the property for agricultural purposes required.

### *1.1.2 Site description*

The development site is bound by Urana Road, Nation Road, Klinberg Road, Walla Walla Jindera Road, Glenellen Road and Ortlipp Road. The proposal would have major construction and operational access off Urana and Walla Walla Jindera Roads, with minor maintenance and emergency access off Klinberg Road and Ortlipp Road. Urana Road forms the major transport route to and from the site. Access points for each site occur at Urana Road for the western entrance, Walla Walla Jindera Road for Central Access and Ortlipp Road for the eastern access. Jindera Solar Farm development site comprises around 404 ha of freehold land. The majority of the development site has been cleared of native vegetation, and cultivated for agriculture, which is the dominant land use in the area. Specific to the subject land, this has included:

- Extensive clearing of native vegetation;
- Paddocks sown with crops and pasture;
- Modification of a natural drainage line into farm dams.

The proposal is located within the South Western Slopes Bioregion with the main vegetation types identified as Blakely's Red Gum and Yellow Box Grassy Woodland, over soil ranging from fertile black/brown loam to brown loamy clay and grey clay at the lowest point characterised as Grassy Wetland.

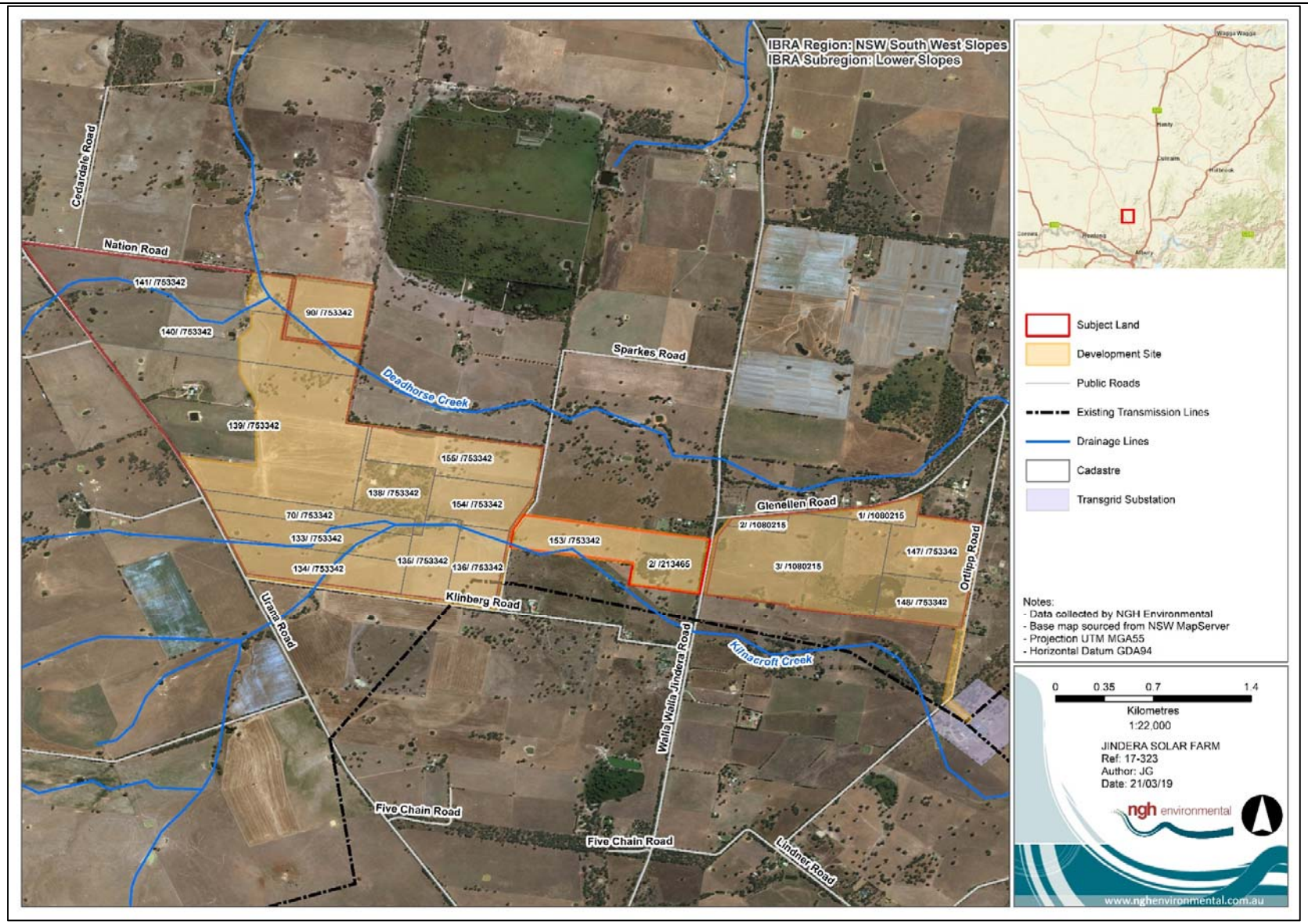



Figure 1-1 Site Map

## 1.2 STUDY AIMS

This BDAR has been prepared by NGH Environmental on behalf of Jindera Solar Farm, a partner company of Green Switch Australia Pty Ltd.

The aim of this BDAR is to address the requirements of the BAM, as required in the Secretary's Environmental Assessment Requirements (SEARs) and summarised below.

| Secretary's Environmental Assessment Requirement | Where addressed |
|---|---|
| The EIS must address the following specific issues:<br>Biodiversity impacts related to the proposed development are to be assessed in accordance with section 7.9 of the *Biodiversity Conservation Act 2016* using the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the Biodiversity Conservation Act 2016 (s6.12),<br>Biodiversity Conservation Regulation 2017 (s6.8) and the BAM, unless OEH and DPE determine that the proposed development is not likely to have any significant impact on biodiversity values. | Sections 6 and 7 |
| The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM. | Sections 8, 9 and 10 |
| The BDAR must include details of the measures proposed to address the offset obligation as follows;<br>a. The total number and classes of biodiversity credits required to be retired for the development/project;<br>b. The number and classes of like-for-like biodiversity credits proposed to be retired;<br>c. The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules;<br>d. Any proposal to fund a biodiversity conservation action;<br>e. Any proposal to make a payment to the Biodiversity Conservation Fund.<br>If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits | Section 10 |
| The BDAR must be submitted with all digital spatial data associated with the survey and assessment as per Appendix 11 of the BAM: | Attached |
| The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the BC Act 2016. | Document verification (front of document) |

No specific considerations for any threatened species, populations or communities were specified in the SEARs or by the NSW Office of Environment and Heritage (OEH).

## 1.3 SOURCE OF INFORMATION USED IN THE ASSESSMENT

The following information sources were used in this BDAR:

- Proposal layers, construction methodology and concept designs provided by Green Switch Pty Ltd.
- Australian Government's Species Profiles and Threats (SPRAT) database http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl
- NSW OEH's Threatened Species Profiles http://www.environment.nsw.gov.au/threatenedspeciesapp/
- DPI profiles of threatened species, population, and ecological communities
- Commonwealth Department of Environment and Energy Protected Matters Search Tool

  Accessed online at http://environment.gov.au/epbc/protected-matters-search-tool
- Australia's IBRA Bioregions and sub-bioregions. Accessed http://environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 2.
- NSW OEH's Biodiversity Assessment Method (BAM) calculator (http://www.environment.nsw.gov.au/bbccapp/ui/mynews.aspx).
- NSW OEH's BioNet threatened biodiversity database

  Accessed online via login at http://www.bionet.nsw.gov.au/.
- NSW OEH Threatened Species Profiles

  http://www.environment.nsw.gov.au/threatenedSpeciesApp/ and

  www.environment.nsw.gov.au/AtlasApp/UI_Modules/
- OEH BioNet Vegetation Classification Database (OEH 2017)

  Accessed online via login at http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx
- OEH VIS Mapping

  Accessed online at http://www.environment.nsw.gov.au/research/VISmap.htm
- Office of Environment and Heritage (OEH) (2017). Biodiversity Assessment Method.
- NSW Government SEED Mapping

  https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU
- NSW Biodiversity Values Map https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap

# 2 LANDSCAPE FEATURES

## 2.1 IBRA BIOREGIONS AND SUBREGIONS

The development site falls within the NSW South Western Slopes IBRA Bioregion and the Lower Slopes Subregion.

The South Western Slopes is an extensive area of foothills and isolated ranges comprising the lower inland slopes of the Great Dividing Range extending from north of Cowra through southern NSW into western Victoria with an area of about 8 070 608 ha or 93% of this bioregion occurs in NSW, with the remainder in Victoria. The NSW portion of the bioregion occupies about 10.1% of the state. Towns located in the bioregion include Cootamundra, Mudgee, Gundagai, Narrandera, Parkes, Wagga Wagga and Young.

The Lower Slopes Subregion is characterised by wide valleys of the Riverina alluvial fans containing isolated peaks and undulating hilly ranges. The geology of the Lower Slopes is comprised of Ordovican to Devonian faulted sedimentary rocks imbedded with large areas of intrusive granites.

The Lower Slopes also contains large areas of Tertiary and Quaternary alluvium deposits. Vegetation communities within the subregion occupy suitable landscapes, such as:

- White Cypress Pine on the ranges;
- Poplar Box, Kurrajong, Wilga and Red Box in the north;
- Grey Box woodlands with Yellow Box, White Cypress Pine and Belah on lower areas;
- Myall, Rosewood and Yarran on grey clays;
- Dwyer's Gum on granite;
- Red Ironbark on sedimentary rocks; and
- River Red Gum on all streams with Black Box in the west.

## 2.1 NSW LANDSCAPE REGIONS AND AREA

The development site is in Brokong Plains Mitchell Landscape. This was entered into the BAM Calculator for the proposal.

## 2.2 NATIVE VEGETATION

As determined by aerial imagery and GIS Mapping, approximately 746 ha of native vegetation occurs in the surrounding 1500 m buffer area. This vegetation in the landscape surrounding the development site is predominantly open woodland comprised of Blakely's Red Gum (*Eucalyptus blakelyi*), Yellow Box (*Eucalyptus melliodora*), White Box (*Eucalyptus albens*) and River Red Gum (*Eucalyptus camaldulensis*).

## 2.3 CLEARED AREAS

Within the 1500 m buffer around the development site, around 2686 ha has been cleared of native vegetation. 338 ha of cleared areas occur within the development site and are primarily agricultural land, used for cropping and grazing (Figure 2-1).

Figure 2-1 Example of cleared areas in the development site

## 2.4 RIVER AND STREAMS

The development site is located within the Murray Catchment, about 15 km from the Murray River. Two ephemeral creeks run through the development site. These are Dead Horse Creek which runs through the north western corner of the development site, and Kilnacroft Creek which transects the southern western section of the development site (Figure 2-1 and Figure 2-2). Within the development site, both Deadhorse Creek and Kilnacroft Creek have been fenced from stock and revegetated with native plants and shrubs around remnant native Blakely's Red Gums (*Eucalyptus blakelyi*). No water was present in the creeks during the duration of the field surveys which were undertaken between Nov 2017 and Jan 2019.

The two creeks run into Bowna Creek, which feeds into Lake Hume, upstream of the Murray River.

Figure 2-2 Deadhorse Creek in the development site

Figure 2-3 Kilnacroft Creek in the development site

## 2.1 WETLANDS

Two wetlands occur within the development site. One large man-made wetland is present in the South Western Corner of the development site and a smaller ephemeral wetland, comprised of native wetland grasses such as Swamp Wallaby Grass (*Amphibromus nervosus*), Feather Spear Grass (*Lachnagrostis filiformis*) and Common Rush (*Juncus sp.*), occurs in the north eastern corner (Figure 2-3 and Figure 2-4). Nineteen farm dams are also present in the development site (Figure 2-5). These dams are heavily utilised by stock and most lack fringing vegetation.

Figure 2-4 Man-made wetland in the development site

Figure 2-5 Ephemeral wetland in the development site

Figure 2-6 Typical farm dams within the development site

Two smaller, unlisted swamps were identified near the development site including the seasonal, mostly dry Swamp, 177 m north of the development site, and the perennial Foot's Swamp, located 5.3 km east (Figure 2-7).

An EPBC Protected Matters search completed on 18 March 2019 identified seven wetlands of international importance. The closest of these to the development site is Barmah Forest, located over 100 km from the development site, downstream in the Murray Catchment. The Protected Matters search also identified one nationally important wetland, the Lake Hume which is located about 11 km from the development site. Lake Hume is an important natural asset of northern Victoria, used to store water for irrigation and also a recreational and tourist attraction for the region (DEE 2010). The development is unlikely to permanently alter the flow regime of Kilnacroft Creek and Deadhorse Creek which are part of the Lake Hume catchment. The development site is highly unlikely to impact hydrological processes affecting Lake Hume wetland.

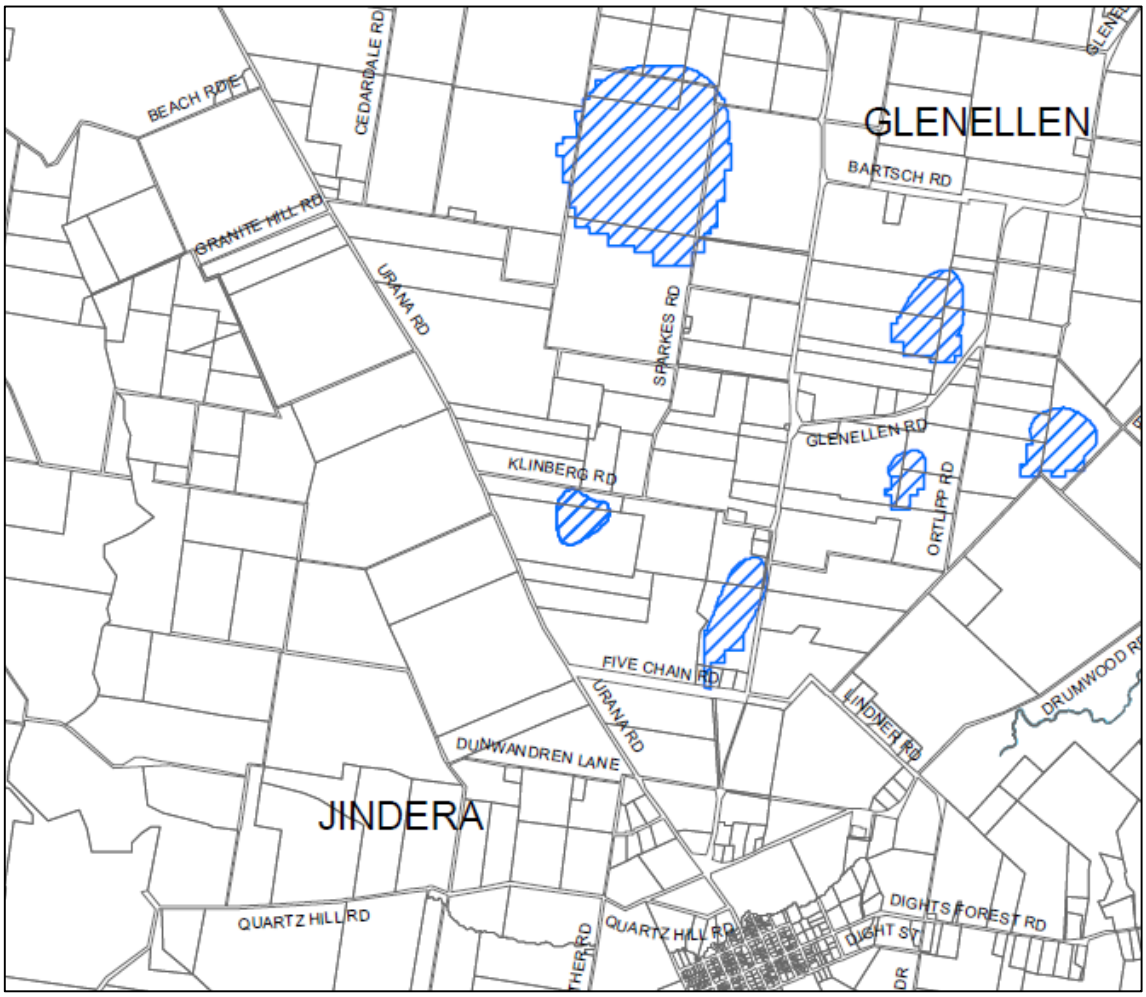



Figure 2-7 Wetlands identified in the Greater Hume LEP.

## 2.2 CONNECTIVITY FEATURES

The buffer area is largely cleared and heavily fragmented. The native vegetation remaining is generally isolated woodland patches surrounded by cleared agricultural land or isolated paddock trees. The two vegetated creek lines provide the main connectivity across the landscape. Kilnacroft Creek is partially vegetated and provides a corridor from segmented remnant vegetation to Klinberg Road in the South, across Lots 133, 134 and 135 of DP 753342. Dead Horse Creek provides a corridor to Nation Road in the North. Roadside vegetation surrounding the development site also provides connectivity in a North-South and East-West direction.

The man-made wetland in the south-eastern corner could provide resting substrate for birds and other fauna visiting the water wetland.

## 2.3 AREAS OF GEOLOGICAL SIGNIFICANCE

No karsts, caves, crevices or cliffs or other areas of geological significance occur in or adjacent to the development site.

## 2.4 AREAS OF OUTSTANDING BIODIVERSITY VALUE

No areas of Outstanding Biodiversity Value occur within the development site (NSW Biodiversity Values Map). Dead Horse and Kilnacroft Creeks are listed as areas of high biodiversity value under the Biodiversity Conservation Regulation 2017 (Figure 2-8). The development site falls within an area of high biodiversity value. The potential impact to an area of high biodiversity value would trigger the requirement of a BDAR if not already required as a state significant development. Impacts on Dead Horse and Kilnacroft Creeks have been considered in this report.

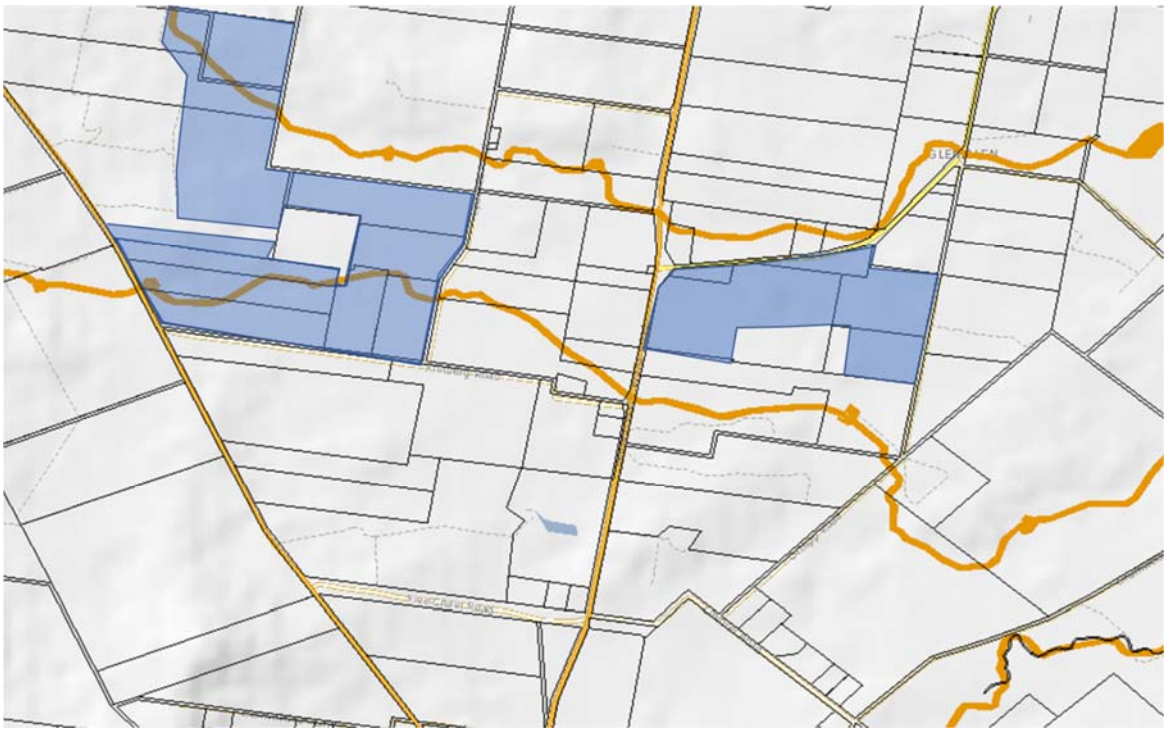


Figure 2-8 Areas listed as high biodiversity value.

## 2.1 SITE CONTEXT COMPONENTS

### Method applied

The proposal conforms to the definition of a *site-based development* under the Biodiversity Assessment Methodology. The site-based development assessment methodology has been used in this BAM assessment. The Percent Native Vegetation was calculated by estimating the percent cover of native vegetation relevant to the benchmark for the PCT. PCTs were allocated based on existing vegetation mapping, field inspections and aerial imagery.

### Percent Native Vegetation Cover

The 1500m buffer area around the development site comprises as area of 3432ha. As determined by GIS mapping from aerial imagery, approximately 746 ha of native vegetation occurs in the 1500 m buffer area (Figure 2-9).

The Percent Native Vegetation Cover within the 1500 m buffer area surrounding the development site was calculated to be 21.7%. This was entered into the BAM calculator for the assessment.

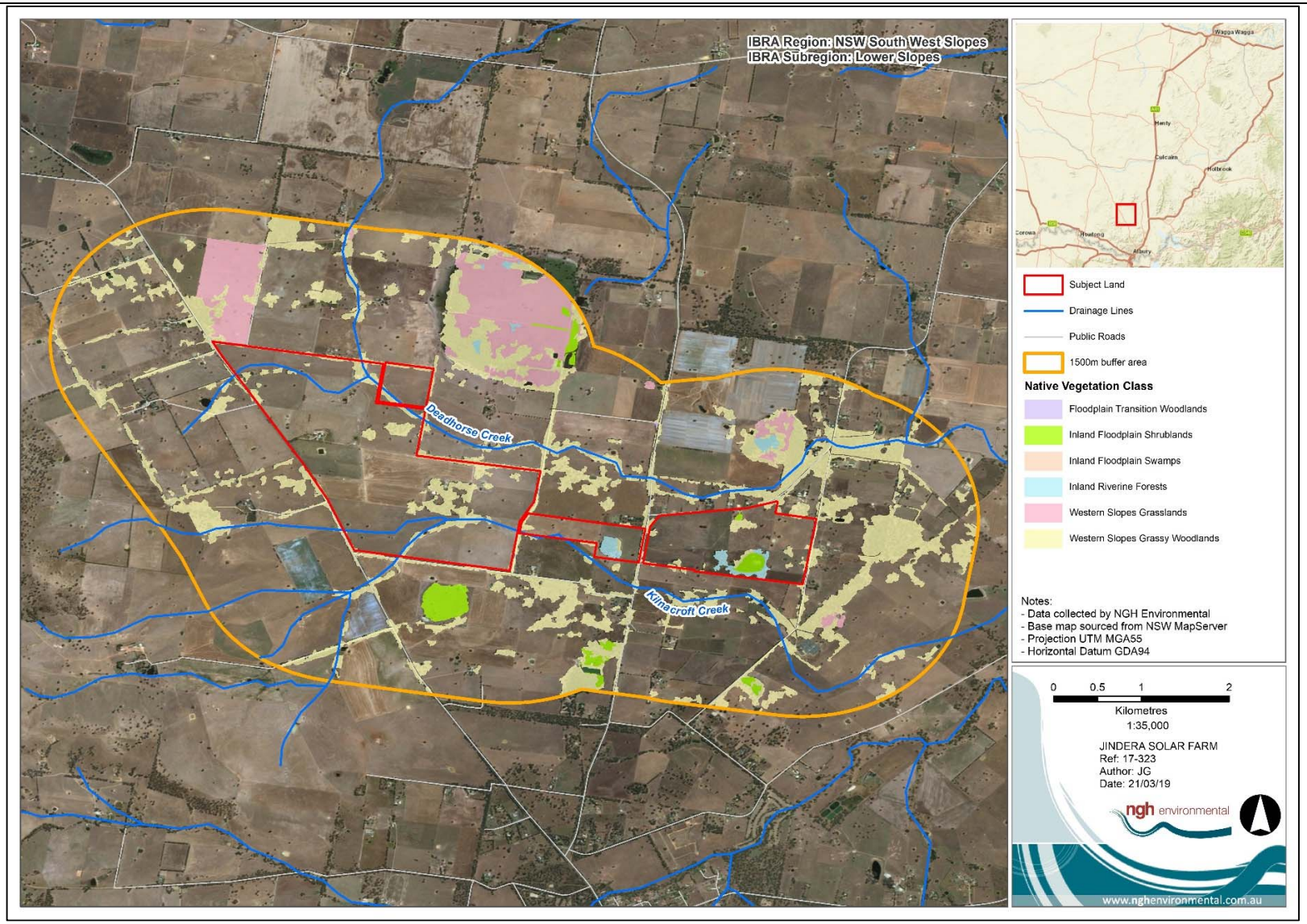



Figure 2-9 Location Map

# 3 NATIVE VEGETATION

## 3.1 NATIVE VEGETATION EXTENT

61.11 ha of native vegetation occurs within the development site. This is comprised of:

- 12.3 ha of River Red Gum – wallaby grass tall woodland wetland on the outer River Red Gum zone, mainly in the Riverina Bioregion
- 42.8 ha of Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
- 1.3 ha of Gilgai wetland mosaic in the southern NSW South Western Slopes Bioregion

40 scattered paddock trees occur within the development site (Figure 3-1). Paddock trees are defined as:

- a tree or a group of up to three trees less than 50 m apart from each other, and
- over an exotic groundcover, and
- more than 50 m away from any other living tree greater than 20 cm DBH, and
- on category 2 land surrounded by category 1 land (as defined by the BAM, 2017). *

*The regulatory land mapping has not yet been published under the new *Local Land Service Act 2016* (LLS Act). During the transitional period, land categories are to be determined in accordance with the definitions of regulated land in the LLS Act. In this case, the paddock trees are located on land with native vegetation present since January 1990, surrounded by land that has been cleared of native vegetation since January 1990.

Paddock trees throughout the development site were assessed under the streamlined assessment module – clearing paddock trees (Appendix 1 of the BAM) and incorporated into this report. They are considered both in terms of ecosystem credits and as habitat for threatened species and any credits generated are additional to those created by applying the full BAM.

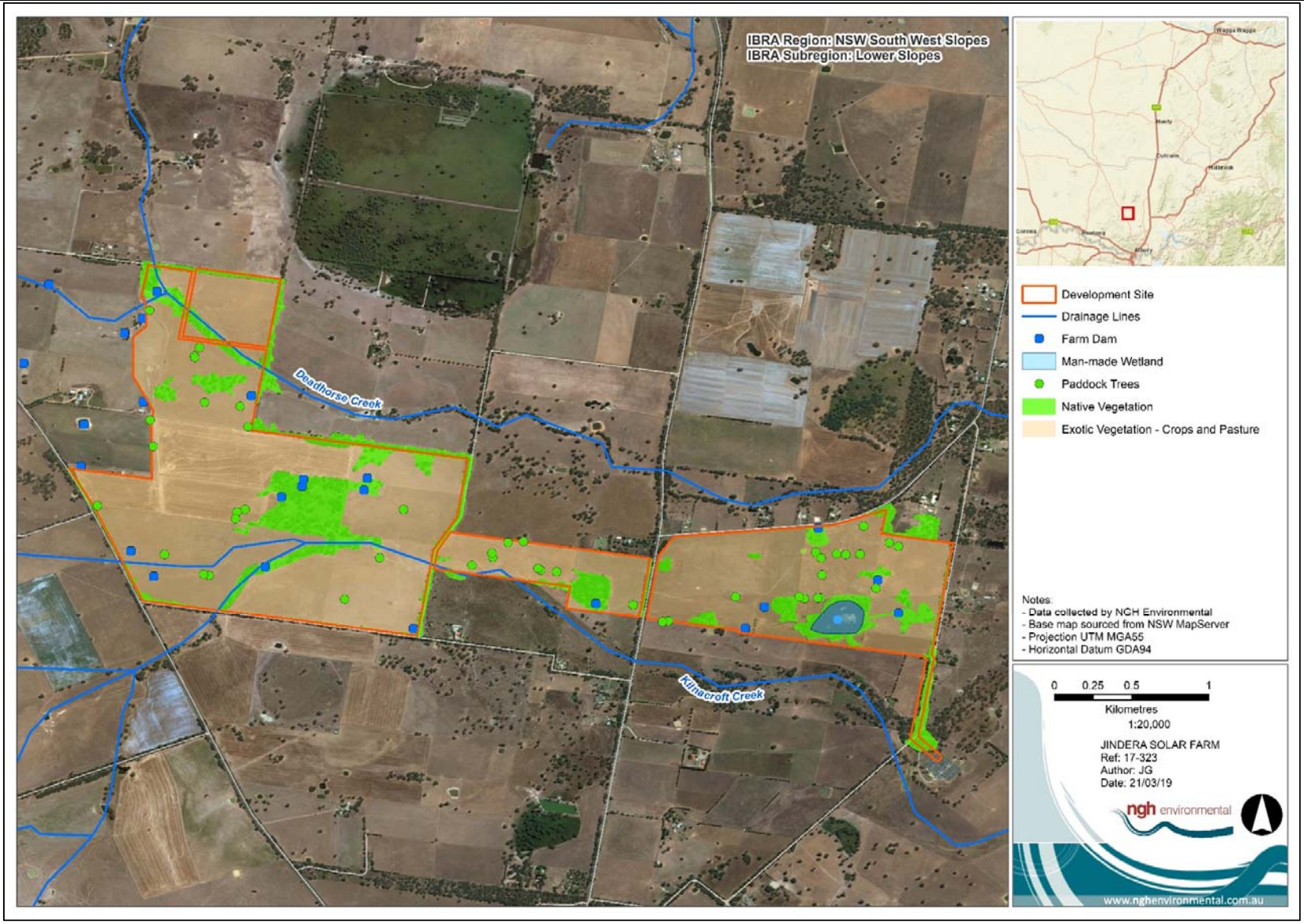



Figure 3-1 Native vegetation extent within the development site.

## 3.2 PLANT COMMUNITY TYPES (PCTS)

### *3.2.1 Methods to assess PCTs*

#### Review of existing information

- A search was undertaken of OEH Vegetation Information System (VIS) database and NSW SEED mapping to access existing vegetation mapping information within the development site. Two relevant existing vegetation maps were assessed; Riverina State Vegetation Mapping - VIS 4469 and;
- SEED Mapping – Sharing and Enabling Environmental Data (2017).

Four vegetation types are mapped within the development site. These are;

Woodland areas are mapped as;

- (PCT 277) - Blakely's Red Gum – Yellow Box Grassy Woodland of the NSW South Western Slopes Bioregion
- (PCT 266) - White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion in the North East of the development site.
- (PCT 278) – A small patch of Riparian Blakely's Red Gum – box – shrub – sedge – grass tall open forest of the central NSW South Western Slopes Bioregion.

Two wetland areas area in the East of the development site mapped as:

- (PCT 17) - Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion)
- (PCT 24) - Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains.

#### Floristic Survey

A site overview was undertaken on 29 and 30 November 2017. As existing mapping was insufficient to assign plant community types (PCTs), the entire subject land was surveyed by two ecologists by car and on foot. The aim of this survey was to determine the PCTs present in the development site and their condition and extent. Random meander searches were conducted in areas of native vegetation to determine the plant species present. PCTs were identified from the native species present, landforms and physiography and location in the IBRA subregion using the BioNet Vegetation Classification Database. The subject land was then stratified into areas of similar condition class to determine vegetation zones for each PCT.

Detailed floristic surveys were undertaken on 29 and 30 November 2017. Additional areas that were considered for the development footprint were undertaken on the 30th August 2018 and 6th March 2019. Vegetation integrity plots, of 20 m by 50 m, were established in each vegetation zone. Data was collected on the composition, structure and function of the vegetation. Data was collected utilising the methodology presented in the BAM 2017 by persons trained in the BAM and under the direction of persons accredited under the BAM.

### *3.2.2 PCTs identified on the development site*

Based on the field surveys, three PCTs were identified to occur within the development site (Figure 3-1), including:

- PCT 9 – River Red Gum – wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion;
- PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion; and
- PCT 360 – Gilgai wetland mosaic in the southern NSW South Western Slopes Bioregion.

Existing vegetation mapping had some areas in the development site mapped as *PCT 266 – White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion,* however on inspection these areas were comprised of mature Blakely's Red Gum and Yellow Box trees and identified as PCT 277. PCT 266 occurs on roadside vegetation just outside the development site.

Existing vegetation mapping also identified two wetland PCTs on the development site, PCT 17 and PCT 24. On inspection of these wetland areas, the characteristic species for these mapped PCTS were absent. Based on the species present they were identified to PCT 360 and PCT 9 respectively.

A description of the PCTS identified in the development site follows;

Table 3-1 River Red Gum – wallaby grass tall woodland wetland on the outer River Red Gum zone, mainly in the Riverina Bioregion profile.

| **River Red Gum – Wallaby Grass tall woodland wetland on the outer River Red Gum zone, mainly in the Riverina Bioregion (PCT 9)** | | |
|---|---|---|
| ***Vegetation formation*** | Forested Wetlands | |
| ***Vegetation class*** | Inland Riverine Forests | |
| ***Vegetation type*** | **PCT ID** | 9 |
| | **Common Community Name** | River Red Gum - wallaby grass tall woodland wetland |
| ***Approximate extent within the development site*** | 12.3 ha of this PCT occurs in the south eastern corner of the development site. This is comprised of;<br>11.1ha as woodland within the wetland area<br>1.2 ha as a derived grassland on the eastern edge of the wetland | |
| ***Species relied upon for PCT identification*** | ***Species name*** | ***Relative abundance*** |
| | River Red Gum *Eucalyptus camaldulensis* | 1% |
| | Ringed Wallaby Grass *Rytidosperma caespitosa* | 10% |
| | Swamp Dock *Rumex brownii* | <1% |
| | Feather Spear Grass *Lachnagrostis filiformis* | 2% |
| | Common couch *Cynodon dactylon* | 1% |
| | Rush *Juncus sp.* | 5% |
| ***Justification of evidence used to identify the PCT*** | This vegetation is mapped on the SEED Portal as PCT 24 or PCT 277 however, results from the ecological survey did not detect the characteristic plant species for these PCTS.<br>These areas were identified with a dominance of River Red Gum (*Eucalyptus camaldulensis*). The shrub layer is absent and groundcover ranges from mid-dense to sparse. Extensive information of species assemblages is lacking. Four PCTS were | |

| **River Red Gum – Wallaby Grass tall woodland wetland on the outer River Red Gum zone, mainly in the Riverina Bioregion (PCT 9)** | |
|---|---|
| | considered that have River Red Gum as the dominant species in the NSW South Western Slopes. These are:<br><br>*PCT 2 - River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW*<br><br>*PCT 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion*<br><br>*PCT 7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion*<br><br>*PCT 9 - River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion*<br><br>PCT 9 was considered the best match for the PCT based on the following criteria present in the community:<br><br>• Occurs on outer floodplains rather than rivers<br>• Dominance of Wallaby Grass rather than Warrego Grass<br>• Brown grey clay soils<br>• Located within the lower slopes IBRA subregion<br>• Plant species listed above characteristic to this PCT<br><br>As such it was selected as the most appropriate PCT. |
| ***TEC Status*** | Not listed under either the BC Act or EPBC Act |
| ***Estimate of percent cleared in NSW*** | Current extent = 12 000 ha (66% cleared) |

**River Red Gum – Wallaby Grass tall woodland wetland on the outer River Red Gum zone, mainly in the Riverina Bioregion (PCT 9)**

***Examples***

Figure 3-2 River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone, mainly in the Riverina Bioregion.

Table 3-2 Blakely's Red Gum-Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.

| **Blakley's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (PCT 277)** | | |
|---|---|---|
| ***Vegetation formation*** | Grassy Woodlands | |
| ***Vegetation class*** | Western Slopes Grassy Woodland | |
| ***Vegetation type*** | **PCT ID** | 277 |
| | **Common Community Name** | Blakely's Red Gum-Yellow Box grassy tall woodland |
| ***Approximate extent within the development site*** | This PCT is the dominant native vegetation type within the development site comprising of about 42.8 ha across multiple patches. | |
| ***Species relied upon for PCT identification*** | **Species name** | **Relative abundance** |
| | Blakely's Red Gum *Eucalyptus blakelyi* | 8-40% |
| | Yellow Box *Eucalyptus melliodora* | 12-25% |
| ***Justification of evidence used to identify the PCT*** | This vegetation community is heavily disturbed and has been intensively grazed in the understory. The understory is dominated by exotic annual grasses and forbs and very few native understory species are present. The overstory is dominated by a mix of Blakely's Red Gum and Yellow Box. Due to the absence of native understory species, only these two species could be used to identify the PCT.<br>PCT 277 is considered to be the most appropriate PCT based on;<br>• Yellow Box and Blakely's Red gum codominant in the community<br>• Located in the Lower Slopes IBRA subregion.<br>• Occurs on flats<br>• Existing vegetation mapping consistent with this PCT.<br>As such, PCT 277 was selected as the most suitable PCT. | |
| ***TEC Status*** | Forms part of the TEC: White Box- Yellow Box - Blakely's Red Gum Woodland listed as endangered under the BC Act. | |
| ***Estimate of percent cleared in NSW*** | Current extent = 30 000 ha (94% cleared) | |

**Blakley's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (PCT 277)**

***Examples***

Figure 3-3 Blakely's Red Gum-Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

Table 3-3 Gilgai wetland mosaic in the southern NSW South Western Slopes Bioregion

| **Gilgai Wetland Mosaic in the Southern NSW South Western Slopes Bioregion (PCT 360)** | | |
|---|---|---|
| ***Vegetation formation*** | Freshwater Wetlands | |
| ***Vegetation class*** | Inland Floodplain Swamps | |
| ***Vegetation type*** | **PCT ID** | 360 |
| | **Common Community Name** | Gilgai wetland mosaic |
| ***Approximate extent within the development site*** | This PCT is generally characterised as small isolated patches associated with wetlands. The extent of this PCT within the development is limited to a small ephemeral wet area of 1.3 ha on the northern eastern corner of the development site located around a single farm dam. | |
| ***Species relied upon for PCT identification*** | **Species name** | **Relative abundance** |
| | *Eucalyptus blakelyi* | <1% |
| | *Bulbine bulbosa* | 0.5% |
| | *Amphibromus nervosus* | 40% |
| | *Eleocharis acuta* | 10% |
| | *Rytidosperma caespitosa* | <1% |
| | *Anthosachne scabra* | <1% |
| ***Justification of evidence used to identify the PCT*** | On the SEED Portal this area has been identified as PCT 17. Following the field survey, no characteristic species of PCT 17 were present and is was not determined to be an appropriate PCT. This area was dominated by an abundance of wetland grasses and forbs.<br><br>Two PCTS were short listed. There were;<br>• Gilgai Wetland mosaic in the Southern NSW south western slopes bioregion (PCT 360)<br>• Shallow marsh wetland of regularly flooded depressions on floodplains in the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 12).<br><br>The species present in this community was similar to both of these PCTs. PCT 360 was considered to be a better match based on the following characteristics;<br>• the presence of upper stratum species, *Eucalyptus Blakelyi* at the site<br>• the location in the Jindera district<br>• grey cracking clays<br>• Shallow depression<br>• Ephemeral wetland not appearing to be regularly flooded<br><br>As such, PCT 9 was considered to be the most suitable PCT. | |
| ***TEC Status*** | Not listed under the BC Act or EPBC Act | |
| ***Estimate of percent cleared*** | Current extent 100 ha (90% cleared) | |

**Gilgai Wetland Mosaic in the Southern NSW South Western Slopes Bioregion (PCT 360)**

***Examples***

Figure 3-4 Gilgai wetland mosaic in the southern NSW South Western Slopes Bioregion

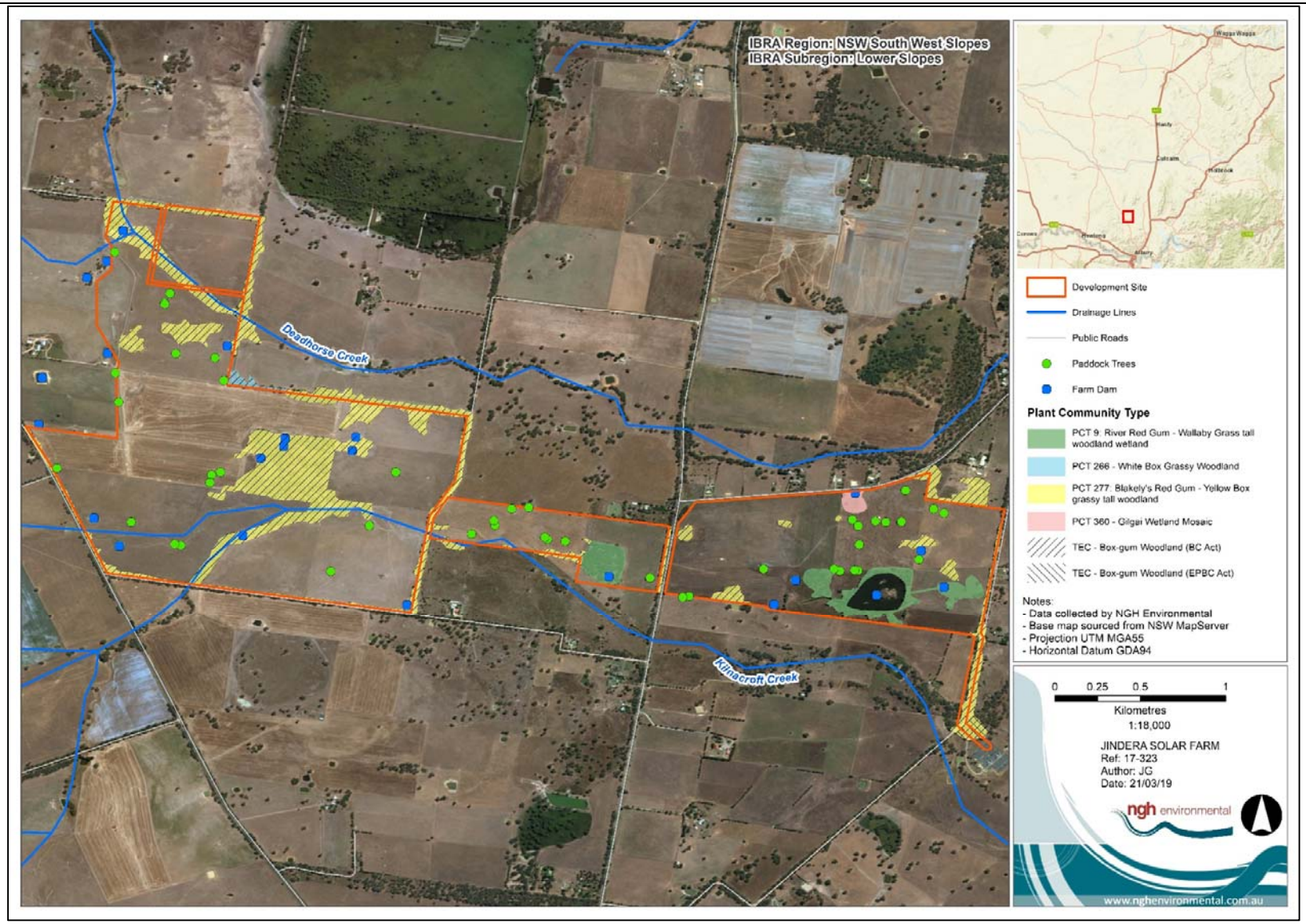



Figure 3-5 PCTs and TECs at the development site

# VEGETATION INTEGRITY ASSESSMENT

### *3.2.3 Vegetation zones and survey effort*

The random meander, overview inspection and detailed floristic plots have been used to assist the delineation of zones. Three PCTs were identified in the development site. Each of these PCTs was considered in terms of whether they should be further stratified into zones on the basis of current condition state / management or other environmental variables. Nine zones were identified in the development site (Table 3-4, & Table 3-5). PCT 9 was stratified into three zones, on the basis of tree cover. PCT 277 was stratified into four zones based on understory condition and site management. An area of PCT 277 around the substation was unable to surveyed, due to site restrictions. As a precautionary approach, this area was classed as an additional zone and benchmark data was used. PCT360 was considered to be a homogenous zone.

Nineteen plots were undertaken throughout the ten zones in the development site. The number of floristic plots undertaken in each zone was in line with the minimum plot requirements per zone area as specified in the BAM (2017).

Table 3-4 Vegetation zones in the development site

| Zone ID | PCT ID | Stratification unit / condition | Area in develop-ment site (ha) | Survey effort (# plots) | Patch size (ha) | Example |
|---|---|---|---|---|---|---|
| 1 | 277 | **Grazed understory**<br>This zone is comprised of multiple patches of Blakely's Red Gum-Yellow Box grassy tall woodland of consistent quality across both sites. The middle story had been largely removed by livestock grazing and the lower story is dominated by exotic annual grasses and forb such as Rye Grass (**Lolium sp.*) and Barley Grass (**Hordeum leporinum*). This zone is intensely grazed by livestock.<br>This woodland is an EEC listed under the BC Act. | 31.5 | 6 | 100+ |  |
| 2 | 277 | **Roadside vegetation**<br>This zone occurs alongside Ortlipp Road. It is comprised of an overstory of Blakely's Red Gum and Yellow Box. The understory has been disturbed and has a high infestation of High Threat Weeds such as Paspalum (**Paspalum dilatatum*), however some native herbs and forb still persist in the understory such as Wallaby Grass (*Rytidosperma spp.*), Matrush (*Lomandra filiformis*) and Spear Grass (*Austrostipa scabra*).<br>This zone also occurs along Urana Road and Walla Walla-Jindera Road where site access road upgrades are required.<br>This woodland is an EEC listed under the BC Act. | 0.90 | 1 | 100+ |  |

| Zone ID | PCT ID | Stratification unit / condition | Area in develop-ment site (ha) | Survey effort (# plots) | Patch size (ha) | Example |
|---|---|---|---|---|---|---|
| 3 | 277 | **Creek line**<br>This zone occurs along Dead Horse Creek and Kilnacroft Creek. It contains a few large mature remnant Yellow Box and Blakley's Red Gum, but the majority of the area has been revegetated with native species such as Apple Box (*Eucalyptus bridgesiana*), Red Box (*Eucalyptus polyanthemos*), Western Silver Wattle (*Acacia decora*) and Red Stemmed Wattle (*Acacia rubida*). This area has been fenced from stock and some native forbs and grasses persist in the creekline such as Sneezeweed (*Centipeda cunninghamiana*), River Mint (*Mentha australis*), Sedge (*Carex sp.*) and Wood-sorrel (*Oxalis perennans*).<br>This woodland is an EEC listed under the BC Act. | 9.8 | 4 | 100+ |  |
| 4 | 277 | **Regrowth**<br>This zone occurs in only one area, on the north western side of the development site, along Nation Road. It is comprised of a dense stand of Juvenile Blakely's Red Gum. No mature trees are in this zone. The understory is almost entirely exotic, comprised of exotic annual species such as Barley Grass. This zone is grazed by livestock.<br><br>This woodland is an EEC listed under the BC Act. | 0.6 | 1 | 100+ |  |

| Zone ID | PCT ID | Stratification unit / condition | Area in develop-ment site (ha) | Survey effort (# plots) | Patch size (ha) | Example |
|---|---|---|---|---|---|---|
| 5 | 9 | **Wetland**<br>Three patches of this zone occur in the development site. It is comprised of an overstory of River Red Gum (*Eucalyptus camaldulensis*). The understory has been disturbed through frequent grazing by livestock. The middle strata comprising shrubs has been eliminated. The groundcover is mostly comprised of bare ground and leaf litter with some scattered Rushes (Juncus sp.) and annual exotic forbs and grasses.<br><br>This PCT is not listed under the BC Act or EPBC Act as a TEC. | 8.9 | 3 | 9.7 |  |
| 6 | 9 | **Woodland**<br>This zone occurs in the south eastern corner of the development site. It is comprised of a sparse overstory of mature River Red Gums. The middle strata has been eliminated. The area is grazed by livestock, but this paddock has been rested and there is a good coverage of native Ringed Wallaby Grass (**Rytidosperma caespitosa*) in between the exotic annual grasses such as Barley Grass and Fescue (**Vulpia myuros*).<br><br>This PCT is not listed under the BC Act or EPBC Act as a TEC. | 2.2 | 1 | 100+ |  |

| Zone ID | PCT ID | Stratification unit / condition | Area in develop-ment site (ha) | Survey effort (# plots) | Patch size (ha) | Example |
|---|---|---|---|---|---|---|
| 7 | 9 | **Derived Grassland**<br>Remnant native vegetation comprising grassy groundcover of the lower strata only amongst a heavy exotic weed burden.<br><br>This PCT is not listed under the BC Act or EPBC Act as a TEC. | 1.2 | 1 | 1 |  |
| 8 | 360 | **Wetland**<br><br>This zone consisted occurs in the north eastern end of the development site adjacent to Glenellen Road. It is a small ephemeral wetland adjacent to a dam. This PCT is considered one homogenous zone and comprised of dense coverage of Swamp Wallaby Grass (*Amphibromus nervosus*), Feather Spear Grass (*Lachnogrostis filiformis*) and Juncus sp.<br><br>This PCT is not listed under the BC Act or EPBC Act as a TEC. | 1.3 | 1 | 1.3 |  |
| 9 | 277 | **Benchmark Data**<br>This zone occurs around the substation where the proposed transmission line would connect. It is comprised of an overstory of Blakely's Red Gum and Yellow Box. This area was assessed visually over the fence however due to site | 0.4 | 0 | 101 | No image |

| Zone ID | PCT ID | Stratification unit / condition | Area in develop-ment site (ha) | Survey effort (# plots) | Patch size (ha) | Example |
|---|---|---|---|---|---|---|
| | | restrictions no plots were able to be undertaken within this zone. As a precautionary approach, Benchmark data was used for the BAM calculator. | | | | |
| 10 | N/A | **Exotic Vegetation**<br>The majority of the development site is comprised of exotic vegetation. Exotic vegetation is dominated by crops and exotic annual grasses such as Rye Grass (*Lolium* sp.) and Barley Grass (*Hordeum* sp.).<br>These areas were not considered to represent a PCT or TEC. | 340 | 1 | N/A |  |

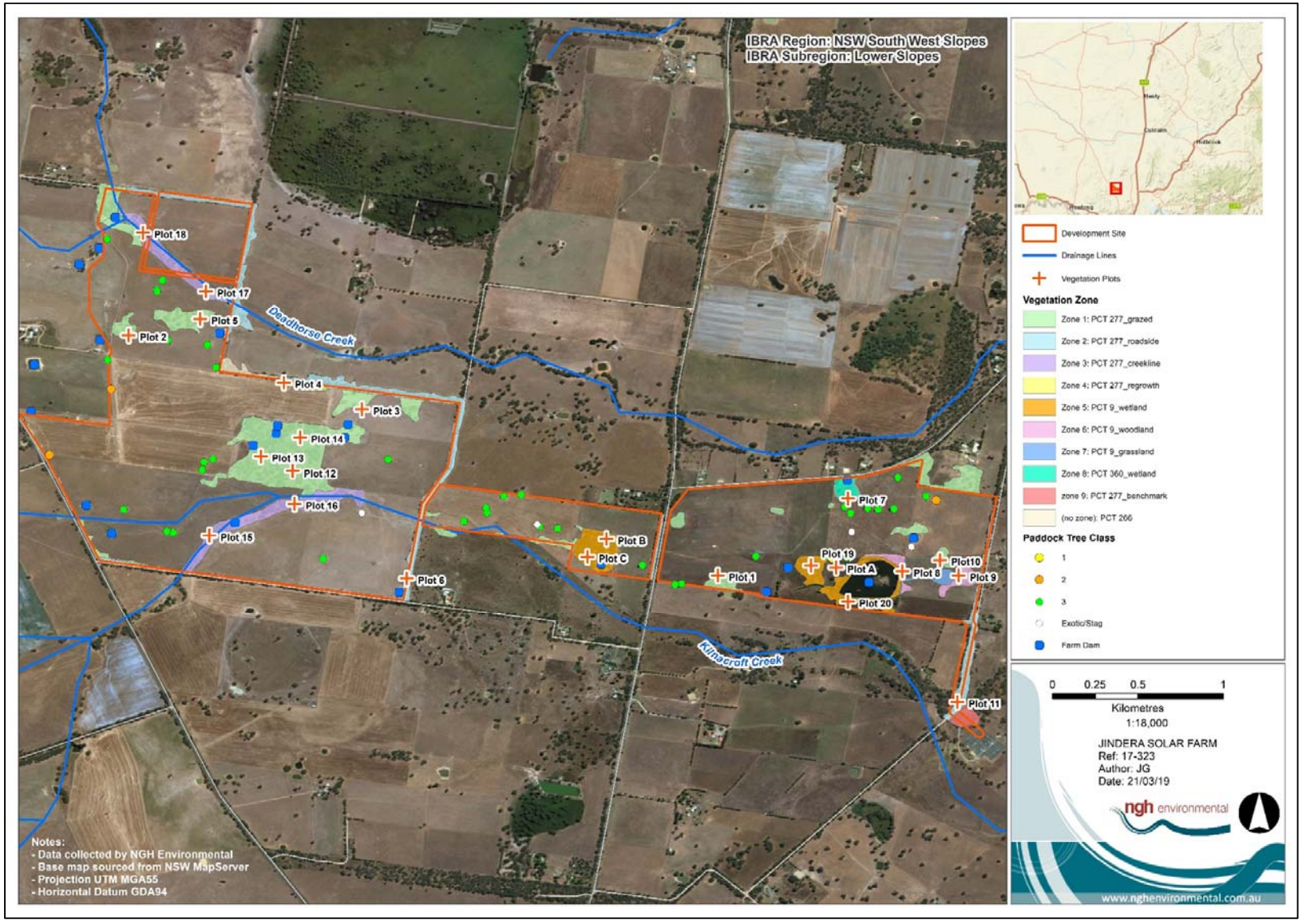



Figure 3-6 Vegetation zones at the development site

### 3.2.4 Paddock Trees

44 isolated paddock trees occur throughout the exotic agricultural land in the development site (Appendix C). 41 of these trees are native species, and 4 are either dead stags or exotic trees.

The 40 native paddock trees are a mix of Yellow Box and Blakely's Red Gum. The Blakely's Red Gum and Yellow Box paddock trees are most likely remnant of the surrounding Blakely's Red Gum Woodland identified in the development zone. As such, PCT277 - *Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion* was assigned to the Paddock Trees. Threatened species that would use the paddock trees are assumed to be the same threatened species that are returned by the BAM Calculator for the vegetation zones. Where targeted fauna surveys were required for the BAM Calculations, paddock trees were also included in the surveys. Assessments of threatened species that would use the paddock trees as habitat has been incorporated into this BDAR under sections 4 and 5.

All paddock trees were mapped in the field using a handheld GIS tablet. Trees were identified to genus and species. The Diameter at Breast Height (DBH) of the tree was assessed and assigned a paddock tree class relevant to the large tree benchmark. The large tree benchmark for PCT277 is 50 cm DBH. The trees were visually assessed from the ground to determine whether any hollows were present. The paddock trees occurring in the development site are shown in Appendix C and Figure 3-6.

### 3.2.1 Vegetation integrity assessment results

81 plant species were identified within the nineteen vegetation integrity survey plots, comprised of 37 native species and 44 exotic species. The results of the plot field data can be found in Appendix A.

The plot data from the vegetation integrity survey plots was entered into the BAM calculator by an accredited assessor. The results of the vegetation integrity assessment are provided in Table 3-5.

Table 3-5 Table of current vegetation integrity scores for each vegetation zone within the development site.

| Zone ID | Composition score | Structure score | Function score | Vegetation Integrity Score |
|---|---|---|---|---|
| 1 PCT277_Grazed | 6 | 32.7 | 56 | 22.2 |
| 2 PCT277_Roadside | 31.8 | 45.3 | 78.8 | 48.4 |
| 3 PCT277_Creekline | 22.7 | 34.8 | 80.8 | 40.0 |
| 4 PCT277_Regrowth | 3 | 32.7 | 44.8 | 16.3 |
| 5 PCT9_Wetland | 6 | 22.9 | 67.8 | 21.0 |
| 6 PCT9_Woodland | 9.6 | 40.2 | 20.1 | 19.8 |
| 7 PCT9_Derived Grassland | 34.8 | 28.9 | 15 | 24.7 |
| 8 PCT360_Wetland | 48.5 | 90.5 | n/a | 66.2 |
| 9 PCT 277_Benchmark* | 100 | 1000 | 100 | 100 |

***** Benchmark data for this PCT was used for this zone

# 4 THREATENED SPECIES

## 4.1 ECOSYSTEM CREDIT SPECIES

The following ecosystem credit species were returned by the calculator as being associated with the PCTs present on the development site:

Table 4-1 Ecosystem credit species.

| Ecosystem credit species | Associated PCT | NSW listing status | National listing status |
|---|---|---|---|
| Australian Painted Snipe<br>*Rostratula australis* | 9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Vulnerable |
| Barking Owl<br>*Ninox connivens* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Not listed | Not listed |
| Black-chinned Honeyeater (eastern subspecies)<br>*Melithreptus gularis gularis* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Not listed |
| Brown Treecreeper (eastern subspecies)<br>*Climacteris picumnus victoriae* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | Vulnerable | Not listed |
| Corben's Long-eared Bat<br>*Nyctophilus corbeni* | 9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Vulnerable |
| Diamond Firetail<br>*Stagonopleura guttata* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Not listed |
| Dusky Woodswallow<br>*Artamus cyanopterus cyanopterus* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Not listed |

| Ecosystem credit species | Associated PCT | NSW listing status | National listing status |
|---|---|---|---|
| Flame Robin<br>*Petroica phoenicea* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | Not listed | Not listed |
| Gang-gang Cockatoo<br>*Callocephalon fimbriatum* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | Vulnerable | Not listed |
| Grey-crowned Babbler (eastern subspecies)<br>*Pomatostomus temporalis temporalis* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | Vulnerable | Not listed |
| Grey-headed Flyingfox<br>*Pteropus poliocephalus* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | Vulnerable | Vulnerable |
| Hooded Robin (south-eastern form)<br>*Melanodryas cucullata cucullata* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Not listed |
| Koala<br>*Phascolarctos cinereus* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Vulnerable |
| Little Eagle<br>*Hieraaetus morphnoides* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Not listed |
| Little Lorikeet<br>*Glossopsitta pusilla* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Not listed |
| Little Pied Bat<br>*Chalinolobus picatus* | 9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Not listed |

| Ecosystem credit species | Associated PCT | NSW listing status | National listing status |
|---|---|---|---|
| Major Mitchell's Cockatoo<br>*Lophochroa leadbeateri* | 9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Not listed |
| Masked Owl<br>*Tyto novaehollandiae* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Not listed |
| Purple-crowned Lorikeet<br>*Glossopsitta porphyrocephala* | 9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Not listed |
| Regent Honeyeater<br>*Anthochaera phrygia* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Critically Endangered | Critically Endangered |
| Scarlet Robin<br>*Petroica boodang* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | Vulnerable | Not listed |
| Speckled Warbler<br>*Chthonicola sagittata* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | Vulnerable | Not listed |
| Spotted Harrier<br>*Circus assimilis* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Not listed | Not listed |
| Spotted-tailed Quoll<br>*Dasyurus maculatus* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Endangered (SE mainland population) |
| Square-tailed Kite<br>*Lophoictinia isura* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | Vulnerable | Not listed |

| Ecosystem credit species | Associated PCT | NSW listing status | National listing status |
|---|---|---|---|
| | 9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | | |
| Superb Parrot<br>*Polytelis swainsonii* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Vulnerable |
| Swift Parrot<br>*Lathamus discolor* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Endangered | Critically Endangered |
| Turquoise Parrot<br>*Neophema pulchella* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | Vulnerable | Not listed |
| Varied Sittella<br>*Daphoenositta chrysoptera* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Not listed | Not listed |
| White-bellied Sea-Eagle<br>*Haliaeetus leucogaster* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Not listed | Not listed |
| Yellow-bellied Sheathtail-bat<br>*Saccolaimus flaviventris* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Not listed |
| Painted Honeyeater<br>*Grantiella picta* | 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion<br>9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Vulnerable | Vulnerable |

### *4.1.1 Species excluded from the assessment*

No ecosystem credit species were excluded from the assessment; all are assumed to occur and contribute to ecosystem credits.

## 4.2 SPECIES CREDIT SPECIES

### *4.2.1 Candidate species to be assessed*

The BAM Calculator predicted the following 23 species credit species to occur at the development site (Table 4-2). A desktop assessment was undertaken for habitat constraints and geographic restrictions to determine which species would be included or excluded for further targeted surveys in the development site. Four species lacked suitable habitat and were excluded from further assessment. These species are highlighted in grey in Table 4-2.

Table 4-2 Candidate species credit species requiring assessment

| Species credit species | Habitat components and geographic restrictions | Sensitivity to gain class | NSW Listing Status | National Listing Status | Habitat components and abundance on site | Included or excluded | Reason for inclusion or exclusion |
|---|---|---|---|---|---|---|---|
| **FAUNA** | | | | | | | |
| Barking Owl *Ninox connivens* (Breeding) | Woodland and open forest, including fragmented remnants and partly cleared farmland. Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground. | High | Vulnerable | Not listed | Hollow bearing trees present in development site. | Included | Habitat components on site |
| Bush Stone-curlew *Burhinus grallarius* | Open forests and woodlands with a sparse, grassy ground layer and fallen timber. | High | Endangered | Not listed | Woodland with fallen timber in development site | Included | Habitat components on site |
| Eastern Pygmy Possum *Cercartetus nanus* | Broad range of habitat from rainforest through sclerophyll forest and woodland to heath, but in most areas woodlands and heath preferred. Known in subregion. | High | Vulnerable | Not listed | Woodland areas present in development site. | Included | Habitat components on site |
| Gang-gang Cockatoo *Callocephalon fimbriatum* (Breeding) | In spring and summer, tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, lower altitudes in drier, more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages. Known in subregion. | High (breeding) | Vulnerable | Not listed | Hollow bearing trees present in development site. | Included | Habitat components on site |
| Grey-headed Flying-fox *Pteropus Poliocephalus* (Breeding) | Range of vegetation communities including rainforest, open forest, and closed and open woodland. Roost sites usually near water, | High | Vulnerable | Vulnerable | Woodland areas in development site. | Included | Habitat components on site |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | including lakes, rivers, and coastlines. Known to roost in locality. | | | | | | |
| Koala<br>*Phascolarctos cinereus* | Temperate, subtropical and tropical eucalypt woodlands and forests where suitable food trees grow, of which there are more than 70 eucalypt species and 30 non-eucalypt species that are particularly abundant on fertile clay soils. Known in subregion. | High | Vulnerable | Vulnerable | Woodland areas in development site. | Included | Habitat components on site |
| Large-eared Pied Bat<br>*Chalinolobus dwyeri* | Cliffs, or within 2km of rocky areas containing caves, overhangs, escarpments, outcrops or crevices or within 2km of old mines or tunnels. | Very high | Vulnerable | Vulnerable | No cliffs within development site. No caves with | Excluded | No suitable habitat |
| Little Eagle<br>*Hieraaetus morphnoides*<br>(Breeding) | Open eucalypt forest, woodland, or open woodland, and Sheoak or Acacia woodlands and riparian woodlands in interior NSW, where they nest in tall living trees within a remnant patch.<br>Nest trees - live (occasionally dead) large old trees within vegetation. | Moderate | Vulnerable | Not listed | Large old trees present in development site | Included | Habitat components on site |
| Major Mitchell's Cockatoo<br>*Lophochroa leadbeateri*<br>(Breeding) | Living or dead tree with hollows greater than 10cm diameter | High (breeding) | Vulnerable | Not listed | Hollow bearing trees present in development site. | Included | Habitat components on site |
| Masked Owl<br>*Tyto novaehollandiae*<br>(Breeding) | Living or dead trees with hollows greater than 20cm diameter. | High | Vulnerable | Not listed | Hollow bearing trees present in development site. | Included | Habitat components on site |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pink-tailed Legless Lizard<br>*Aprasia parapulchella* | Rocky Areas or within 50m of rocky areas. | High | Vulnerable | Vulnerable | No rocky areas in development site. | Excluded | No suitable habitat |
| Regent Honeyeater<br>*Anthochaera phrygia* | Mapped important areas | High | Critically Endangered | Critically Endangered | Not within mapped important areas | Excluded | Not within mapped important areas. |
| Southern Myotis<br>*Myotis macropus* | Dependent on waterways with pools of 3m wide or greater.<br>Hollow Bearing trees within 200m of riparian zone.<br>Bridges, caves or artificial structures within 200m of riparian zone. | High | Vulnerable | Not listed | Manmade wetland providing permanent water present in development site. | Included | Habitat components on site. |
| Square-tailed Kite<br>*Lophoictinia isura*<br>(Breeding) | Timbered habitats including dry woodlands and open forests, particularly timbered watercourses. Nest Trees. | Moderate | Vulnerable | Not listed | Woodland areas present in development site. | Included | Habitat components on site |
| Squirrel Glider<br>*Petaurus norfolcensis* | Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely connected (i.e. no more than 50 m apart). | High | Vulnerable | Not listed | Woodland and Hollow bearing trees present in development site.<br>Known records within development site. | Included | Habitat components on site. |
| Superb Parrot<br>*Polytelis swainsonii*<br>(Breeding) | Living or dead *E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta* with hollows greater than 5cm diameter; greater than 4m above ground or trees with a DBH of greater than 30cm. | High (breeding) | Vulnerable | Vulnerable | Hollow bearing trees present in development site. | Included | Habitat components on site |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Swift Parrot<br>*Lathamus discolor* | Mapped Important Areas | Moderate | Endangered | Critically Endangered | Development site not within mapped important areas. | Excluded | Not within mapped important areas |
| White-bellied Sea-eagle<br>*Haliaeetus leucogaster*<br>(Breeding) | Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines | High | Vulnerable | Not listed | Within 1km of wetlands. Large mature trees present in development site. | Included | Habitat components on site. |
| **FLORA** | | | | | | | |
| Ausfeld's Wattle<br>*Acacia ausfeldii* | Footslopes and low rises on sandstone.<br>Associated species include *Eucalyptus albens*, *E. blakelyi* and *Callitris* spp., with an understorey dominated by *Cassinia* spp. and grasses. | High | Vulnerable | Not listed | Blakely's Red Gum present in development site. | Included | Within geographic distribution. |
| Austral Pillwort<br>*Pilularia novae-hollandiae* | Semi-permanent/ephemeral wet areas<br>Periodically waterlogged sites (including table drains and farms dams) | High | Endangered | Not listed | Wetlands present in development site. | Included | Habitat components on site. |
| Silky Swainson-pea<br>*Swainsona sericea* | Box-gum woodland in southern tablelands and South West Slopes. Sometimes in association with cypress pines. Known in subregion. | High | Vulnerable | Not listed | Box-gum Woodland present in development site. | Included | Within geographic distribution. |
| Small Purple-pea<br>*Swainsona recta* | Predominantly grassy woodlands, but sometimes extends into grassy open forest, usually with tree cover including Blakely's Red Gum, Yellow Box, and White Box. Known in subregion. | Moderate | Not listed | Endangered | Box-gum Woodland present in development site. | Included | Within geographic distribution. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Small Scurf-pea<br>*Cullen parvum* | Grassland, River Red Gum woodland or Box-Gum woodland, sometimes on grazed land and usually on table drains or adjacent to drainage lines or watercourses, in areas with rainfall between 450 and 700 mm. Known in subregion. | High | Endangered | Not listed | Box-gum Woodland and River Red Gum present in development site. | Included | Within geographic distribution. |

### 4.2.2 Inclusions based on habitat features

A Bionet search was undertaken on 27th November 2017 to determine if any further threatened species are considered likely to occur on the development site.

Known populations of the Sloane's Froglet (*Crinia sloanei*) occurs 11-12km South-east of the development site. The Sloane's froglet habitat include periodically inundated areas in grassland, woodland and disturbed habitats. Habitat constraints listed in the Threatened Species Database collection include within 500m of waterbodies, swamps and wet areas containing relatively shallow sections with submergent and emergent vegetation. The two wetlands and 19 farm dams within the development site are considered suitable habitat for the Sloane's Froglet and this species was added to the BAM Calculator as a candidate species requiring further assessment.

### 4.2.3 Exclusions based on habitat quality

Under Section 6.4.1.17 of the BAM, a species credit species can be considered unlikely to occur on a development site (or within specific vegetation zones) if following field assessment, it is determined that the habitat is substantially degraded such that the species is unlikely to utilise the development site (or specific vegetation zones). These species are identified in Table 4-3 along with justification regarding the habitats present.

The majority of the development site has been ploughed for crops and undergone extensive grazing by livestock for many years. The understory is mostly exotic annual grasses and very few native species were detected. The following zones (Table 4-3) have been excluded for targeted flora and fauna searches as they are considered to be substantially degraded and are no longer representative of the habitats in which these species could occur.

Table 4-3 Exclusions of species based on habitat quality.

| Species Credit Species | Zones Excluded | Reason for exclusion |
|---|---|---|
| **Flora** | | |
| *Swainsona recta*<br>Small Purple-pea | Zone 1 & 4 | These zones have been subject to heavy grazing by livestock for many years and ploughed for crops. The understory is dominated by Barley Grass and very few native species remain in the understory of these zones. The subject threatened species are unlikely to have survived. |
| *Swainsona sericea*<br>Silky Swainson-Pea | Zone 1 & 4 | These zones have been subject to heavy grazing by livestock for many years and ploughed for crops. The understory is dominated by Barley Grass and very few native species remain in the understory of these zones. The subject threatened species are unlikely to have survived. |
| *Cullen parvum*<br>Small Scurf Pea | Zone 1 & 4 | These zones have been subject to heavy grazing by livestock for many years and ploughed for crops. The understory is dominated by Barley Grass and very few native species remain in the understory of these zones. The subject threatened species are unlikely to have survived. |

| | | |
|---|---|---|
| *Pilularia novae-hollandiae*<br>Austral Pillwort | Zone 1, 2, 4 & 6 | No ephemeral wet areas in these zones. |
| **Fauna** | | |
| Eastern Pygmy Possum<br>*Cercartetus nanus* | Zone 1, 4, 5, 6, 7, 8 | The majority of the woodland patches are substantially degraded, being isolated patches within an agricultural landscape. These woodland patches are comprised of an overstory of Eucalypts with an exotic ground cover of annual grasses. There are no understory shrubs present in these sites and they lack any nectar rich shrubs such as Banksias and Callistemon which are an important food source for the Eastern Pygmy Possum. |

### 4.2.4 Candidate species requiring confirmation of presence or absence

The species listed in Table 4-4 are those that are considered to have habitats present at the development site. Surveys have been conducted for these species and the results are summarised in Table 4-5. Details of the survey methodologies and results are provided for each surveyed species are provided in section 4.2.5. One species, Squirrel Glider (*Petaurus norfolcensis*) is known to occur in the development site. A further five of these species were unable to be surveyed during the recommended survey time and are assumed to be present on the site.

Species polygons have been defined for the species present on the site as mapped on Figure 4-1.

Table 4-4 Summary of species credit species surveyed at the development site

| Species credit species | Biodiversity risk rating | Survey period | Assumed to occur/survey/expert report | Present on site? | Species polygon area or count |
|---|---|---|---|---|---|
| **FAUNA** | | | | | |
| Barking Owl<br>*Ninox connivens* | 2.00 | May-Dec | Surveyed August 2018 | No | 0 |
| Bush Stone-curlew<br>*Burhinus grallarius* | 2.00 | Jan-Dec | Surveyed August 2018 | No | 0 |
| Eastern Pygmy Possum<br>*Cercartetus nanus* | 2.00 | All | Surveyed August 2018. Not during recommended survey time. | Assumed to occur in creek line and roadside vegetation (Zone 2, 3 & 9) | 2.27 ha |
| Gang-gang Cockatoo<br>*Callocephalon fimbriatum* | 2.00 | Oct-Jun | Surveyed November 2017 | No | 0 |
| Glossy Black-cockatoo<br>*Calyptorhynchus lathami* | 2.00 | Mar-Aug | Surveyed August 2018 | No | 0 |

| | | | | | |
|---|---|---|---|---|---|
| Grey-headed Flying-fox *Pteropus poliocephalus* | 2.00 | Oct - Dec | Surveyed August 2018 | No | 0 |
| Koala *Phascolarctos cinereus* | 2.00 | Any | Surveyed November 2017 and August 2018 | No | 0 |
| Little Eagle *Hieraaetus morphnoides* | 1.50 | Aug - Oct | Surveyed August 2018 | No | 0 |
| Major Mitchell's Cockatoo *Lophochroa leadbeateri* | 2.00 | Sep-Dec | Surveyed November 2017 | No | 0 |
| Masked Owl *Tyto novaehollandiae* | 2.00 | May-Aug | Surveyed August 2018 | No | 0 |
| Regent Honeyeater *Anthochaera phrygia* | 3.00 | Sep-Dec | Surveyed August 2018 | No | 0 |
| Sloane's Froglet *Crinia sloanei* | 1.50 | Jun - Jul | Surveyed August 2018 | No | 0 |
| Southern Myotis *Myotis macropus* | 2.00 | Oct-Mar | Not surveyed for during recommended survey period. | Assumed to occur surrounding wetland (zone 1 and 6) | 0.65 ha |
| Square-tailed Kite *Lophoictinia isura* | 1.50 | Sep-Jan | Surveyed November 2017 | No | 0 |
| Squirrel Glider *Petaurus norfolcensis* | 2.00 | All | Surveyed August 2018<br>Known to occur in development site. | Yes | 9.09 ha |
| Superb Parrot *Polytelis swainsonii* | 2.00 | Sep-Nov | Surveyed November 2017 | No | 0 |
| Swift Parrot *Lathamus discolor* | 3.00 | May-Aug | Surveyed August 2018 | No | 0 |
| White-bellied Sea-eagle *Haliaeetus leucogaster* | 2.00 | Jul - Dec | Surveyed August 2018 | No | 0 |
| **FLORA** | | | | | |
| Ausfeld's Wattle *Acacia ausfeldii* | 2.00 | Any | Surveyed November 2017 | No | 0 |
| Austral Pillwort *Pilularia novae-hollandiae* | 3.00 | Oct-Dec | Surveyed November 2017 | No | 0 |
| Silky Swainson-pea *Swainsona sericea* | 2.00 | Sep-Feb | Surveyed November 2017. Not surveyed in transmission line. | Yes, assumed presence in transmission line easement (zone 2 and zone 9) | 1.78 ha |

| | | | | | |
|---|---|---|---|---|---|
| Small Purple-pea *Swainsona recta* | 1.00 | Sep-Nov | Surveyed November 2017. Not surveyed in transmission line. | Yes, assumed presence in transmission line easement (zone 2 and zone 9) | 1.78 ha |
| Small Scurf-pea *Cullen parvum* | 2.00 | Dec-Jan | Surveyed November 2017 – not during recommended survey time. | Assumed present in Zone 2, 3, 6, 7 & 9 | 4.46 ha |

### *4.2.5 Survey methods*

#### Nocturnal Mammals: Eastern Pygmy Possum, Squirrel Glider, Grey-headed Flying-fox

SURVEY EFFORT

A targeted spotlight survey was completed on the evenings of 22 and 23 August 2018 for a total of approximately 8-person hours. A 100-watt spotlight was used for both vehicle-based and foot surveys of planted vegetation, remnant vegetation, and isolated paddock trees. This involved visual searches of trees for arboreal mammals, and above the canopy for Grey-headed Flying-foxes during vehicle-based and foot searches and listening for calls for Squirrel Glider and Grey-headed Flying-fox during foot surveys. Vehicle-based searches were undertaken for approximately 6-person hours, and foot surveys for 2-person hours. Weather conditions recorded for these days at the nearest weather station included minimum temperature of 1.4°C, maximum temperature of 14.1°C, and 0.2 mm of rainfall.

SURVEY RESULTS

No threatened nocturnal mammals were seen during the survey. Five Common Brushtail Possums *Trichosurus vulpecula* were recorded at sites across the proposal area, from the north-west to the south-east. One Common Ringtail Possum *Pseudocheirus peregrinus* was seen in the north-west of the proposal area. No flying fox breeding camps were observed within the development site.

Two known records of the Squirrel Glider occur in the woodland patch in the centre of the Western property (Bionet). These records occur from 2016 and 2017. As such, the squirrel glider is considered to occur in the development site. Continuous patches of woodland (trees less than 50m apart) from the known population are mapped as Squirrel Glider habitat in the development site (Figure 4-1- Figure 4-3)

Surveys for the Eastern Pygmy Possum were unable to be undertaken during the specified time period (Oct – March) and as per the BAM, the Eastern Pygmy Possum is assumed to occur in the development site. The majority of the woodland patches are substantially degraded, being isolated patches lacking any nectar rich shrubs such as Banksias and Callistemon which are an important food source for the Eastern Pygmy Possum. Suitable habitat for the Eastern Pygmy Possum occurs within Zone 3 (PCT 277 _ Creekline) and Zone 2 (PCT 277_Roadside) which contain nectar rich shrubs such as Callistemon. These zones are mapped as a threatened species polygon (Figure 4-1- Figure 4-3)

#### Sloane's Froglet

SURVEY EFFORT

A targeted frog survey was completed at farm dams on 22 and 23 August 2018. Weather conditions recorded for these days at the nearest weather station (Albury-Wodonga 072160) included minimum temperature of 1.4°C, maximum temperature of 14.1°C, and 0.2 mm of rainfall. Point call surveys including

call playback were used at 12 farm dams within the development footprint as well as the large wetland in the east of the proposal area. At the time of survey, there was standing water in these dams.

SURVEY RESULTS

No Sloane's Froglets were seen or heard during the survey. The only species recorded during the survey was Plains Froglet *Crinia parinsignifera*, recorded at Dams 11, 12, and 13. This species is not listed as threatened under the BC Act or EPBC Act.

### Nocturnal Birds: Masked Owl, Barking Owl, Bush Stone-curlew

SURVEY EFFORT

A targeted species was completed on the nights of 22 and 23 August 2018 for a total of approximately 8 person hours. Call playback with a megaphone was used from the vehicle along planted vegetation, remnant vegetation, and isolated paddock trees, followed by a period of listening for responses. This was done at 10 sites for the Masked Owl and Barking Owl and 5 sites for the Bush Stone-curlew. Weather conditions recorded for these days at the nearest weather station included minimum temperature of 1.4°C, maximum temperature of 14.1°C, and 0.2 mm of rainfall.

SURVEY RESULTS

No threatened birds were seen or heard during the survey. One Tawny Frogmouth *Podargus strigoides* was seen in roadside woodland in the north-west of the development footprint.

### Woodland Birds: Regent Honeyeater, Bush Stone-curlew, Gang-Gang Cockatoo, Major Mitchell Cockatoo, Superb Parrot, Swift Parrot, Little Eagle, White Bellied Sea Eagle, Square-tailed Kite, Glossy Black Cockatoo, Little Eagle, White Bellied Sea Eagle, Square-tailed Kite.

SURVEY EFFORT

Woodland bird surveys were completed over two survey time (the 29th - 30th November 2017 and 22, 23 and 24 August 2018). Weather conditions recorded for the August surveys at the nearest weather station included minimum temperature of 0.5°C, maximum temperature of 16.6°C, and 0.2 mm of rainfall. Ten 20-minute point surveys for birds were carried out across the proposal area, as well as 24 opportunistic surveys during frog surveys at the farm dams. Opportunistic surveys were also undertaken throughout the site visit including traversing the site by car and on foot. Paddock trees and remnant trees were surveyed for evidence of stick nests used by raptors.

SURVEY RESULTS

One threatened bird species was seen during the survey, Flame Robin (*Petroica phoenicea*). Groups of Flame Robins (up to nine) were recorded at three locations, two in roadside woodland in the north-west of the proposal area, and one in open farmland in the south-east (Figure 4-1- Figure 4-3) Flame Robin is included as an ecosystem credit species and offset has been included in the ecosystem credits.

No other threatened birds were observed during the surveys. Two stick nests were recorded in roadside woodland in the centre of the proposal area. Neither of these nests was large enough to be used by a threatened raptor. A full list of bird species detected are shown in Appendix B.1.3.

### Southern Myotis

SURVEY EFFORT

Targeted bat surveys were completed from the 22 to 24 August 2018. Weather conditions recorded for these days at the nearest weather station included minimum temperature of 0.5°C, maximum temperature

of 16.6°C, and 0.2 mm of rainfall. Two Anabat Swifts were put out for three nights, one in a patch of woodland at the north-west of the proposal area, and one on the edge of the large dam in the south-east of the proposal area.

SURVEY RESULTS

Surveys for the Southern Myotis were unable to be completed during the specified time period (October to March) and as per the BAM. This species is assumed to occur in all woodland patches within the development site.

The Southern Myotis relies on pools or waterways greater than 3m wide (Bionet). The only suitable waterway within the development site is the manmade wetland in the south-east. A 200m buffer was applied around the wetland to determine suitable woodland habitat for the Southern Myotis. This was calculated as the threatened species polygon in the BAM Calculator.

### Koala

SURVEY EFFORT

Targeted searches for Koalas during the day were undertaken on the 29th and 30th November 2017. This involved visual searches of trees and searches for signs of Koalas such as scats and scratches within mature feed trees. A targeted spotlight survey was completed on the evenings of 22 and 23 August 2018 for a total of approximately 12-person hours. A 100-watt spotlight was used for both vehicle-based and foot surveys of planted vegetation, remnant vegetation, and isolated paddock trees.

SURVEY RESULTS

No Koalas or evidence of Koalas were seen during the survey.

### Threatened Forbs: Small Purple pea, Silky Swainson-Pea and Small Scurf Pea

SURVEY EFFORT

The understory throughout the development is highly disturbed through heavy grazing and cropping. The majority of the site is dominated by exotic grasses and lacks any native understory. Suitable habitat for these species only occurs within the River Red Gum Woodland surrounding the man-made wetland in the South- east of the development site, where some native grasses and forbs occur. Targeted searches in this area was undertaken on the 29 and 30 November 2017 for a period of approximately 2 hours. These areas were surveyed using the parallel field traverse survey technique in the accordance with the NSW Guide to Surveying Threatened Plants (OEH, 2016).

Surveys for the Small Scurf-pea were unable to be undertaken during the specified time period in Summer (Dec – Jan).

SURVEY RESULTS

The Small Purple pea and Silky Swainson-Pea were not detected within the survey area of the development site. Surveys were not undertaken in the transmission line easement along Ortlipp Road and they are assumed to occur in this area.

As surveys were not undertaken during the specified time period for the Small Scurf-pea, this species is assumed to occur within the River Red Gum Woodland surrounding the man-made wetland and alongside Ortlipp Road in the Transmission line easement. Species polygons are provided in Figure 4-1 to Figure 4-3.

### Threatened shrubs: Ausfeld's Wattle

SURVEY EFFORT

Suitable habitat for this species could occur in areas of remnant woodland vegetation. Surveys were undertaken for this species on the 29 and 30 November 2017. Within the woodland areas, very few midstorey species were present and any shrubs would have been easily detected.

SURVEY RESULTS

Ausfeld's Wattle was not detected during the site surveys. Very few understory shrubs occurred within the remnant woodlands in the development site. It is considered unlikely that the species would have been overlooked if present and they are not considered to occur within the development site.

### Threatened shrubs: Austral Pillwort

SURVEY EFFORT

Suitable habitat for this species could occur in areas of wetland depressions such as Zone 5 and Zone 8. Subsequent design of the proposal avoided these areas and no suitable habitat occurs in the development footprint.

SURVEY RESULTS

No impacts would occur in wetland areas.

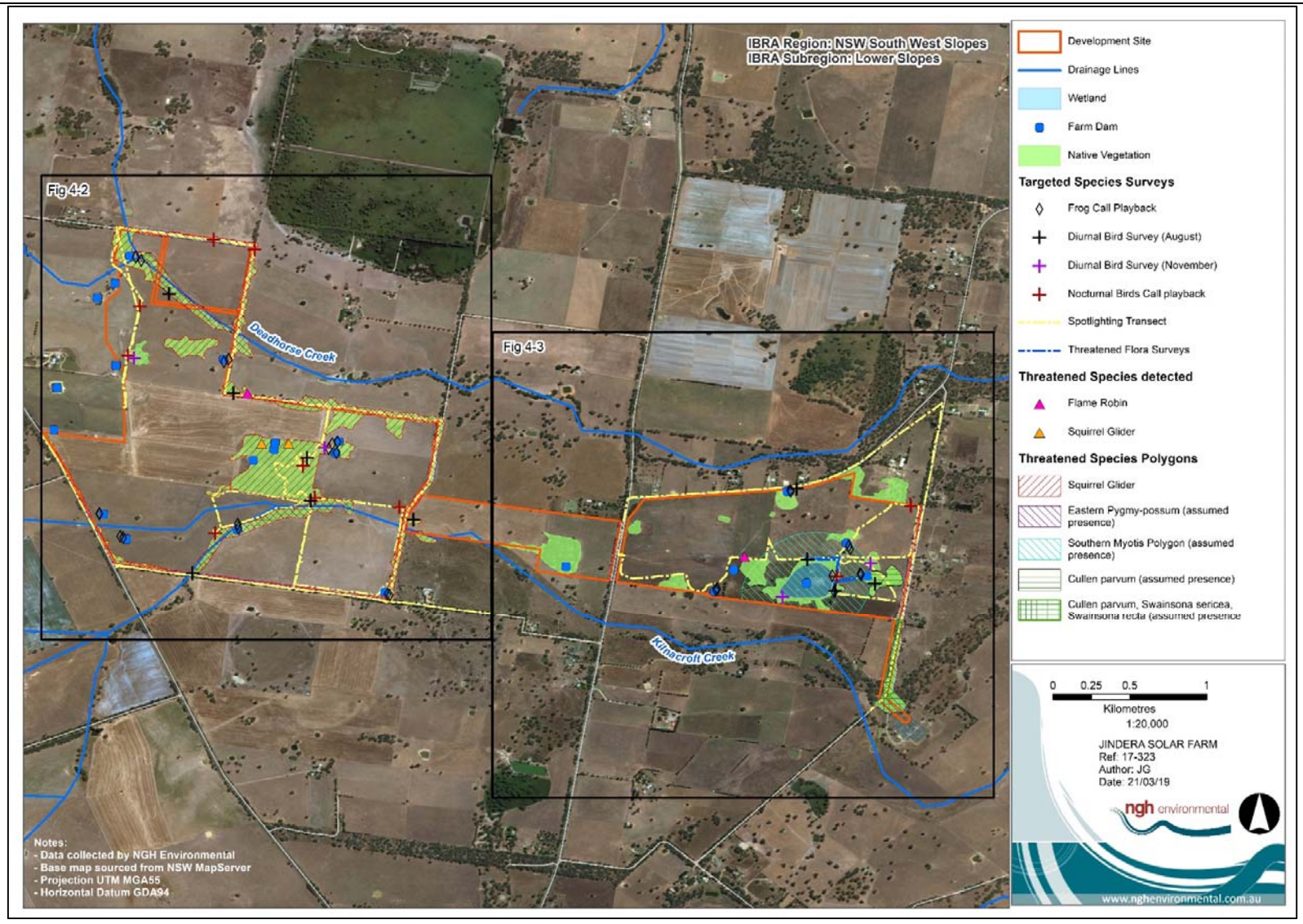



Figure 4-1 Threatened species polygons and targeted survey locations

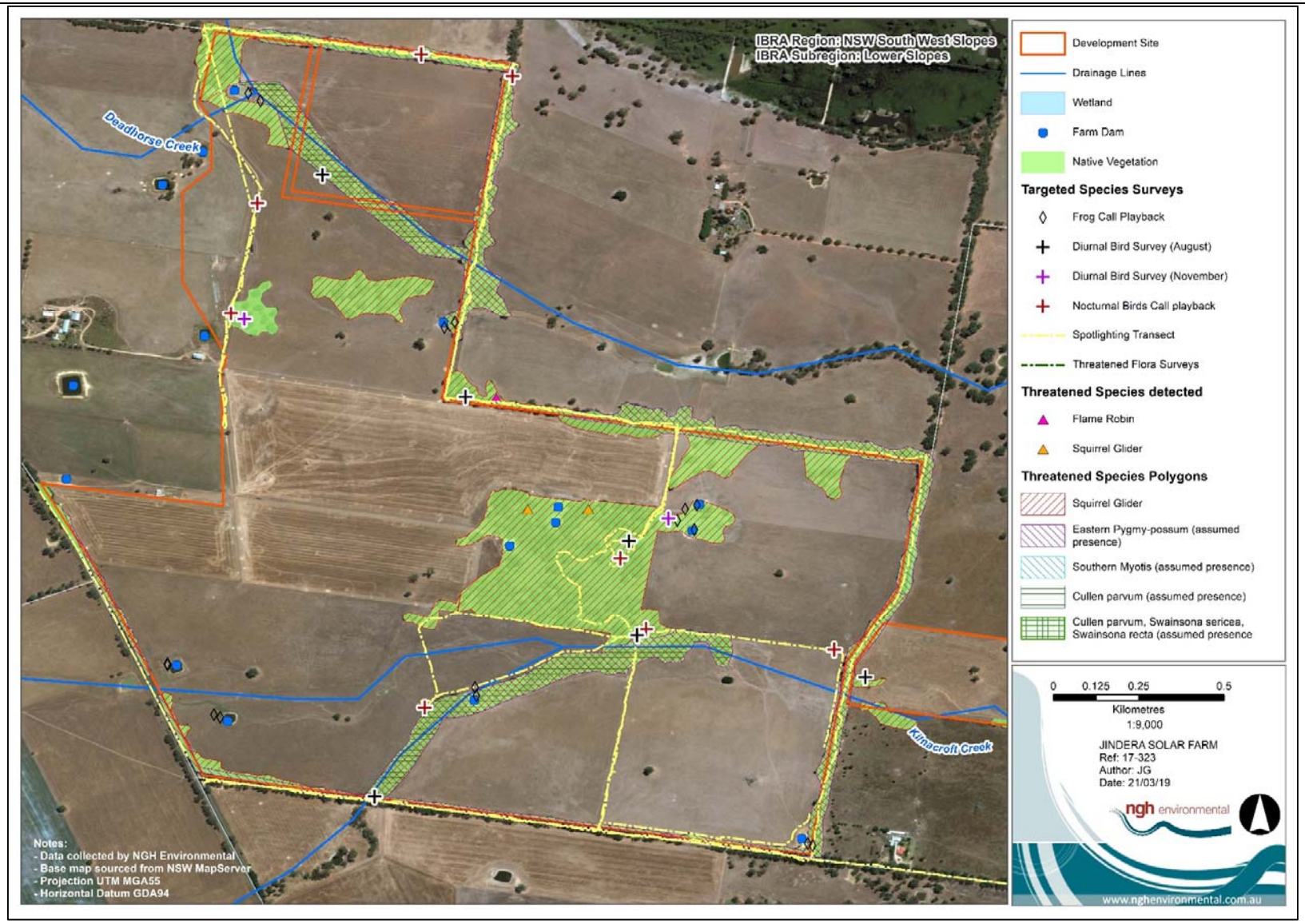



Figure 4-2 Threatened Species Polygons and targeted survey locations (Western side of development site).

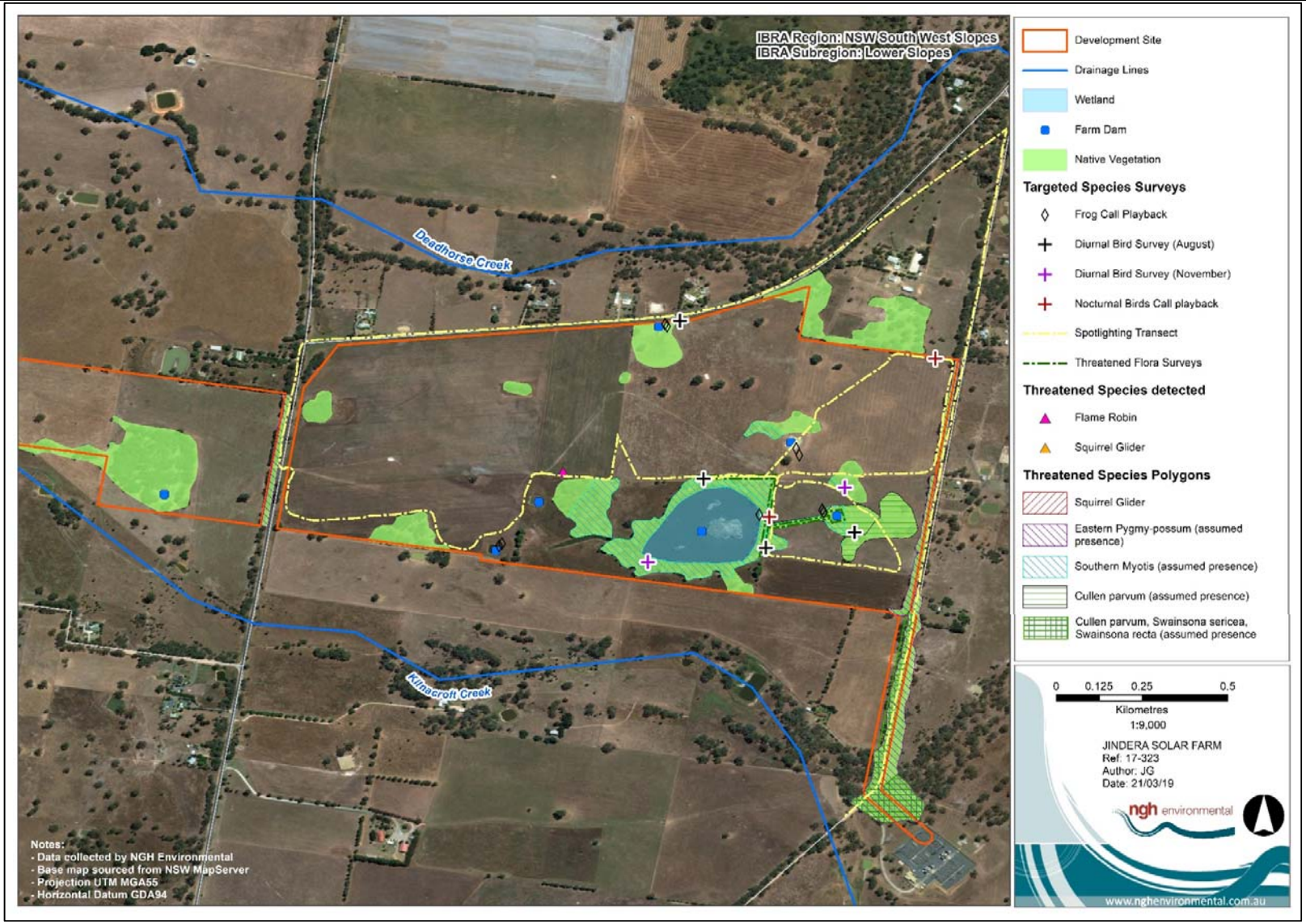



Figure 4-3 Threatened Species Polygons and targeted survey locations (Eastern side of development site).

## 4.3 ADDITIONAL HABITAT FEATURES RELEVANT TO PRESCRIBED BIODIVERSITY IMPACTS

### *4.3.1 Occurrences of karst, caves, crevices and cliffs*

As verified by the field inspection, there are no occurrences of karst, caves, crevices, or cliffs in the development site.

### *4.3.2 Occurrences of rock*

As verified by the field inspection, there are no occurrences of surface rock in the development site.

### *4.3.3 Occurrences of human made structures and non-native vegetation*

As verified by the field inspection, there are no human made structures within the development site. Both parcels of land comprising the development site are cleared and currently used for cropping and pasture. The extent of productive agriculture land in the region is considerable and native animals benefiting cleared exotic vegetation environments have ample access to suitable habitat in the surrounding landscape, thus only minimal impact on threatened species is anticipated from the proposal.

### *4.3.4 Hydrological processes that sustain and interact with the rivers, streams and wetlands*

Two ephemeral waterways, Kilnacroft Creek and Deadhorse Creek traverse the development site. They were dry at the time of the survey and are expected to flow only during high rainfall. Part of the creek line that runs through the development site is vegetated but is unlikely habitat for the Southern Bell Frog (*Litoria raniformis*), which prefers permanent water.

19 farm dams occur within the development site. Farm dams within this locality can provide suitable habitat for the Sloane's Froglet (*Crinea sloanei*). Targeted surveys were undertaken for this species as discussed in Section 4.2. The removal of farm dams by the proposal may slightly increase surface water flow. Potential impacts to hydrological processes are discussed in Section 6.2.4 and Section 7.3.4.

# 5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC protected matters report was undertaken on the 27th November 2017 and researched again on the 18th March 2019 (10 km buffer of the development site) to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the development site (refer to Appendix E). Relevant to Biodiversity these include:

- Wetlands of International Importance – 7;
- Threatened Ecological Communities – 3;
- Threatened fauna species – 18;
- Threatened flora species – 4; and
- Migratory species – 13.

The potential for these MNES to occur at the site are discussed below.

## 5.1 WETLANDS OF INTERNATIONAL IMPORTANCE

Seven wetlands of international importance were returned from the protected matters report. The nearest of these (within 170 km of the development site) is Barmah Forest. Gunbower Forest occurs around 230 km east of the development site. All other wetlands returned from the search are over 300 km away. The Murray River occurs approximately 14 km from the development site, though there is no indication that the proposal will impact the Murray River.

## 5.2 THREATENED ECOLOGICAL COMMUNITIES

Three threatened ecological communities (TECs) were returned from the protected matters report. Only one of these TEC's has the characteristic species present in the development site.

The presence of Yellow Box (*Eucalyptus melliodora*) and Blakley's Red Gum (*Eucalyptus blakelyi*), indicates the potential for the federally listed EEC, *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* to occur in the development site.

An assessment was undertaken to determine if the Blakely's Red Gum – Yellow Box grassy tall woodland (PCT277) meets the condition threshold for the EPBC listed ecological community defined in the EPBC Policy Statement for Box-gum Woodland (DEH, 2006) (Table 5-2).

The woodland patches within the intensely grazed areas (Zones 1 and zone 4) are degraded in the understory with almost 100% exotic groundcover. The woodland patches along the creek line (zone 3) also have a predominantly exotic understory. These areas do not form part of the EPBC listed White Box-Yellow Box-Blakely's Red Gum Grassy Woodland EEC.

Roadside vegetation surveyed along Ortlipp Road (Zone 2) has a predominantly native understory in some parts but lacks diversity of native forbs and large mature trees (>125cm DBH). It does not meet the criteria for the EPBC listed community.

The woodland vegetation around the transgrid substation was unable to be surveyed due to site access restrictions. No floristic plots were able to be undertaken within this area to determine whether it met the criteria thus a precautionary approach was used. For the purposes of this assessment this area of woodland

was considered to meet the criteria for the EPBC listed *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* community.

Table 5-1 Condition threshold assessment for the federally listed White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and derived native grasslands

| EPBC Requirement | Zone 1 and Zone 4<br>(PCT 277_ Grazed & PCT 277_regrowth) | Zone 2<br>(PCT 277 _Roadside) | Zone 3<br>(PCT 277_ Creekline) |
|---|---|---|---|
| **Is, or was previously, at least one of the most common overstory species White Box, Yellow Bo or Blakely's Red Gum.** | Yes, Yellow Box and Blakley's Red Gum common in the overstory. | Yes, Yellow Box and Blakley's Red Gum common in the overstory. | Yes, Yellow Box and Blakley's Red Gum common in the overstory. |
| **Does the patch have a predominantly native understory** | No – no native understory species present. The understory is dominated by exotic weed species.<br>**Not the listed ecological community** | Yes - Native Wallaby Grass (*Rytidosperma spp.*), Spear Grass (*Austrostipa spp.*) and Mat Rush (*Lomnandra* spp.) provide at least 50% of the perennial vegetation cover. | No – some native understory species present but provide less than 2% cover. *Phalaris aquatica* provides at least 50% of the perennial vegetation cover.<br>**Not the listed ecological community** |
| **Is the Patch 0.1ha or greater in size** | | Yes | |
| **There are 12 or more native understory species (excluding grasses).** | | No – 3 native forbs detected in BAM plot along Ortlipp Road. Plot undertaken in area of better understory condition. | |
| **Is the Patch 2 ha or greater in size** | | Yes, patch extends along roadside outside development footprint. | |
| **Does the patch have an average of 20 or more mature trees per hectare (mature trees at least 125cm DBH)** | | No – no mature trees greater than 125cm DBH detected. | |
| **Is there natural regeneration of Yellow Box plus mature trees at least 125cm DBH** | | No – Natural regeneration but no mature trees greater than 125cm DBH detected.<br>**Not the listed ecological community** | |

## 5.3 THREATENED SPECIES

Twenty-two threatened species were returned from the protected matters report. Of these, four species are considered to have the potential to utilise the habitats at the development site. These are:

- **Birds:** Superb Parrot (*Polytelis swainsonii*) and Swift Parrot (*Lathamus discolor*)
- **Mammals:** Koala (*Phascolarctos cinereus*) and Grey-headed Flying-fox (*Pteropus poliocephalus*);

## 5.4 MIGRATORY SPECIES

Thirteen listed migratory species were returned from the protected matters report. Two of these species are considered to have the potential to occur at the development site. These are;

- Fork-tailed Swift (*Apus pacificus*) and
- White-throated Needletail (*Hirundapus caudacutus*).

These species are almost exclusively aerial and unlikely to rely on the habitats present in the development site.

# 6 AVOID AND MINIMISE IMPACTS

## 6.1 AVOIDING AND MINIMISING IMPACTS ON NATIVE VEGETATION AND HABITAT

### *6.1.1 Site selection – consideration of alternative locations/routes*

During the development of the proposal, a number of alternatives were considered. These include the 'do nothing option' (not developing the solar farm), alternative proposal area locations, and developing different renewable technologies.

During the site selection process for the proposal, the proponent reviewed the solar generation potential of many areas in NSW using a combination of computer modelling and analysis, on the ground surveying, and observation and experience of the proponent. The proposed site was selected because it provides the optimal combination of:

- Low environmental constraints (predominantly cleared cropping and grazing land of low agricultural value);
- Level or gently sloping terrain for cost effective construction;
- High quality solar resource;
- Compatible land use zoning (on the development site and considering adjacent land holdings);
- Low flood risk;
- Existing road access;
- Connection to the transmission network;
- High levels of available capacity on the grid transmission system; and
- Land availability and support from the landowner.

The development site is of a scale that allows for flexibility in the design, allowing site constraints identified during the EIS process to be avoided or effectively mitigated.

Available grid capacity at a suitable voltage on the existing Jindera substation with transmission lines connecting the solar farm to Albury was also instrumental in making Jindera an ideal choice for a renewable energy development.

### *6.1.2 Proposal components – consideration of alternate modes or technologies*

The Australian Government's Large-scale Renewable Energy Target (LRET) and NSW Government's Renewable Energy Action Plan (REAP) outline the commitment by both Australia and NSW more specifically to reducing GHG emissions and have set targets for increasing the supply of renewable energy. Other forms of largescale renewable energy accounted for in the LRET include wind, hydro, biomass, and tidal energy. The feasibility of wind, solar, biomass, hydro and tidal projects depend on the availability of energy resources and grid capacity.

PV solar technology was chosen because it is cost-effective, low profile, durable and flexible regarding layout and siting. It is a proven and mature technology which is readily available for broad scale deployment at the site. Unlike wind farms, which are installed on elevated topography, solar energy farms can be effectively screened by vegetation to reduce the impact of visual disturbance, which would also provide

additional habitat for local fauna. Solar energy farms also have few moving parts and are less likely to interfere with bird flight patterns.

Superior solar resources have been identified in NSW, providing excellent opportunities for solar projects.

### 6.1.3 Proposal planning phase – detailed design

A preliminary constraints analysis was conducted by an NGH Environmental ecologist, which informed the site layout design. Vegetation constituting the highest ecological constraints, such as forming components of EECs and providing habitat for threatened flora and fauna were avoided and minimised as far as practical by amending the configuration of solar panels to avoid the removal of trees present at the project site.

These were;

- Avoiding impacts to wetland areas (Zone 5 and Zone 8).
- Avoiding impacts to Kilnacroft Creek and Dead Horse Creek to allow for connectivity to be maintained across the landscape (Zone 3). Some track access would be required though the creek line.
- Reducing the clearing footprint of the project to avoid areas of remnant woodland patches were possible
- Locating ancillary facilities in areas where there are no biodiversity values;
- providing structures to enable species such as the Squirrel Glider to move across barriers or hostile gaps;
- Maintaining the landscape to allow surface water to follow existing drainage routes; and
- Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site.
- Maintaining the connectivity of wildlife movement corridors.

The following zones have been avoided by the proposal (Table 6-1). Zones 3 and Zone 8 had the highest vegetation integrity scores (VIS) in the development site.

Table 6-1 Vegetation zones avoided by the proposal

| Zone ID | PCT | Zone Name | VIS | TEC | Zone Area (ha) |
|---|---|---|---|---|---|
| **4** | 277 - Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | PCT277_Regrowth | 16.3 | EEC | 0.6 |
| **5** | 9 -River Red Gum – wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | PCT9_Wetland | 21.0 | n/a | 8.9 |
| **8** | 360- Gilgai wetland mosaic in the southern NSW South Western Slopes Bioregion | PCT360_Wetland | 66.2 | n/a | 1.3 |

The final site layout and location has not been able to completely avoid all areas of biodiversity value because the length and size of the panels means it is difficult to avoid small patches of vegetation and isolated paddock trees.

The final design footprint is detailed in Figure 6-1.

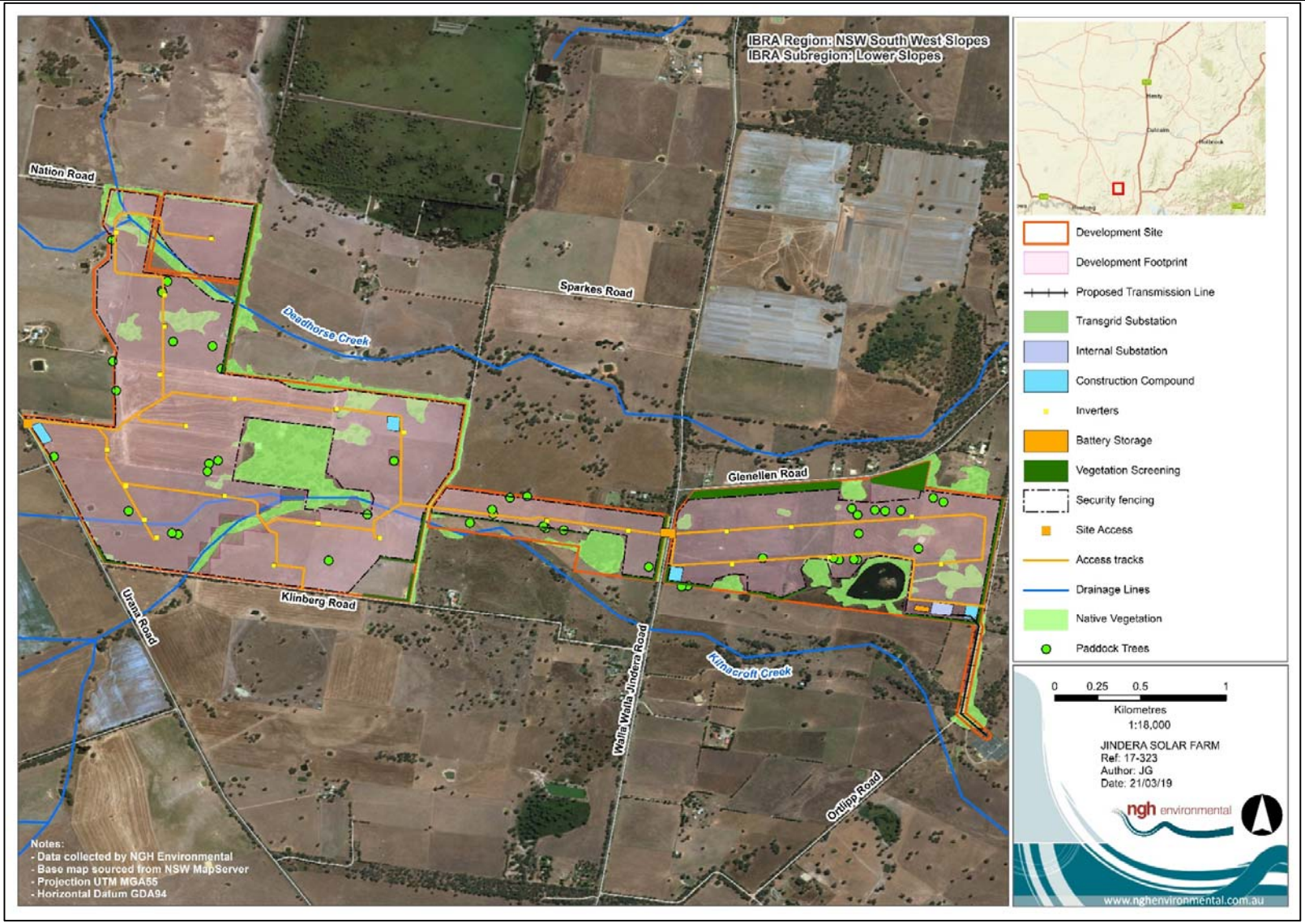



Figure 6-1 Final project footprint

## 6.2 AVOIDING AND MINIMISING PRESCRIBED BIODIVERSITY IMPACTS

The BC Regulation (clause 6.1) identifies actions prescribed as impacts to be assessed under the biodiversity offsets scheme:

- Impacts of development on the habitat of threatened species associated with non-native vegetation.
- Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.
- Impacts of development on movement of threatened species that maintains their life cycle.
- Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities.
- Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

How these prescribed impacts have been avoided and minimised by the proposal is detailed below.

### *6.2.1 Impacts of development on the habitat of threatened species associated with non-native vegetation.*

The Flame Robin was detected within the development site in three locations. In two sites, groups of Flame Robins were seen foraging in roadside vegetation and one site, a group was observed foraging off a fence post in an open area near the man-made wetland. Flame Robins often forage in open pastures and use fence posts to pounce on invertebrate prey (OEH, 2017). As the priority within the development site was to reduce impacts to native vegetation and woodland areas, all open pastures and cleared land in the development site were utilised to form part of the development footprint and have not been avoided by the proposal. However abundant open pastures are common in the adjacent paddocks outside the development site and surrounding environment and provide similar habitat for the Flame Robin.

### *6.2.2 Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range*

The development site is not a known migratory path for threatened species. The main connectivity through the development site is assumed to occur along the two creek lines and the large remnant patch of woodland in the centre of these providing an important refuge. These areas would be avoided by the development and allow movement to continue across the landscape. Larger woodland patches and wetlands would also be retained providing 'steppingstone' refuges for mobile species in an existing highly cleared environment. The proposed plantings for the development will also contribute to increasing local connectivity.

### *6.2.3 Impacts of development on movement of threatened species that maintains their life cycle.*

The development site is not a known migratory path for threatened species. For threatened species that may move across the landscape, retaining the two revegetated creek lines in the development site will maintain connectivity across the landscape to facilitate movement in a north-south direction. These creek lines also connect to the remnant roadside vegetation that would be retained. Larger woodland patches and wetlands would also be retained providing 'steppingstone' refuges for mobile species in an existing highly cleared environment.

### 6.2.4 Impacts of development on water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities.

Kilnacroft and Dead Horse Creek run through the West of the development site. The development footprint was selected to avoid developing the vegetated sections of either creek. There would be no removal or impact to riparian vegetation and the proposal does not modify the topography the creek lines.

Indirectly, the proposed works would involve a range of activities that could disturb soils and potentially lead to sediment laden runoff. This could affect water quality of local water ways during rainfall events. These potential impacts are discussed in Section 7.3.4 and are unlikely to significantly impact on water quality.

Nineteen farm dams are present within the development site. Ten of these dams will be retained as they fall within vegetated areas. The large man-made wetland would also be retained. Nine farm dams would need to be filled by the proposal due to the size constraints of the solar trackers. These farm dams would be filled in during construction.

### 6.2.5 Impacts of vehicle strikes on threatened species or on animals that are part of a TEC

The proposal would not directly increase impacts of vehicle strikes on threatened species. The development site is currently surrounded by country roads that threatened species such as the Squirrel Glider and Eastern Pygmy possum would be crossing. However, an increase in vehicle traffic may increase vehicle strikes on these threatened species outside of the buffer area. Site management to enforce and reduce site speed limits would minimise impacts of vehicle strikes within the subject land.

# 7 IMPACTS UNABLE TO BE AVOIDED

## 7.1 DIRECT IMPACTS

The construction and operational phases of the proposal has the potential to impact biodiversity values at the site that cannot be avoided. This would occur through direct impacts such as habitat clearance and installation and existence of infrastructure.

Table 7-1 Potential impacts to biodiversity during the construction and operational phases

| Nature of impact | Extent | Frequency | Duration and timing | Consequence |
|---|---|---|---|---|
| **Direct impacts** | | | | |
| Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks) | 17.41 ha | Regular | Construction | • Direct loss of native flora and fauna habitat<br>• Potential over-clearing of habitat outside proposed development footprint<br>• Injury and mortality of fauna during clearing of fauna habitat and habitat trees<br>• Disturbance to stags, fallen timber, and bush rock |
| Displacement of resident fauna | Unknown | Regular | Construction, operation | • Direct loss of native fauna<br>• Decline in local fauna populations |
| Injury or death of fauna | Unknown | Regular | Construction | • Direct loss of native fauna<br>• Decline in local fauna populations |
| Removal of habitat features e.g. HBTs | >12 HBTs | Regular | Construction | • Direct loss of native fauna habitat<br>• Injury and mortality of fauna during clearing of habitat features |
| Shading by solar infrastructure | 80 ha (19% of 404 ha development site at horizontal) | Regular | Operational Phase: Long-term | • Potential loss of ground cover resulting in unstable ground surfaces and sedimentation of adjacent waterways. |
| Existence of permanent solar infrastructure (Fencing, array infrastructure). | 80 ha | Regular | Operational Phase: long-term | • Modification of habitat beneath array (mostly non-native)<br>• Reduced fauna movements across landscape due to fencing<br>• Collision risks to birds and microbats (fencing). |

### 7.1.1 Changes in vegetation integrity scores

17.41 ha of native vegetation would be removed by the development. Complete clearing is assumed within the solar infrastructure and the final vegetation integrity score would be 0.

The changes in vegetation integrity scores as a result of vegetation clearing are documented for each vegetation zone in Table 7-2 below.

Table 7-2 Table of current and future vegetation integrity scores for each vegetation zone within the development site.

| Zone ID | PCT | TEC and/or threatened species habitat? | Impact Area (ha) | Current vegetation integrity score | Future vegetation integrity score |
|---|---|---|---|---|---|
| **1** | PCT277_Grazed understory | Box-Gum Woodland EEC<br>Squirrel Glider | 12.47 | **22.0** | **0** |
| **2** | PCT277_Roadside | Box-Gum Woodland EEC<br>Eastern Pygmy Possum (Assumed)<br>*Cullen parvum* (assumed)<br>*Swainsona sericea* (assumed)<br>*Swainsona recta* (assumed) | 1.38 | **48.4** | **0** |
| **3** | PCT277_Creekline | Box-Gum Woodland EEC<br>Squirrel Glider<br>Eastern Pygmy Possum (Assumed) | 0.49 | **40.0** | **0** |
| **6** | PCT9_Woodland | Southern Myotis (Assumed)<br>*Cullen parvum* (assumed) | 1.57 | **19.8** | **0** |
| **7** | PCT9_Derived Grassland | *Cullen parvum* (Assumed) | 1.10 | **24.7** | **0** |
| **9** | PCT277_Benchmark | Box-Gum Woodland EEC<br>Eastern Pygmy Possum (Assumed)<br>*Cullen parvum* (assumed)<br>*Swainsona sericea* (assumed)<br>*Swainsona recta* (assumed) | 0.40 | **100** | |
| | | **TOTAL:** | **17.41** | | |

### 7.1.2 Loss of Paddock Trees

40 native Paddock trees were recorded within the development site. The paddock tree inventory is shown in Appendix C. 33 of these paddock trees would be removed by the proposal.

### 7.1.3 Loss of species credit species habitat or individuals

The loss of species credit species habitat or individuals as a result of clearing is documented in Table 7-3 below.

Table 7-3 Summary of species credit species loss at the development site.

| Species Credit Species | Biodiversity risk weighting | Area of habitat / count of individuals lost |
|---|---|---|
| Squirrel Glider (*Petaurus norfolcenisis*) | 2.00 | 8.60 ha in Zone 1: 277_grazed<br>0.49 ha in Zone 3: 277_Creekline |
| Eastern Pygmy Possum (*Cercartetus nanus*) – assumed present | 2.00 | 1.38 ha in Zone 2: 277_roadside<br>0.49 ha in Zone 3: 277_creekline<br>0.40 ha in Zone 9: 277_benchmark |
| Southern Myotis (*Myotis macropus*) – assumed present | 2.00 | woodland within 200m of wetland dam<br>0.44 ha in Zone 1: 277_grazed<br>0.21 in Zone 6: 9_woodland |
| Small Scurf Pea (*Cullen parvum*) – assumed present | 2.00 | 0.90 ha in Zone 2: 277_roadside<br>0.49 ha in Zone 3: 277_creekline<br>1.57 ha in Zone 6: 9_woodland<br>1.10 ha in Zone 7: 9_derived grassland<br>0.40 ha in Zone 9: 277_benchmark |
| Silky Swainson-pea (*Swainsona sericea*) – assumed present | 2.00 | 1.38 ha in Zone 2: 277_roadside<br>0.40ha in Zone 9: 277_benchmark |
| Small Purple-pea (*Swainsona recta*) – assumed present | 1.00 | 0.90 ha in Zone 2: 277_roadside<br>0.40 ha in Zone 9: 277_benchmark |

## 7.2 INDIRECT IMPACTS

Indirect impacts can occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities or threatened species habitat beyond the development site. Table 7-4 below details the type, frequency, intensity, duration and consequence of the direct and indirect impacts of the proposal.

Table 7-4 Potential impacts on biodiversity during the construction and operational phases.

| Nature of impact | Extent | Frequency | Duration and timing | TEC, threatened species and habitats likely to be affected | Consequence for bioregional persistence |
|---|---|---|---|---|---|
| **Indirect impacts (those listed below are included in the BAM)** | | | | | |
| Inadvertent impacts on adjacent habitat or vegetation | Unknown | Rare | Construction Phase: Short-term | • PCT 277 – Blakely's Red Gum-Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion. | • Injury and mortality of fauna during clearing of fauna habitat and habitat trees;<br>• Disturbance to stags, fallen timber; and<br>• Increased edge effects. |
| Reduced viability of adjacent habitat due to edge effects | Unknown | Constant | Operational Phase: Long-term | • PCT 277 – Blakely's Red Gum-Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.<br>• Flame Robin<br>• Squirrel Glider | • Loss of connectivity between remnant 277 within and around development footprint; and<br>• Reduced genetic diversity within isolated populations |
| Reduced viability of adjacent habitat due to noise, dust, heat or light spill | Unknown | Rare | Operational Phase: Short-term | • Squirrel Glider<br>• Southern Myotis<br>• Flame Robin | • May alter fauna activities and/or movements;<br>• Loss of foraging or breeding habitat; and |
| Transport of weeds and pathogens from the site to adjacent vegetation | Unknown | Irregular | Construction & Operational Phase: Long-term | • PCT 277 – Blakely's Red Gum-Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion. | • Degradation of community biodiversity and integrity; a<br>• Weed encroachment (remnant veg); and |
| Increased risk of starvation, exposure and loss of shade or shelter | Unknown | Rare | Construction & Operational Phase: Long-term | • Squirrel Glider<br>• Southern Myotis<br>• Flame Robin | • Loss of foraging habitat;<br>• Exposure to predators when moving between segmented patches of vegetation; and<br>• Loss of access to water (loss of dams). |
| Loss of breeding habitats | 12 HBT | Constant | Construction Phase: Long-Term | • Squirrel Glider<br>• Southern Myotis | • Loss of potential breeding habitat including fallen and hollow logs at height;<br>• Loss of vegetation close to water: and |

| Nature of impact | Extent | Frequency | Duration and timing | TEC, threatened species and habitats likely to be affected | Consequence for bioregional persistence |
|---|---|---|---|---|---|
| | | | | | • Increased pressure and competition for remaining HBT resources from native and exotic hollow dependent fauna |
| Earthworks and mobilisation of sediments | Unknown | Regular | Construction | PCT 277 – Blakely's Red Gum-Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion. | • Erosion and sediment deposition pollution on downstream habitats; and<br>• Alternation of surface watercourses (isolating high biodiversity value communities). |

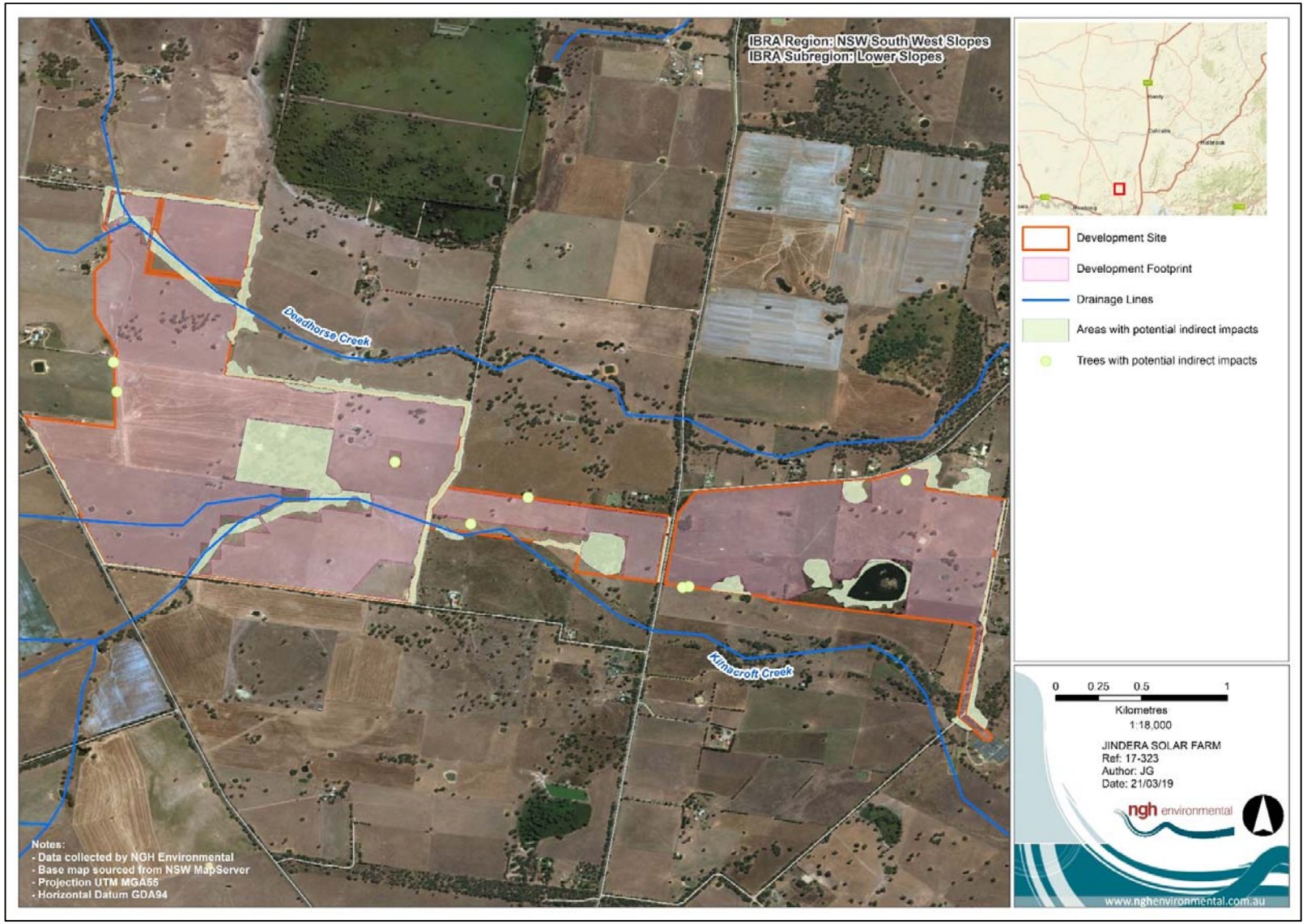



Figure 7-1 Estimated zones of indirect impact for the proposal

## 7.3 PRESCRIBED IMPACTS

The following prescribed biodiversity impacts are relevant to the proposal:

- Impacts of the development on the connectivity of different areas of habitat of threatened species that facilitates the movement of these species across their range;
- Impacts of the development on movement of threatened species that maintains their life cycle;
- Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation;
- Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities; and
- Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC.

These are discussed in detail below and the necessary information required by Section 9.2 of the BAM provided.

### *7.3.1 Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation*

The Flame Robin (*Petroica phoenicea*) was observed within the development site in August, at three separate locations, with one location being in non-native vegetation. A group of Flame Robins were observed foraging off a fence post into open pasture near the man-made wetland in the South-east of the development site. The Flame Robin is a migratory bird and moves to lower and more open areas in winter (OEH, 2017). Outside the breeding season, the Flame Robin forages in scattered flocks.

Breeding habitat of the Flame Robin is tall moist eucalypt forests and woodlands, with nests built in sheltered sites dominated by native grasses. The non-native vegetation does not support breeding habitat for the Flame Robin and provides foraging habitat only. The species is highly mobile, being migratory, and abundant open pastures and cleared lands occurs in the surrounding and adjacent paddocks outside the development site. Possible breeding habitat in the roadside vegetation would remain. It is not anticipated any impacts would occur to breeding habitat of the Flame Robin.

### *7.3.2 Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range*

Squirrel Gliders are known to occur in the development site. The Squirrel Glider needs large trees, no more than 50 metres apart for movement across their home range (Bionet, 2017). Home ranges for linear habitats ranged between 300 and 840m long (van der Ree and Bennett, 2003). The Squirrel Glider has been observed in the square patch of woodland in the centre of the Western side of the development site (Figure 4-1). Connectivity from this patch occurs to the South along Kilnacroft Creek and down to Klinberg Road to intersect with roadside vegetation. Impacts to the Squirrel Glider has been minimised by retaining this known habitat for the Squirrel Glider and the connected vegetation along Kilnacroft Creek.

Scattered paddock trees occur to the north of the known patch connecting with the linear remnant vegetation. However, these paddock trees just over 50m apart (65m) from the known patch so it is not known whether the squirrel glider would move in a northern direction. These paddock trees would be removed by the development. Mitigation measures to install squirrel glider poles to connect to Sparkes

Road would allow for connectivity to occur to the north, should the Squirrel Glider be moving to the remnant vegetation to the north.

The Eastern Pygmy Possum was unable to be surveyed for during the appropriate survey period and has been assumed to occur in the development site. Home ranges for the Eastern Pygmy Possum range from 0.35 to 0.68ha (OEH, 2017). Therefore, patches of woodland may still provide habitat for the Eastern Pygmy-possum. Larger patches of remnant woodland and the revegetated creek lines with a shrub layer would be retained within the development site. These areas provide better quality habitat for the Eastern Pygmy-possum if it were to occur within the development site. Smaller isolated patches of woodland and scattered paddock trees would be removed; however, the Eastern Pygmy-possum would be unlikely to utilise these sparse and isolated woodlands.

The Southern Myotis was unable to be surveyed for during the appropriate survey period and has been assumed to occur in the development site. This species forages near permanent waterways. The man-made wetland is the only suitable habitat within the development site. This water source would not be removed. The Southern Myotis is highly mobile and movement of this species would be unlikely to be impacted, as any existing movement would currently occur over a highly cleared landscape.

For all other threatened species that may forage in the development site on occasion, retaining the two revegetated creek lines in the development site will maintain connectivity across the landscape to facilitate movement in a north-south direction. These creek lines also connect to the remnant roadside vegetation that would be retained. Larger woodland patches and wetlands would also be retained providing 'steppingstone' refuges for mobile species in an existing highly cleared environment. Due to the highly cleared and fragmented landscape within the development site the proposal is not likely to disrupt the movement of any other threatened species.

### *7.3.3 Impacts of the development on movement of threatened species that maintains their life cycle*

The Squirrel Glider requires tree hollows for nesting. Tree hollows are present within the known remnant patch, and these trees would be retained. However, the revegetated creek line may lack abundant hollows as most trees in this zone are not old enough to have developed hollows. It is recommended that felled paddock trees with hollow limbs would have their hollows relocated into the retained woodland vegetation.

For all other threatened species that may move across the landscape, retaining the two revegetated creek lines in the development site will maintain connectivity across the landscape to facilitate movement in a north-south direction. These creek lines also connect to the remnant roadside vegetation that would be retained. Larger woodland patches and wetlands would also be retained providing 'steppingstone' refuges for mobile species in an existing highly cleared environment. Due to the highly cleared and fragmented landscape within the development site the proposal is not likely to disrupt the movement of any other threatened species that maintains their lifecycle.

### *7.3.4 Impacts of development on water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities (including subsidence or upsidence resulting from underground mining or other development)*

The farm dams in the development site could potentially provide habitat for the threatened Sloane's Froglet (*Crinia sloanei*). Surveys were undertaken for this species during peak calling season in August, however they were not detected. No other aquatic threatened species or threatened ecological communities are considered to use the farm dams or ephemeral drainage lines.

The construction of the proposal would involve a range of activities that would disturb soils and potentially lead to sediment laden runoff affecting local waterways during rainfall events. These potential impacts are unlikely to significantly impact water quality with the implementation of recommended mitigation measures including erosion and sedimentation controls. The use of fuels and other chemicals on site during construction poses a risk of surface water contamination in the event of a spill. Mitigation measures to implement spill management procedures would minimise impacts to waterways and hydrological processes.

The surface water management investigation indicates there will be a slight increase of 0.1% to 0.3% of peak flow during operation (Johnson, 2019). This slight increase is not expected to cause any impact downstream. Operation of the proposal would have minimal potential for any impact to surface water quality. Appropriate drainage features would be constructed along internal access roads to minimise the risk of dirty water leaving the site or entering waterways. With the exception of internal roads, parking areas and areas around site offices, the site would be largely vegetated with grass cover (specifically, ground cover would be maintained beneath the solar array). Risks to water quality impacts during operation would therefore be low.

### *7.3.5 Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC*

The proposal would not directly increase impacts of vehicle strikes on threatened species. The development site is surrounded by country roads that threatened species such as the Squirrel Glider would currently be crossing. However, an increase in vehicle traffic may increase vehicle strikes on these threatened species outside of the buffer area. Site management to enforce and reduce site speed limits would minimise impacts of vehicle strikes within the subject land.

## 7.4 IMPACTS TO MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

### *7.4.1 Wetlands of International Importance*

No wetlands of international importance would be impacted by the development

### *7.4.2 Threatened Ecological Communities*

As a precautionary approach, the area of woodland around the transgrid substation was considered to form part of the EPBC listed *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Box-gum Woodland). 0.4ha of this community would be impacted through the

construction of the proposed transmission line. An assessment of significance was undertaken for this community and concluded that a significant impact was unlikely, on the basis that;

- The amount of habitat to be removed or disturbed by the proposal is minimal.
- The proposal area occurs on land that has been previously cleared and modified from existing use as a Transgrid Substation.
- Mitigation measures would be implemented to prevent the introduction of pathogens or invasive weeds on site.

A referral to the Federal Department of Environment is not considered necessary for this community.

### *7.4.3 Threatened Species*

Based on a habitat assessment, four federally listed threatened species could occur in the development site. These are;

- Swift Parrot *Lathamus discolor* – Critically Endangered
- Superb Parrot (*Polytelis swainsonii*) - Vulnerable
- Grey-headed Flying-fox (*Pteropus poliocephalus*) - Vulnerable
- Koala (*Phascolarctos cinereus*) – Vulnerable

#### Swift Parrot and Superb Parrot

Suitable Box-Gum Woodland habitat is present for the Swift Parrot and Superb Parrot in the development site. Surveys were undertaken for this species and they were not detected. However, it is considered these species may forage in the development site on occasion.

EPBC Assessments of significance were completed for these two fauna species (Appendix G). These concluded that a significant impact was unlikely, on the basis that the proposal would not:

- Lead to a reduction of the size or area of occupancy of a population, or fragment or disrupt the breeding cycle of a population
- Affect habitat critical to the survival of these species
- Affect habitat or introduce disease such that these species would decline
- Introduce invasive species harmful to the species
- Interfere with the recovery of these species.

A referral to the Federal Department of Environment is not considered necessary for these species.

#### Grey-headed Flying-fox

Suitable habitat is present for the Grey-headed Flying-fox in the development site. Surveys were undertaken for this species and they were not detected. However, it is considered these species may forage in the development site on occasion.

EPBC Assessments of significance were completed for this species (Appendix G). These concluded that a significant impact was unlikely, on the basis that the proposal would not:

- Lead to a reduction of the size or area of occupancy of a population, or fragment or disrupt the breeding cycle of a population
- Affect habitat critical to the survival of these species

- Affect habitat or introduce disease such that these species would decline
- Introduce invasive species harmful to the species
- Interfere with the recovery of these species.

A referral to the Federal Department of Environment is not considered necessary for this species

### Koala

The EPBC Referral Guidelines for the Koala (DoE 2014) documents the 'Koala habitat assessment tool' to assist proponents in determining if a proposal may impact on habitat critical to the survival of the Koala. The tool is provided as Table 7-5 below as it applies to the proposal. Impact areas that score five or more using the habitat assessment tool contain habitat critical to the survival of the Koala. The assessment in Table 7-5 resulted in a score of 2, and so habitat within the study area is not considered to be critical to the survival of the Koala. An assessment of significant impact according to the EPBC Act is not required.

Table 7-5: Koala habitat assessment tool for inland areas (DoE 2014)

| Attribute | Score | Inland | Applicable to the proposal? |
|---|---|---|---|
| Koala occurrence | +2 (high) | Evidence of one or more koalas within the last 5 years. | |
| | +1 (medium) | Evidence of one or more koalas within 2 km of the edge of the impact area within the last 10 years. | |
| | 0 (low) | None of the above. | ✓<br>One known record within 10km from 2004 (Bionet) |
| Vegetation composition | +2 (high) | Has forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species, **OR**<br>1 food tree species that alone accounts for >50% of the vegetation in the relevant strata. | ✓<br>Red River Gum, Blakely's Red Gum and Yellow Box are food tree species in the South Western Slopes Bioregion |
| | +1 (medium) | Has forest, woodland or shrubland with emerging trees with only 1 species of known koala food tree present. | |
| | 0 (low) | None of the above. | |
| Habitat connectivity | +2 (high) | Area is part of a contiguous landscape ≥ 1000 ha. | |
| | +1 (medium) | Area is part of a **contiguous landscape** < 1000 ha, but ≥ 500 ha. | |

| Attribute | Score | Inland | Applicable to the proposal? |
|---|---|---|---|
| | 0 (low) | None of the above. | ✓ |
| Key existing threats | +2 (high) | Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence.<br>Areas which score 0 for koala occurrence and have no dog or vehicle threat present | |
| | +1 (medium) | Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, **OR**<br>Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present. | ✓<br>Site adjacent to roads and house - Some degree of vehicle and dog threat present |
| | 0 (low) | Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, **OR**<br>Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present. | |
| Recovery value | +2 (high) | Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1. | |
| | +1 (medium) | Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1. | |
| | 0 (low) | Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1. | ✓<br>Study area is not considered a habitat refuge, nor does it provide important connectivity to large areas surrounding a habitat refuge. |
| **Total** | **3** | **Decision: Habitat not critical to the survival of the Koala—assessment of significance not required** | |

### *7.4.4 Migratory species*

Two migratory species, the Fork-tailed Swift and the White-throated Needletail could occur on the site on occasion. These species are almost exclusively aerial and the habitat within the development site is not considered important habitat for these species.

An assessment of significance was undertaken (Appendix G) for these species and concluded that a significant impact was unlikely, on the basis that the proposal would not:

- Substantially modify, destroy or isolate an area of important habitat for these species
- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for these species
- Seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

No referral is considered necessary to the Federal Department of Environment and Energy for these migratory species.

## 7.5 LIMITATIONS TO DATA, ASSUMPTIONS AND PREDICTIONS

The floristic plots are based on a single visit survey. Floristic surveys were undertaken during the optimal flowering time for species in Spring 2017 however it is possible that not all plant species were detected that may be present at the site due to seasonal and climatic constraints. In particular, inconspicuous or geophytic species which flower outside the surveyed period may not have been recorded.

Additional Floristic surveys were taken in Winter 2018 and Summer 2019. All plots recorded a score over the minimum threshold required, apart from one exotic plot near the man-made wetland. Severe drought conditions may have reduced the abundance and cover of native forbs and grasses in this plot however this area was visually assessed in both 2017 and 2018 during good conditions as being an exotic pasture.

The calculation of hollow-bearings trees, in particular the size and number of hollows, was made from ground level. It is possible that some hollows are present that were not visible from ground level, which may result in underestimates of the number of hollows. However, it was noted where it was considered likely that hollows were present but not visible from ground level.

# 8 MITIGATING AND MANAGING IMPACTS

## 8.1 MITIGATION MEASURES

A general summary of the key measures required to mitigate the impacts of the proposal is provided below. Mitigation measures proposed to manage impacts, including proposed techniques, timing, frequency, responsibility for implementing each measure, risk of failure and an analysis of the consequences of any residual impacts are provided in Table 8-1.

### *8.1.1 Impacts from the clearing of vegetation and habitats*

1. Time works to avoid critical life cycle events;
2. Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler; and
3. Relocate habitat features (fallen timber, hollow logs) into retained vegetation patches.

### *8.1.2 Indirect impacts*

1. Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed;
2. Adaptive dust monitoring programs to control air quality;
3. Temporary fencing to protect significant environmental features such as riparian zones;
4. Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas; and
5. Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.
6. No barbed wire to be used on security fencing

### *8.1.3 Prescribed impacts*

1. Appropriate landscape plantings of local indigenous species to replace loss of planted vegetation;
2. Installation of Squirrel Glider Poles to maintain connectivity
3. Install hollows of felled trees onto younger trees in retained vegetation patches.
4. Sediment barriers and spill management protocols to control the quality of water runoff from the site into the receiving environment; and
5. Enforce site speed limits to reduce impacts of vehicle strikes on threatened fauna.

Table 8-1 Mitigation measures proposed to avoid and minimise impacts on native vegetation and habitat

| Mitigation measure | Proposed techniques | Timing | Frequency | Responsibility | Risk of failure | Risk and consequences of residual impacts |
|---|---|---|---|---|---|---|
| **Displacement of resident fauna through vegetation clearing and habitat removal** | | | | | | |
| Time works to avoid critical life cycle events | • Hollow-bearing trees would not be removed during breeding season (spring to summer) to mitigate impacts on Superb Parrots<br>• If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure no impacts to fauna would occur | Construction | Regular | Contractor | Moderate | Species not detected during pre-clearing surveys may be impacted. |
| Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler | • Pre-clearing checklist<br>• Tree clearing procedure | Construction | Regular | Contractor | Moderate | Species not detected during pre-clearing surveys may be impacted |
| Relocate habitat features (fallen timber, hollow logs) from within the development site | • Tree-clearing procedure including relocation of habitat features to adjacent area for habitat enhancement | Construction | Regular | Contractor | Low | None |
| **Indirect impacts on native vegetation and habitat** | | | | | | |
| Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is | • Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing<br>• No stockpiling or storage within dripline of any mature trees | Construction | Regular | Contractor | Low | None |

| Mitigation measure | Proposed techniques | Timing | Frequency | Responsibility | Risk of failure | Risk and consequences of residual impacts |
|---|---|---|---|---|---|---|
| preferable in situations where partial clearing is proposed | • In areas to clear adjacent to areas to be retained, chainsaws would be used rather than heavy machinery to minimise risk of unauthorised disturbance;<br>• Access to the Box-Gum Woodland EEC would not be permitted via vehicles to reduce understorey impacts and clearing; and<br>• Strict weed protocol must be observed at all times. | | | | | |
| Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise | • Construction Environmental Management Plan will include measures to avoid noise encroachment on adjacent habitats such as avoiding night works as much as possible. | Construction | Regular | Contractor | Low | None |
| Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill | • Avoid night works; and<br>• Direct lights away from vegetation. | Construction/ Operation | Regular | Contractor | Low | None |
| Adaptive dust monitoring programs to control air quality | • Daily monitoring of dust generated by construction activities; and<br>• Construction would cease if dust observed being blown from site until control measures were implemented; and<br>• All activities relating to the proposal would be undertaken with the objective of preventing visible | Construction | Regularly | Contractor | Moderate | Sedimentation in ephemeral waterways and dams. |

| Mitigation measure | Proposed techniques | Timing | Frequency | Responsibility | Risk of failure | Risk and consequences of residual impacts |
|---|---|---|---|---|---|---|
| | dust emissions from the development site. | | | | | |
| Temporary fencing to protect significant environmental features such as riparian zones | • Prior to construction commencing, exclusion fencing, and signage would be installed around habitat to be retained | Construction | Regularly | Contractor | Low | None |
| Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas | • A Weed Management procedure would be developed for the proposal to prevent and minimise the spread of weeds. This would include:<br>o Management protocol for declared priority weeds under the *Biosecurity Act 2015* during and after construction;<br>o Weed hygiene protocol in relation to plant, machinery, and fill;<br>• Wash down site vehicles prior to entering the site;<br>• Any occurrences of pathogens such as Myrtle Rust and Phytophthora would be monitored, treated, and reported; and<br>• The weed management procedure would be incorporated into the Biodiversity Management Plan. | Construction, Operation | Regular | Contractor | Moderate | Weed encroachment |
| Staff training and site briefing to communicate environmental | • Site induction; and<br>• Toolbox talks. | Construction | Regular | Contractor | Moderate | Impacts to native vegetation or threatened |

| Mitigation measure | Proposed techniques | Timing | Frequency | Responsibility | Risk of failure | Risk and consequences of residual impacts |
|---|---|---|---|---|---|---|
| features to be protected and measures to be implemented | | | | | | species for Staff training not being followed |
| Preparation of a vegetation management plan to regulate activity in vegetation and habitat adjacent to the proposed development | • Preparation of a Biodiversity management plan that would include protocols for:<br>o Protection of native vegetation to be retained;<br>o Best practice removal and disposal of vegetation;<br>o Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist;<br>o Weed management;<br>o Unexpected threatened species finds;<br>o Exclusion of vehicles through sensitive areas;<br>o Best practice clearing of overstorey vegetation for construction of the transmission line to avoid understorey impacts; and<br>o Rehabilitation of disturbed areas. | Construction | One-off | Contractor | Moderate | Impacts to native vegetation or threatened species for Biodiversity Management Plan not being followed. |
| Barbed Wire would not be used on internal and external fences surrounding Sparkes Rd and | • Retained native vegetation would be considered as an offset site | Construction | Regular | Client | Low | None |
| **Prescribed biodiversity impacts** | | | | | | |

| Mitigation measure | Proposed techniques | Timing | Frequency | Responsibility | Risk of failure | Risk and consequences of residual impacts |
|---|---|---|---|---|---|---|
| Sediment barriers and spill management procedures to control the quality of water runoff released from the site into the receiving environment | • An erosion and sediment control plan would be prepared in conjunction with the final design and implemented; and<br>• Spill management procedures would be implemented. | Construction | Regular | Contractor | Moderate | Impacts may occur to waterway if erosion and sedimentation control plan not implemented |
| Appropriate landscape plantings of local indigenous species to replace loss of planted vegetation | • Landscape plantings will be comprised of local indigenous species | Operation | Regular | Client | Moderate | Plants not surviving |
| Installation of Glider Poles to maintain connectivity within development site | • Install Glider Poles to connect central woodland patch to Sparkes Road. | Construction | Once | Contractor | Moderate | Squirrel Gliders may not use poles during construction. |
| Install hollows of felled trees onto younger trees or on ground in retained vegetation patches. | • Hollow tree limbs would be placed in retained vegetation patches | Construction | Once | Contractor | Moderate | Hollows may be installed incorrectly. Supervision by qualified persons required. |
| Staff training and site briefing to communicate impacts of traffic strikes on native fauna | • Awareness training during site inductions regarding enforcing site speed limits; and<br>• Site speed limits to be enforced to minimise fauna strike. | Construction and Operation | Regular | Contractor | Moderate | Fauna strikes from vehicles |

# 9 SERIOUS AND IRREVERSIBLE IMPACTS (SAII)

The principles used to determine if a development will have serious and irreversible impacts, include impacts that:

- Will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline;
- Will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size;
- Impact on the habitat of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very limited geographic distribution; or
- Impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

## 9.1 POTENTIAL SERIOUS AND IRREVERSIBLE IMPACT ENTITIES

### *9.1.1 Threatened ecological communities*

One threatened ecological community will be impacted by the proposal that is listed as a potential SAII entity in the *Guidance to assist a decision-maker to determine a serious and irreversible impact*. This is the;

- White Box-Yellow Box- Blakely's Red Gum Woodland (Box-gum Woodland)

### *9.1.2 Threatened species*

There are no SAII candidate species recorded at the development site.

### *9.1.3 Additional potential entities*

No further species were considered to be potential SAII entities.

## 9.2 ASSESSMENT OF SERIOUS AND IRREVERSIBLE IMPACTS

### *9.2.1 White Box - Yellow Box – Blakely's Red Gum Woodland* (Box-gum Woodland)

An assessment of the impacts to Box-gum Woodland was undertaken. Figure 9-1 shows the location of the Box-gum Woodland within the development site.

**a) the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII**

Fourteen scattered isolated patches of remnant Box-gum Woodland are present in the development site, covering a combined total area of around 45 ha. The larger, more intact patches of Box-gum Woodland have been avoided by the proposal. Around 31 ha of Box-gum Woodland would remain in the development site. Box-gum Woodland in the adjacent road reserves would also be avoided by the development. Some smaller isolated patches of Box-gum Woodland were unable to be avoided because the rigid tracker/mounting system of the solar panels require complete runs of 90 m in length and are unable to adapt around

small patches of vegetation. Additionally, retained vegetation in the development site create potential shadowing effects reducing the capacity of the solar panels.

**b) the area (ha) and condition of the TEC to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone**

Up to 14.74 ha of Box-gum Woodland would be impacted by the proposal. The area and condition for each vegetation zone to be impacted is shown in the table below;

| Zone ID | Zone name | Impact area (ha) | Vegetation Integrity Score |
|---|---|---|---|
| **1** | PCT 277_Grazed understory | 12.47 | 22.0 |
| **2** | PCT 277_Roadside | 1.38 | 48.4 |
| **3** | PCT 277_Creekline | 0.49 | 40.0 |
| **9** | PCT277_Benchmark | 0.40 | 100* |
| | **TOTAL:** | **14.74** | |

*Benchmark Data for this PCT used

**c) a description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact**

No threshold has yet been defined by OEH for the extent of Box-gum Woodland to be removed that constitutes a serious and irreversible impact**.**

**d) the extent and overall condition of the potential TEC within an area of 1000 ha, and then 10,000 ha, surrounding the proposed development footprint**

Using GIS and State Vegetation Mapping (VIS_4468 & 4469), it is estimated that 203ha of Box-gum Woodland occurs within an area of 1000 ha surrounding the proposed development footprint, and 1463ha of Box-gum Woodland Wetland occurs within an area of 10 000 ha surrounding the proposed development footprint (Figure 9-1).

**e) an estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration**

Using GIS and State Vegetation Mapping (VIS_4468 & 4469), it is estimated that 32 801ha of Box-gum Woodland occurs within the Lower Slopes IBRA Subregion. Vegetation mapped from aerial imagery is assumed to be in moderate to good condition. Up to 14.74 ha is proposed to be removed by the development, which is less than 0.05% of the estimated extent remaining.

**f) an estimate of the area of the potential TEC that is in the reserve system within the IBRA region and the IBRA subregion**

In NSW, Box-gum Woodland is known to occur within at least 42 reserve systems. Around 8 000 ha of Box-gum Woodland is estimated to occur in national parks and nature reserves within the NSW South Western Slopes IBRA Region (Benson 2008). Using GIS Vegetation Mapping it is estimated that 481ha of Box-gum Woodland occurs in four reserves in the Lower Slopes Subregion.

**g) the development, clearing or biodiversity certification proposal's impact on:**

**i. abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns**

Groundwater supplies and levels are unlikely to be affected by the proposal and no groundwater is anticipated to be intercepted or extracted. During construction, the proposal would have a short-term gross impact upon soils and possibly surface water flow, within discreet areas. These impacts are manageable with the implementation of erosion and sediment controls and would be unlikely to impact on abiotic factors critical to the long-term survival of Box-gum Woodland.

**ii. characteristic and functionally important species through impacts such as but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants**

The proposal would remove 14.74 ha of Box-gum Woodland which would permanently remove the characteristic overstory species of Yellow Box (*Eucalyptus melliodora*) and Blakley's Red Gum (*Eucalyptus blakelyi*) in these areas. These areas have an exotic understory and no native understory species would be likely to remain.

Minimal impacts are considered likely to occur to the remaining 31 ha that would be avoided by the proposal. No loss of characteristic or functionally important species are anticipated to the remaining Box-Gum woodland. No introduced fire or flooding regimes would occur, and no increase of natural occurrences of these events is anticipated from the development. No removal of understory species or harvesting of plants would occur in the remaining Box-gum Woodland. It is likely these remaining areas would improve in condition through reduced impacts from cropping and grazing.

**iii. the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts**

Up to 14.74 ha of Box-gum Woodland would be removed. It is likely the remaining 31 ha of Box-gum Woodland avoided by the development would improve in condition through reduced impacts from cropping and grazing. The loss of cropping adjacent to the Box-gum Woodland will reduce fertiliser and herbicide impacts on this community and a reduction in grazing intensity would also protect the remaining woodland patches from constant trampling.

**h) direct or indirect fragmentation and isolation of an important area of the potential TEC**

The small fragmented patches of Box-gum Woodland in the development site are already isolated within the agricultural landscapes. Areas of Box-gum Woodland to be removed are isolated and would not cause further fragmentation of the TEC.

The largest patch (16ha) and the vegetated creek lines in the development site have been avoided by the proposal and would remain connected as corridors. Some minor fragmentation would occur through the construction of access tracks (10m wide) through the creekline corridor, however these would occur in areas when no mature trees are present. The proposal is unlikely to further isolate any areas of Box-gum Woodland.

**i) the measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.**

The 14.74 ha of Box-gum Woodland to be removed would be offset by 201 ecosystem credits to be used for management of another area of Box-gum Woodland in the same IBRA region.

Based on these criteria, it is considered unlikely the proposal would have a serious and irreversible impact on the Box-gum Woodland EEC in the locality.

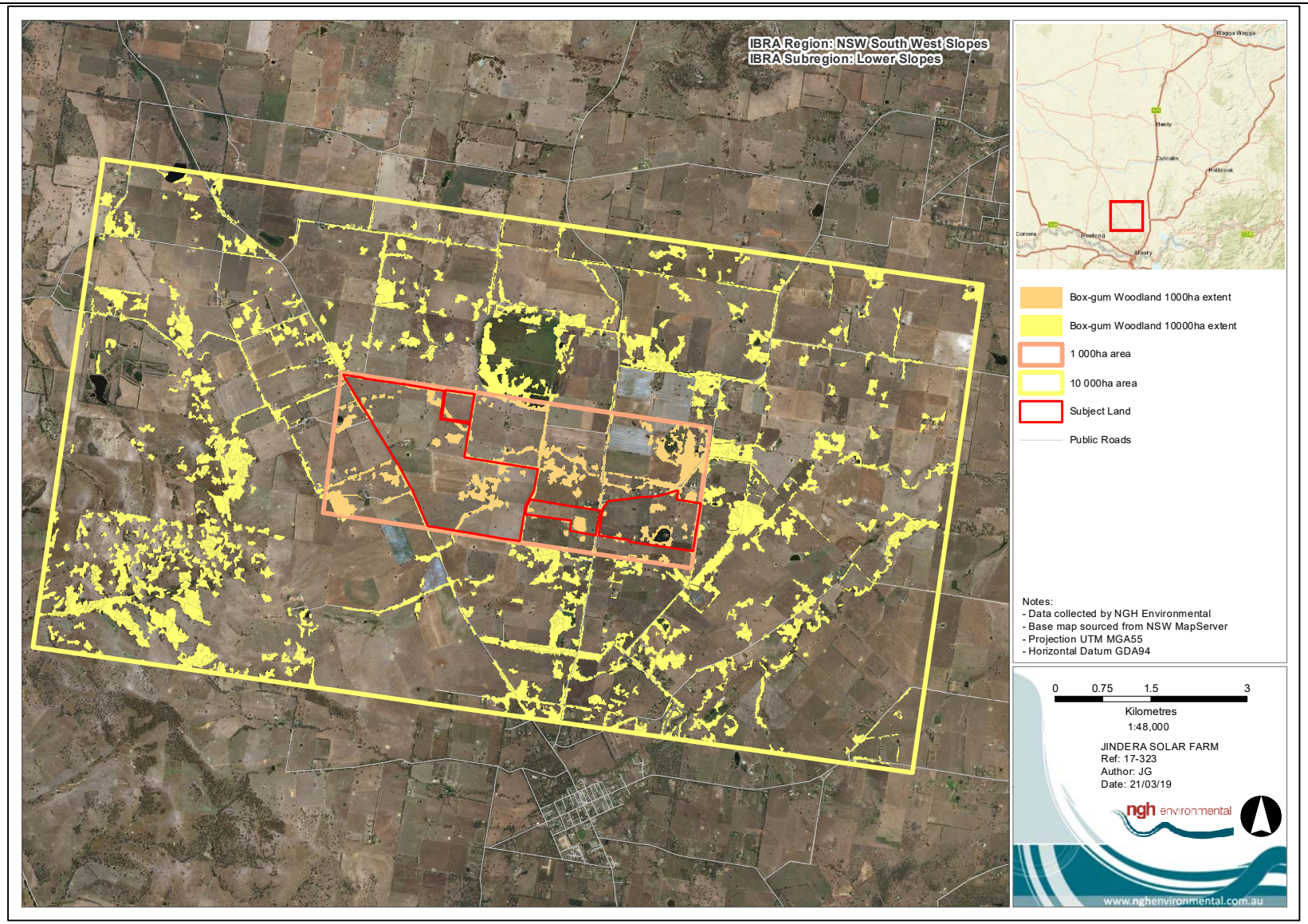



Figure 9-1 Location of serious and irreversible impacts

# 10 REQUIREMENT TO OFFSET

## 10.1 IMPACTS REQUIRING AN OFFSET

### *10.1.1 Ecosystem credits*

An offset is required for all impacts of development on PCTs that are associated with:

a) a vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an endangered or critically endangered ecological community, or
b) a vegetation zone that has a vegetation integrity score of ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or
c) a vegetation zone that has a vegetation integrity score ≥20 where the PCT is not representative of a TEC or associated with threatened species habitat.

The PCTs and vegetation zones requiring offset and the ecosystem credits required are documented in Table 10-1 and mapped on Figure 10-1. The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix I.

Table 10-1 PCTs and vegetation zones that require offsets.

| Zone ID | PCT ID | Zone name | Impact area (ha) | Vegetation Integrity Score | Future Vegetation Score | Ecosystem credits required |
|---|---|---|---|---|---|---|
| **1** | 277 | Grazed understory | 12.47 | 22.0 | 0 | 138 |
| **2** | 277 | Roadside | 1.38 | 48.4 | 0 | 33 |
| **3** | 277 | Creek line | 0.49 | 40.0 | 0 | 10 |
| **6** | 9 | Woodland | 1.57 | 19.8 | 0 | 14 |
| **7** | 9 | Derived Grassland | 1.10 | 24.7 | 0 | 12 |
| **9** | 277 | Benchmark | 0.40 | 100 | 0 | 20 |

### *10.1.1 Paddock tree credits*

Offsets are required for the clearing of Class 2 and Class 3 paddock trees. 33 class 3 and 2 class 2 paddock trees occur within the development footprint (Figure 10-1) and would be removed. The paddock trees form part of PCT 277: Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion. Ecosystem credits are calculated as per the streamlined assessment defined in Appendix 1 of the BAM. These ecosystem credits required are documented in Table 10-2. The Biodiversity credit report generated by the BAM Calculator is provided in Appendix I. 27 ecosystem credits are required for the clearing of the paddock trees.

Table 10-2 Paddock trees that require offsets.

| Class of Paddock Tree being cleared | Hollows Present | Number of Paddock Trees to be cleared | Credits generated per tree | Ecosystem credits required |
|---|---|---|---|---|
| Class 1 | No | 1 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| (<20cm DBH) | | | | |
| Class 2<br>(>20cm DBH and < 50cm DBH) | No | 2 | 0.5 | 1 |
| Class 2<br>(>20cm DBH and < 50cm DBH) | Yes | 0 | 0.75 | 0 |
| Class 3<br>>50cm DBH | No | 21 | 0.75 | 16 |
| Class 3<br>>50cm DBH | Yes | 9 | 1 | 9 |
| | | | **TOTAL:** | **26** |

### *10.1.2 Species credits*

An offset is required for the threatened species impacted by the development that require species credits. These species and the species credits required are documented in Figure 10-1 and Table 10-3.

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix I.

Table 10-3 Species credit species that require offsets.

| Species Credit Species | Biodiversity risk weighting | Area of habitat or count of individuals lost (ha) | Species credits required |
|---|---|---|---|
| Squirrel Glider (*Petaurus norfolcensis*) | 2.0 | 9.09 ha | 105 |
| Southern Myotis (*Myotis macropus*) | 2.0 | 0.65 ha | 7 |
| Eastern Pygmy Possum (*Cercartetus nanus*) | 2.0 | 2.27 ha | 63 |
| Small Scurf Pea (*Cullen parvum*) | 2.0 | 4.46 ha | 93 |
| Silky Swainson-pea (*Swainsona sericea*) | 2.0 | 1.78 ha | 53 |
| Small Purple-pea (*Swainsona recta*) | 1.0 | 1.78 ha | 53 |

### *10.1.3 Offsets required under the EPBC Act*

No species listed on the EPBC Act have been identified as having the potential to be significantly impacted by the development. As such, the proposal is not considered to require offsets in accordance with the EPBC Offsets Policy.

## 10.2 AREAS NOT REQUIRING ASSESSMENT

Approximately 340 ha of exotic vegetation comprised of agricultural crops and pastures would be impacted by the proposal. These zones are not considered native vegetation and do not require offsetting or further assessment.

These areas are mapped on Figure 10-1.

## 10.3 SUMMARY OF OFFSET CREDITS REQUIRED

The following credit requirement is generated for the proposal.

Table 10-4 Summary of offset credits required.

| Ecosystem Credits | Offset credits required |
|---|---|
| PCT 277: Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | 201 |
| PCT 277: Paddock Trees - Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | 26 |
| PCT 9: River Red Gum – wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | 26 |
| **TOTAL:** | **253** |
| **Species Credits** | Offset Credits required |
| Squirrel Glider (*Petaurus norfolcensis*) | 105 |
| Southern Myotis (*Myotis macropus*) | 7 |
| Eastern Pygmy Possum (*Cercartetus nanus*) | 63 |
| Small Scurf Pea (*Cullen parvum*) | 93 |
| Silky Swainson-pea (*Swainsona sericea*) | 53 |
| Small Purple-pea (*Swainsona recta*) | 53 |
| **TOTAL:** | **374** |

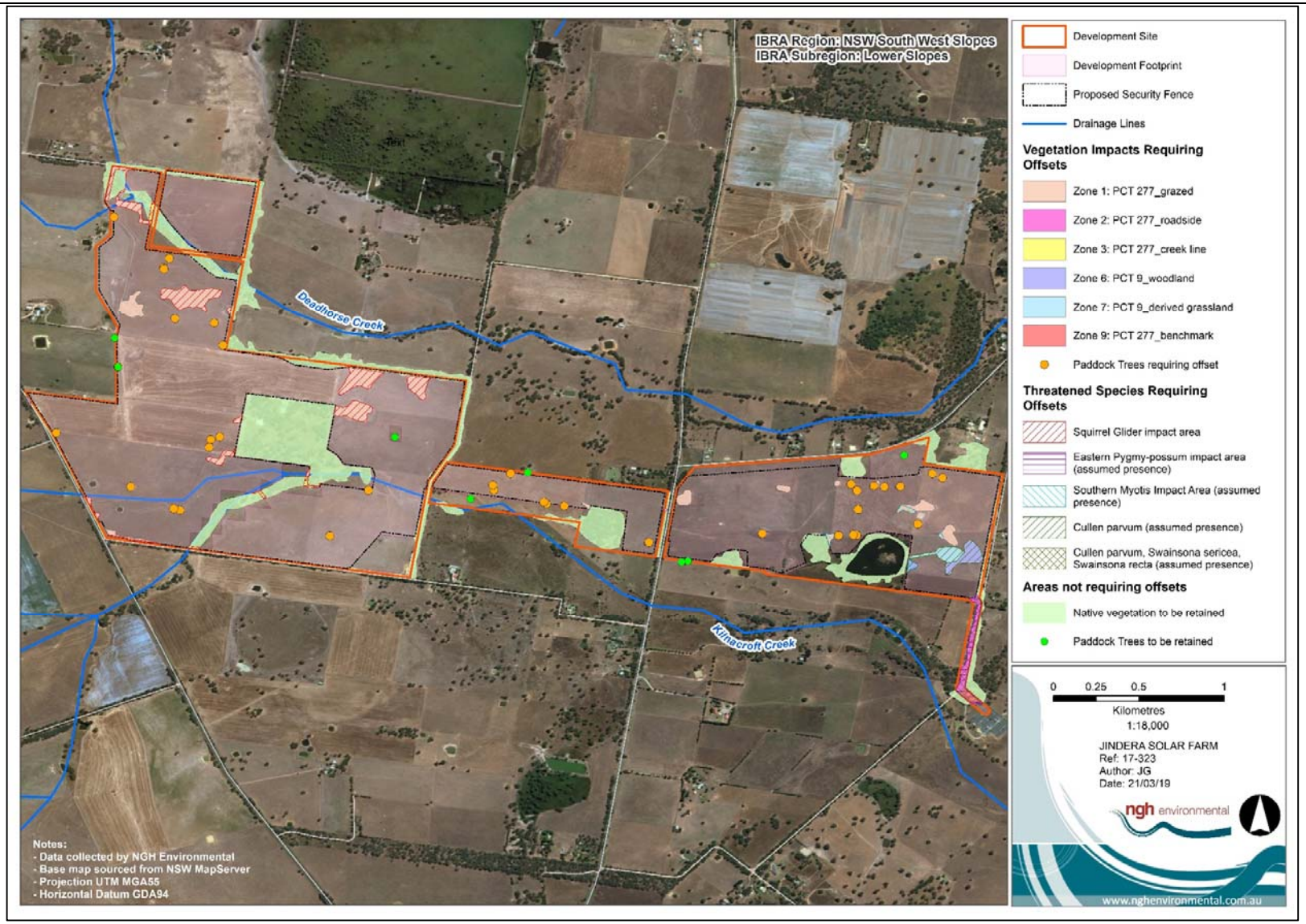



Figure 10-1 Impacts requiring offset, not requiring offset and not requiring assessment

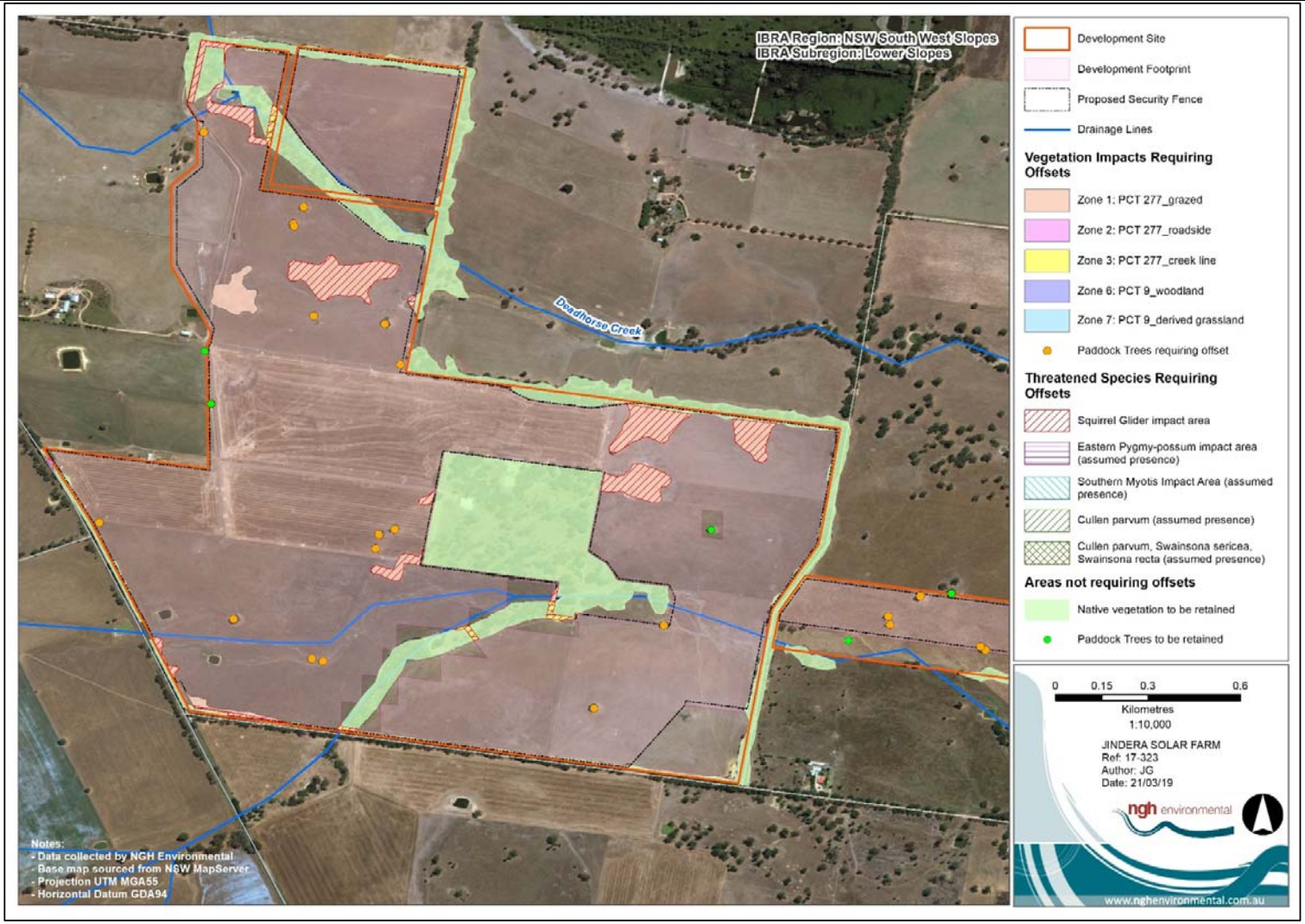



Figure 10-2 Impacts requiring offsets and not requiring offsets (Western side of development site)

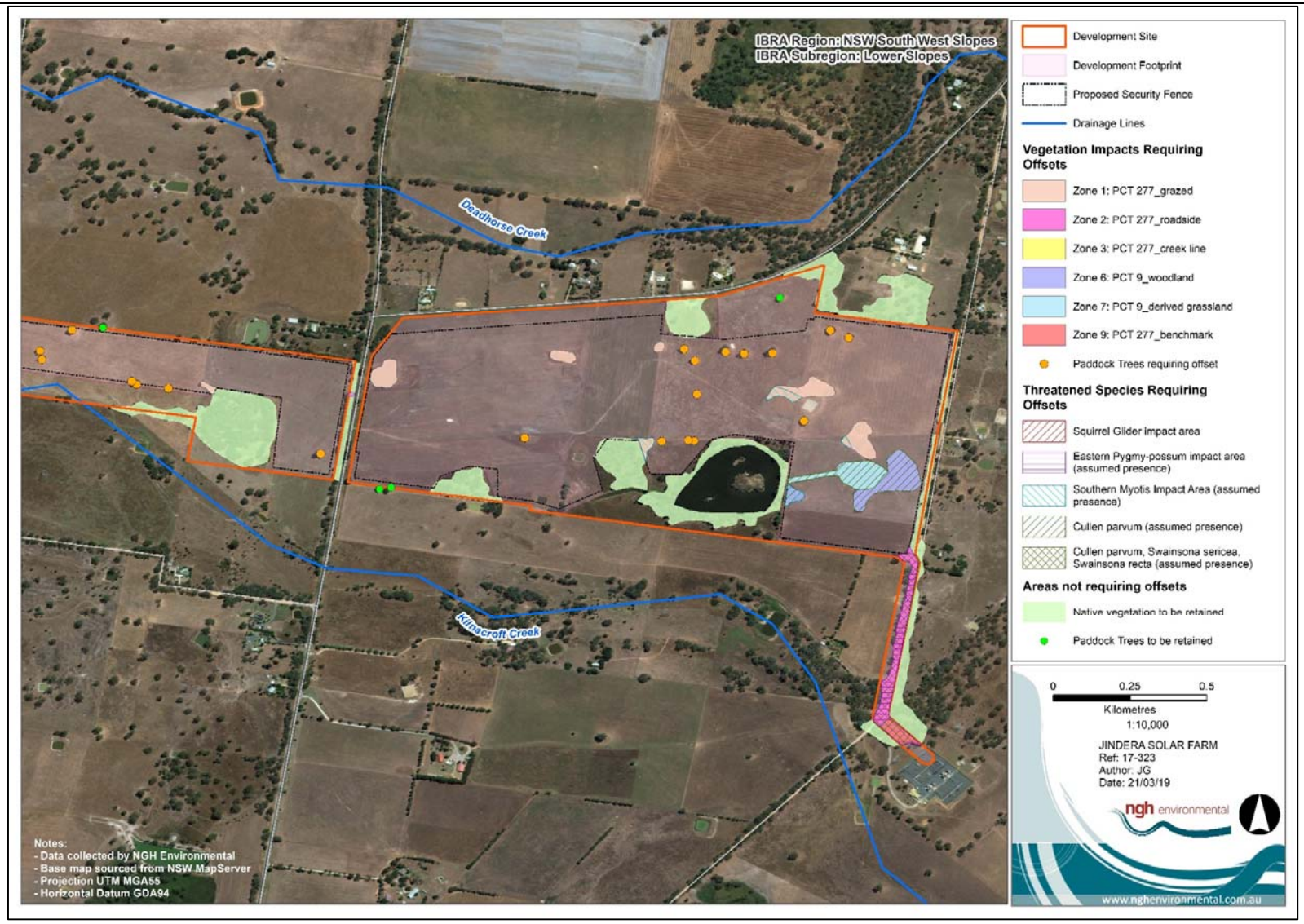



Figure 10-3 Impacts requiring offsets and not requiring offsets (Eastern side of development site)

# 11 CONCLUSIONS

NGH Environmental has prepared this BDAR on behalf of Green Switch Australia Pty Ltd for the Jindera Solar Farm, north of Jindera, NSW. The purpose of this BDAR is to satisfy the assessment requirements of the BOS and BAM as set out under the BC Act for the proposal and to address the biodiversity matters raised in the SEARs. In this BDAR, biodiversity impacts have been assessed through:

- Comprehensive mapping and assessment completed in accordance with the BAM
- The identification of two threatened species and five assumed threatened species within the development site and adjacent vegetation the impacts to which have been adequately assessed
- Mitigation measures which have been outlined to reduce the impacts to biodiversity
- The generation of 253 Ecosystem Credits within the development site, and 374 Species credits which will need to be offset

The retirement of these credits will be carried out in accordance with the NSW Biodiversity Offsets Scheme, and will be achieved by either:

a) Retiring credits under the Biodiversity Offsets Scheme based on the like-for-like rules, or
b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or
c) Funding a biodiversity action that benefits the threaten entity(ies) impacted by the development.

# 12 REFERENCES

Australian Government, Department of Environment and Energy (DEE) (2004). Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (TSSC) on Amendments to the List of Ecological Communities under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). Canberra.

Baker-Gabb, D. (2011) National Recovery Plan for the Superb Parrot *Polytelis swainsonii* Victorian Government Department of Sustainability and Environment (DSE) Melbourne.

DECC (2002) Descriptions for NSW (Mitchell) Landscapes Version 2. NSW Department of Environment and Climate Change.

DECC (2010) National Recovery Plan for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Department of Environment, Climate Change and Water NSW.

DEH (2006) EPBC Act policy statement 3.5 – White Box-Yellow Box-Blakely's red gum grassy woodland and derived native grasslands.

DEE (2010) Directory of Important Wetlands in Australia – Information Sheet (Lake Hume – VIC032) http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=VIC032

DoE (2015) Referral guideline for 14 birds listed as migratory species under the EPBC Act, Australian Government

DoE (2016). Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: http://www.environment.gov.au/sprat.

DoE (2017) National Flying-fox monitoring viewer accessed at http://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf

DoE (2014) EPBC Act Referral Guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory), Commonwealth Department of Environment, 2014.

Johnson, B. (2019) Jindera Solar Farm Surface Water Management Investigation, Jindera Solar Farm Environmental Impact Statement Appendix I

Law, B and Anderson, J. (1999) A survey for the Southern Myotis *Myotis Macropus* (Vespertilionidae) and other bat species in River Red Gum *Eucalyptus camaldulensis* forests of the Murray River, New South Wales.

NSW Scientific Committee (2002). White Box Yellow Box Blakely's Red Gum Woodland – endangered ecological community listing. Final Determination. Accessed on 27/08/19 at https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2000-2003/white-box-yellow-box-blakelys-red-gum-woodland-endangered-ecological-community-listing

$OEH_a$ (2017) Flame Robin – profile accessed at https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20129

$OEH_b$ (2017) Eastern Pygmy-possum – profile accessed at https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10155

Office of Environment and Heritage (OEH) (2017) Biodiversity Assessment Methodology (BAM). Office of Environment and Heritage for the NSW Government, Sydney, NSW.

Office of Environment and Heritage (OEH) (2017) BioNet Vegetation Information System: Classification Database. Accessed online at http://www.environment.nsw.gov.au/research/Visclassification.htm

Royal Botanic Gardens (RBG) (2019) New South Wales Flora Online. Accessed at http://plantnet.rbgsyd.nsw.gov.au/

Van der Ree, R. & Bennett, A (2003) Home range of the squirrel glider (*Petaurus norfolcensis*) in a network of remnant linear habitats.

# APPENDIX A PLOT FIELD DATA

C – Cover (% cover in 20m X 20m plot)

A – Abundance (Number of individuals)

* - Denotes Exotic Species

Δ - Denotes High Threat Weed

Table 12-1 Flora species recorded Plot 1 - 10

| | Scientific Name | Common Name | Family | Plot 1 | | Plot 2 | | Plot 3 | | Plot 4 | | Plot 5 | | Plot 6 | | Plot 7 | | Plot 8 | | Plot 9 | | Plot 10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | PCT 277 Zone 1 | | PCT 277 Zone 1 | | PCT 277 Zone 1 | | PCT 277 Zone 4 | | PCT 277 Zone 1 | | PCT 277 Zone 1 | | PCT360 Zone 8 | | PCT 9 Zone 7 | | PCT 9 Zone 6 | | PCT 277 Zone 1 | |
| | | | | C (%) | A (#) | C | A | C | A | C | A | C | A | C | A | C | A | C | A | C | A | C | A |
| **TREES** | | | | | | | | | | | | | | | | | | | | | | | |
| | *Eucalyptus blakelyi* | Blakely's Red Gum | Myrtaceae | 25 | 5 | 8 | 2 | 15 | 1 | 50 | 200 | 40 | 17 | 18 | 1 | | | | | | | | |
| | *Eucalyptus camaldulensis* | River Red Gum | Myrtaceae | | | | | | | | | | | | | | | | | 10 | 1 | | |
| | *Eucalyptus melliodora* | Yellow Box | Myrtaceae | 12.5 | 1 | 20 | 1 | | | | | | | | | | | | | | | 25 | 4 |
| FORBS | | | | | | | | | | | | | | | | | | | | | | | |
| * | *Acetosella vulgaris* | Sheep Sorrel | Polygonaceae | | | | | | | | | | | | | | | 0.1 | 50 | | | | |
| | *Alternanthera denticulata* | Lesser Joyweed | Amaranthaceae | | | | | | | | | | | | | 0.5 | 200 | | | | | | |
| * | *Chenopodium album* | Fat Hen | Chenopodiaceae | | | 0.1 | 30 | | | | | | | | | | | | | | | | |
| | *Dysphania pumilio* | Black Crumbweed | Chenopodiaceae | | | 0.1 | 50 | | | | | 0.1 | 30 | 0.1 | 10 | | | | | | | | |

| | Scientific Name | Common Name | Family | Plot 1 | | Plot 2 | | Plot 3 | | Plot 4 | | Plot 5 | | Plot 6 | | Plot 7 | | Plot 8 | | Plot 9 | | Plot 10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | PCT 277 Zone 1 | | PCT 277 Zone 1 | | PCT 277 Zone 1 | | PCT 277 Zone 4 | | PCT 277 Zone 1 | | PCT 277 Zone 1 | | PCT360 Zone 8 | | PCT 9 Zone 7 | | PCT 9 Zone 6 | | PCT 277 Zone 1 | |
| | | | | C (%) | A (#) | C | A | C | A | C | A | C | A | C | A | C | A | C | A | C | A | C | A |
| * | *Echium plantagineum* | Patterson's Curse | Boraginaceae | | | 0.1 | 20 | 0.1 | 10 | | | | | | | | | | | | | | |
| * | *Galenia pubescens* | Velcro Weed | Aizoaceae | | | | | | | 0.1 | 30 | | | | | | | | | | | | |
| *Δ | *Hypericum perforatum* | St John's Wort | Hypericaceae | 0.1 | 10 | | | | | | | | | | | | | | | | | | |
| * | *Hypochaeris radicata* | Catsear | Asteraceae | | | | | | | | | | | 0.1 | 1 | | | 0.5 | 50 | 0.1 | 10 | | |
| | *Lomandra multiflora* | Mat Rush | Liliaceae | | | | | | | | | | | | | | | 0.1 | 10 | | | | |
| | *Lythrum hyssopifolia* | Hyssop Loosestrife | Lythraceae | | | | | | | | | | | | | 0.5 | 100 | 0.1 | 10 | | | | |
| * | *Malva parviflora* | Small-flowered Mallow | Malvaceae | | | 0.1 | 5 | 0.1 | 30 | | | 0.1 | 1 | | | | | | | | | 0.2 | 20 |
| * | *Polygonum aviculare* | Wireweed | Polygonaceae | | | 0.1 | 20 | | | 0.1 | 2 | | | | | 0.1 | 30 | 0.1 | 1 | | | | |
| | *Rumex brownii* | Swamp Dock | Polygonaceae | | | | | 0.1 | 1 | | | | | 0.1 | 1 | | | 0.1 | 2 | | | | |
| * | *Rumex crispus* | Curled Dock | Polygonaceae | 0.1 | 10 | | | | | | | | | | | 1 | 200 | 0.1 | 1 | 0.1 | 20 | 0.5 | 80 |
| * | *Silybum marianum* | Variegated Thistle | Asteraceae | 0.1 | 1 | | | | | | | | | | | | | | | | | | |
| * | *Solanum nigrum* | Blackberry nightshade | Solanaceae | | | 0.1 | 20 | 0.1 | 10 | 0.1 | 30 | 0.1 | 10 | 0.1 | 1 | | | | | | | | |
| * | *Sonchus oleraceus* | Sow Thistle | Asteraceae | | | 0.1 | 5 | | | 0.1 | 5 | | | | | | | 0.1 | 10 | | | | |
| * | *Trifolium vesiculosum* | Arrow-leaved Clover | Fabaceae (Faboideae) | | | | | | | 0.1 | 5 | | | | | 0.1 | 1 | | | | | | |
| * | *Trifolium subterraneum* | Subterraneum Clover | Fabaceae (Faboideae) | | | 0.5 | 10 | | | | | | | | | | | | | | | | |

| | Scientific Name | Common Name | Family | Plot 1 | | Plot 2 | | Plot 3 | | Plot 4 | | Plot 5 | | Plot 6 | | Plot 7 | | Plot 8 | | Plot 9 | | Plot 10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | PCT 277 Zone 1 | | PCT 277 Zone 1 | | PCT 277 Zone 1 | | PCT 277 Zone 4 | | PCT 277 Zone 1 | | PCT 277 Zone 1 | | PCT360 Zone 8 | | PCT 9 Zone 7 | | PCT 9 Zone 6 | | PCT 277 Zone 1 | |
| | | | | C (%) | A (#) | C | A | C | A | C | A | C | A | C | A | C | A | C | A | C | A | C | A |
| * | *Urtica urens* | Small Nettle | Urticaceae | | | 0.1 | 30 | | | | | | | | | | | | | | | 0.1 | 1 |
| * Δ | *Xanthium spinosum* | Bathurst Burr | Asteraceae | | | 0.1 | 10 | | | | | | | | | | | | | | | | |
| GRASS AND GRASS LIKE | | | | | | | | | | | | | | | | | | | | | | | |
| | *Amphibromus nervosus* | Swamp Wallaby Grass | Poaceae | | | | | | | | | | | | | 40 | 500 | | | | | | |
| | *Anthosachne scabra* | Common Wheat Grass | Poaceae | | | | | | | | | | | | | | | | | | | | |
| * | *Avena fatua* | Wild Oats | Poaceae | | | | | | | | | 0.1 | 1 | | | | | | | | | | |
| * | *Briza minor* | Little Blowfly Grass | Poaceae | | | | | | | | | | | | | 0.1 | 30 | | | | | | |
| * Δ | *Bromus diandrus* | Great Brome | Poaceae | 0.2 | 30 | 0.1 | 50 | 0.1 | 20 | 5 | 500 | | | 15 | 600 | | | 0.3 | 100 | | | 0.5 | 100 |
| * | *Bromus hordeaceus* | Soft Brome | Poaceae | | | 0.5 | 300 | | | | | | | 15 | 600 | | | 10 | 500 | 2 | 500 | 0.5 | 80 |
| | *Bulbine bulbosa* | Bulbine Lily | Liliaceae | | | | | | | | | | | | | 0.5 | 50 | | | | | | |
| | *Cynodon dactylon* | Common Couch | Poaceae | | | | | | | | | | | | | | | 2 | 10 | | | | |
| | *Cyperus sp.* | Sedge | Cyperaceae | 0.1 | 7 | 0.1 | 1 | | | | | | | | | | | | | | | | |
| * | *Hordeum leporinum* | Barley Grass | Poaceae | 30 | 1000 | 70 | 1000 | 80 | 1000 | 80 | 1000 | 70 | 1000 | 20 | 1000 | 0.2 | 100 | 3 | 500 | 30 | 1000 | 80 | 1000 |
| | *Lachnagrostis filiformis* | Feather Speargrass | Poaceae | | | | | | | | | | | | | 20 | 500 | 2 | 80 | | | | |
| * | *Lolium perenne* | Perennial Ryegrass | Poaceae | 60 | 1000 | 20 | 1000 | 2 | 100 | 0.2 | 100 | 5 | 500 | 15 | 800 | 0.1 | 500 | 10 | 800 | 2 | 300 | | |
| | *Panicum effusum* | Hairy Panic | Poaceae | | | | | | | | | | | | | | | | | | | | |

| | Scientific Name | Common Name | Family | Plot 1 | | Plot 2 | | Plot 3 | | Plot 4 | | Plot 5 | | Plot 6 | | Plot 7 | | Plot 8 | | Plot 9 | | Plot 10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | PCT 277 Zone 1 | | PCT 277 Zone 1 | | PCT 277 Zone 1 | | PCT 277 Zone 4 | | PCT 277 Zone 1 | | PCT 277 Zone 1 | | PCT360 Zone 8 | | PCT 9 Zone 7 | | PCT 9 Zone 6 | | PCT 277 Zone 1 | |
| | | | | C (%) | A (#) | C | A | C | A | C | A | C | A | C | A | C | A | C | A | C | A | C | A |
| * | *Phalaris aquatica* | Phalaris | Poaceae | 5 | 500 | 5 | 100 | 1 | 30 | 0.1 | 10 | 3 | 100 | 20 | 500 | 0.5 | 20 | 0.5 | 10 | 10 | 400 | | |
| | *Poa sieberiana* | Tussock-grass | Poaceae | | | 0.1 | 10 | | | | | | | | | | | | | | | | |
| * | *Romulea rosea* | Onion grass | Iridaceae | | | 3 | 800 | | | | | | | | | | | | | | | | |
| | *Rytidosperma caespitosum* | Ringed Wallaby Grass | Poaceae | | | | | | | | | | | 0.1 | 10 | | | | | 50 | 1000 | | |
| | *Rytidosperma duttonii* | Wallaby Grass | Poaceae | | | | | | | | | | | | | | | 5 | 100 | | | | |
| * | *Triticum aestivum* | Wheat | Poaceae | | | | | | | | | | | | | | | | | | | | |
| * | *Vulpia myuros* | Rat's Tail Fescue | Poaceae | | | 3 | 500 | | | | | 1 | 100 | 10 | 500 | | | 20 | 1000 | 50 | 1000 | | |
| GRAMINOIDS | | | | | | | | | | | | | | | | | | | | | | | |
| | *Juncus usitatus* | Common Rush | Juncaceae | | | 0.1 | 1 | | | | | | | | | 20 | 200 | 5 | 80 | 0.1 | 20 | | |
| | *Eleocharis acuta* | Common Spike-rush | Cyperaceae | | | | | | | | | | | | | 10 | 300 | | | | | | |

Table 12-2 Flora Species recorded Plot 11 – 19, Plot A - C

| | Scientific Name | Common Name | Family | Plot 11 | | Plot 15 | | Plot 16 | | Plot 17 | | Plot 18 | | Plot 19 | | Plot A | | Plot B | | Plot C | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | PCT 277 | | PCT277 | | PCT 277 | | PCT277 | | PCT277 | | PCT9 | | Exotic | | PCT 9 | | PCT9 | |
| | | | | C | A | C | A | C | A | C | A | C | A | C | A | C | A | C | A | C | A |
| **TREES** | | | | | | | | | | | | | | | | | | | | | |
| | *Eucalyptus* blakelyi | Blakely's Red Gum | Myrtaceae | 10 | 1 | 48 | | 25 | 7 | 7.5 | 14 | 8 | 2 | | | | | | | | |
| | *Eucalyptus bridgesiana* | Apple Box | Myrtaceae | | | | | | | 4 | 1 | 4 | 2 | | | | | | | | |
| | *Eucalyptus camaldulensis* | River Red Gum | Myrtaceae | | | | | | | | | | | 25 | 17 | | | 30 | 12 | 25 | 15 |
| | *Eucalyptus melliodora* | Yellow Box | Myrtaceae | 20 | 4 | | | | | 5 | 2 | | | | | | | | | | |
| | *Eucalyptus polyanthemos* | Red Box | Myrtaceae | | | | | | | | | 4 | 2 | | | | | | | | |
| SHRUBS | | | | | | | | | | | | | | | | | | | | | |
| | *Acacia decora* | Western Silver Wattle | Mimosaceae | | | 2 | 1 | | | 0.3 | 1 | 0.1 | 1 | | | | | | | | |
| | *Acacia verniciflua* | Varnish Wattle | Mimosaceae | | | | | 8 | 4 | | | | | | | | | | | | |
| | *Acacia rubida* | Red-stemmed Wattle | Mimosaceae | | | | | | | | | | | | | | | | | | |
| | *Callistemon sp.* (Planted) | | Myrtaceae | | | | | | | 0.5 | 1 | | | | | | | | | | |
| FORBS | | | | | | | | | | | | | | | | | | | | | |
| * | *Acetosella vulgaris* | Sheep Sorrel | Polygonaceae | | | | | | | 0.2 | 20 | 0.1 | 5 | | | | | | | | |
| | *Alternanthera denticulata* | Lesser Joyweed | Amaranthaceae | | | | | | | 0.2 | 10 | | | | | | | | | | |
| * | *Arctotheca calendula* | Capeweed | Asteraceae | | | | | | | | | 0.1 | 10 | 0.1 | 1 | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * | *Carthamus lanatus* | Saffron Thistle | Asteraceae | | | | | | | | | | | | | 0.1 | 1 | | | | |
| | *Centipeda cunninghamiana* | Sneezeweed | Asteraceae | | | | | | | 0.1 | 10 | | | | | | | | | | |
| * | *Cirsium vulgare* | Spear Thistle | Asteraceae | | | | | | | | | | | | | 0.3 | 20 | | | | |
| * | *Chenopodium album* | Fat Hen | Chenopodiaceae | | | | | | | | | | | | | | | | | | |
| * | *Citrullus lanatus* | Camel Melon | Cucurbitaceae | | | | | | | | | | | | | 0.1 | 1 | | | | |
| | *Desmodium varians* | Tick trefoil | Fabaceae (Faboideae) | 0.1 | 3 | | | | | | | | | | | | | | | | |
| | *Dysphania pumilio* | Black Crumbweed | Chenopodiaceae | | | | | | | | | | | | | 0.5 | 100 | | | | |
| * | *Echium plantagineum* | Patterson's Curse | Boraginaceae | | | | | | | | | 0.1 | 10 | | | | | | | | |
| * | *Fumaria sp.* | Fumitory | Papaveraceae | | | | | 0.1 | 1 | | | | | | | | | | | | |
| * | *Galium aparine* | Velcro Weed | Rubiaceae | | | 4 | 300 | 0.5 | 30 | | | | | | | | | | | | |
| * | *Heliotropium europaeum* | Potato Weed | Boraginaceae | | | | | | | | | | | | | | | | | | |
| *Δ | *Hypericum perforatum* | St John's Wort | Hypericaceae | 0.1 | 3 | | | | | | | | | | | 1000 | | | | | |
| * | *Hypochaeris radicata* | Catsear | Asteraceae | | | | | | | 0.2 | 50 | 0.5 | 30 | 0.1 | 5 | 3 | | | | | |
| * | *Lactuca serriola* | Prickly Lettuce | Asteraceae | | | | | | | | | | | 0.1 | 20 | | | | | | |
| | *Lythrum hyssopifolia* | Hyssop Loosestrife | Lythraceae | | | | | | | | | | | | | | | | | | |
| * | *Lysimachia arvensis* | Scarlet pimpernel | Primulaceae | | | | | | | 0.1 | 1 | | | | | | | | | | |
| * | *Malva parviflora* | Small-flowered Mallow | Malvaceae | | | | | | | | | | | | | | | | | | |
| | *Maireana humillima* | | Chenopodiaceae | | | | | | | | | | | | | | | | | 0.1 | 1 |
| | *Mentha australis* | River mint | Lamiaceae | | | | | | | | | 0.1 | 1 | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * | *Oxalis pes-caprae* | Soursob | Oxalidaceae | | | 2 | 30 | | | 0.1 | 1 | | | | | | | | | | |
| | *Oxalis perennans* | Oxalis | Oxalidaceae | | | | | | | | | 0.1 | 1 | | | | | | | | |
| | *Persicaria prostrata* | Creeping Knotweed | Polygonaceae | | | | | | | | | | | | | | | | | | |
| * | *Plantago lanceolata* | Plantain | Plantaginaceae | 0.1 | 10 | | | | | | | | | | | | | | | | |
| * | *Polygonum aviculare* | Wireweed | Polygonaceae | | | | | | | | | | | | | | | | | 0.1 | 1 |
| | *Rumex brownii* | Swamp Dock | Polygonaceae | | | | | | | | | | | | | | | | | | |
| * | *Rumex crispus* | Curled Dock | Polygonaceae | | | 0.1 | 2 | | | | | | | | | | | | | | |
| | *Rumex sp.* | Dock | Polygonaceae | 0.1 | 1 | | | 0.1 | 1 | 0.1 | 10 | 0.1 | 1 | | | | | | | | |
| * | *Silybum marianum* | Variegated Thistle | Asteraceae | | | | | 0.2 | 50 | | | | | | | | | | | | |
| * | *Solanum nigrum* | Blackberry nightshade | Solanaceae | | | | | | | | | | | | | | | | | | |
| | *Solenogyne dominii* | | Asteraceae | | | | | | | | | | | 0.1 | 5 | | | | | | |
| * | *Sonchus oleraceus* | Sow Thistle | Asteraceae | | | | | 0.1 | 1 | | | | | 0.1 | 10 | | | | | | |
| | *Tricoryne elatior* | Yellow Autumn Lily | Anthericaceae | 0.1 | 1 | | | | | | | | | | | | | | | | |
| * | *Trifolium vesiculosum* | Arrow-leaved Clover | Fabaceae (Faboideae) | | | | | | | | | | | | | | | | | | |
| * | *Trifolium repens* | White Clover | Fabaceae (Faboideae) | | | | | | | | | | | 0.1 | 5 | | | | | | |
| * | *Trifolium subterraneum* | Subterraneum Clover | Fabaceae (Faboideae) | | | 0.1 | 10 | 0.1 | 10 | | | | | | | | | | | | |
| * | *Urtica urens* | Small Nettle | Urticaceae | | | | | | | | | | | | | | | | | | |
| * Δ | *Xanthium spinosum* | Bathurst Burr | Asteraceae | | | | | | | | | | | | | | | | | | |
| GRASS AND GRASS LIKE | | | | | | | | | | | | | | | | | | | | | |
| | *Amphibromus nervosus* | Swamp Wallaby Grass | Poaceae | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * | *Aira sp.* | Hair Grass | Poaceae | | | | | | | | | | | | | | | 0.1 | 2 | | |
| | *Anthosachne scabra* | Common Wheat Grass | Poaceae | | | | | | | 0.1 | 10 | | | | | | | | | | |
| | *Austrostipa scabra* | Spear Grass | Poaceae | 0.1 | 10 | | | | | | | | | | | | | | | | |
| * | *Avena fatua* | Wild Oats | Poaceae | 0.1 | 20 | 15 | 1000 | 70 | 1000 | 5 | 200 | 10 | 1000 | 2 | 500 | 0.1 | 20 | | | | |
| | *Bothriochloa macra* | Red Grass | Poaceae | | | | | | | | | | | | | 0.1 | 10 | | | | |
| * | *Briza minor* | Little Blowfly Grass | Poaceae | | | | | | | | | | | | | | | | | | |
| * | *Bromus catharticus* | Praire Grass | Poaceae | 0.1 | 30 | | | | | | | | | | | | | | | | |
| * Δ | *Bromus diandrus* | Great Brome | Poaceae | 35 | 1000 | | | | | | | | | | | | | | | | |
| * | *Bromus molliformis* | Soft Brome | Poaceae | 1 | 100 | | | | | | | | | | | | | | | | |
| * | *Bromus hordeaceus* | Soft Brome | Poaceae | | | | | | | | | | | | | | | | | 0.1 | 1 |
| | *Bulbine bulbosa* | Bulbine Lily | Liliaceae | | | | | | | | | | | | | | | | | | |
| | Carex sp. | Sedge | Cyperaceae | | | | | 2 | 20 | 0.2 | 5 | 0.5 | 1 | 0.1 | 1 | | | | | | |
| | *Cynodon dactylon* | Common Couch | Poaceae | | | | | | | | | 1 | 2 | | | 1 | 100 | | | | |
| | *Cyperus sp.* | Sedge | Cyperaceae | | | | | | | | | | | | | | | | | | |
| | *Eleocharis acuta* | Common Spike-rush | Cyperaceae | | | 3 | 20 | | | | | | | | | | | | | | |
| * | *Eragrostis cilianensis* | Minor stink Grass | Poaceae | | | | | | | | | | | | | 0.2 | 50 | | | | |
| * | *Hordeum leporinum* | Barley Grass | Poaceae | | | | | | | | | 20 | 1000 | | | | | 0.1 | 10 | 0.1 | 50 |
| | *Juncus sp.* | Rush | Juncaceae | | | 0.1 | 2 | 0.1 | 1 | 0.1 | 2 | | | | | 0.1 | 2 | | | | |
| | *Juncus usitatus* | Common Rush | Juncaceae | | | | | | | | | | | 3 | 40 | | | | | | |
| | *Lachnagrostis filiformis* | Feather Speargrass | Poaceae | | | | | | | | | | | | | | | | | | |
| | *Lomandra multiflora* | Mat Rush | Liliaceae | | | | | | | | | | | | | | | | | | |
| | *Lomandra filiformis* | Mat Rush | Liliaceae | 4 | 80 | | | | | 0.2 | 30 | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * | *Lolium perenne* | Perennial Ryegrass | Poaceae | 1 | 100 | 3 | 1000 | 5 | 500 | 15 | 10000 | 40 | 1000 | 3 | 1000 | | | | | | |
| * | *Panicum sp* | Panic Grass | Poaceae | | | | | | | 0.1 | 10 | | | | | 1 | 200 | | | | |
| | *Panicum effusum* | Hairy Panic | Poaceae | | | | | | | | | | | | | | | | | | |
| * Δ | *Paspalum dilatatum* | Paspalum | Poaceae | 5 | 50 | | | | | | | | | | | | | | | | |
| * | *Phalaris aquatica* | Phalaris | Poaceae | 2 | 20 | 3 | 20 | 5 | 40 | 3 | 30 | 5 | 50 | | | | | | | | |
| | *Poa sieberiana* | Tussock-grass | Poaceae | | | | | | | | | | | | | | | | | | |
| * Δ | *Romulea rosea* | Onion grass | Iridaceae | | | 0.1 | 50 | 0.1 | 20 | 15 | 1000 | 5 | 1000 | | | | | | | | |
| | *Rytidosperma caespitosum* | Ringed Wallaby Grass | Poaceae | 5 | 100 | | | | | | | | | | | | | | | | |
| | *Rytidosperma duttonii* | Wallaby Grass | Poaceae | | | | | | | | | | | | | | | | | | |
| | *Rytidosperma sp.* | Wallaby Grass | Poaceae | 0.1 | 5 | | | | | | | | | | | | | 0.1 | 10 | 0.1 | 30 |
| * | *Setaria sp.* | Pigeon Grass | | | | | | | | | | | | | | | | | | | |
| * | *Triticum aestivum* | Wheat | Poaceae | | | | | | | | | | | | | | | | | | |
| * | *Vulpia myuros* | Rat's Tail Fescue | Poaceae | | | | | | | | | | | | | 5 | 1000 | 0.1 | 1 | 0.1 | 10 |

# APPENDIX B PLOT PHOTOS

| | |
|---|---|
| **Plot 1 – PCT 277 Zone 1_Grazed** | **Plot 2 – PCT 277 Zone 1_Grazed** |
|  |  |
| **Plot 3 - PCT 277 Zone 1_Grazed** | **Plot 4 – PCT 277 Zone 4_Regrowth** |
|  |  |
| **Plot 5 – PCT 277 Zone 1_Grazed** | **Zone 6 – PCT 277 Zone 1_Grazed** |
|  |  |

| Plot 7 – PCT 360 Zone 8_Wetland | Plot 8 – PCT 9 Zone 7_Derived Grassland |
|---|---|
|  |  |
| **Plot 9 – PCT 9 Zone 6_Woodland** | **Plot 10 – PCT 277 Zone 1_Grazed** |
|  |  |
| **Plot 11 – PCT 277 Zone 2_Roadside** | **Plot 15 – PCT 277 Zone 3_Creekline** |
|  |  |

| Plot 16 – PCT 277 Zone 3_Creekline | Plot 17– PCT 277 Zone 3_Creekline |
|---|---|
|  |  |
| **Plot 18 – PCT 277 Zone 3_Creekline** | **Plot 19 – PCT 9 Zone 5_Wetland** |
|  |  |
| **Plot A – Exotic** | **Plot B – PCT 9 Zone 5_Wetland** |
|  |  |

| **Plot C – PCT 9 Zone 5_Wetland** | |
|---|---|
|  | |

# APPENDIX C PADDOCK TREES

Assessment of Paddock trees in the development site.

| ID | Latitude | Longitude | Species | DBH (cm) | Hollows | Above Benchmark | Class | To be removed |
|---|---|---|---|---|---|---|---|---|
| **1** | -35.915626 | 146.89638 | Blakely's Red Gum | 145 | No | Yes | 3 | Yes |
| **2** | -35.913026 | 146.901053 | Yellow Box | 200 | Yes | Yes | 3 | Yes |
| **3** | -35.913365 | 146.901362 | Yellow Box | 100 | No | Yes | 3 | Yes |
| **4** | -35.913108 | 146.902269 | Yellow Box | 120 | Yes | Yes | 3 | Yes |
| **5** | -35.913156 | 146.90281 | Yellow Box | 100 | No | Yes | 3 | Yes |
| **6** | -35.913138 | 146.90364 | Yellow Box | 120 | Yes | Yes | 3 | Yes |
| **7** | -35.911494 | 146.903852 | Yellow Box | 100 | Yes | Yes | 3 | No |
| **8** | -35.912476 | 146.905335 | Yellow Box | 120 | No | Yes | 3 | Yes |
| **9** | -35.912688 | 146.905871 | Yellow Box | 100 | No | Yes | 2 | Yes |
| **10** | -35.914345 | 146.901421 | Stag | 100 | Yes | Yes | 0 | Yes |
| **11** | -35.901582 | 146.86484 | Blakely's Red Gum | 120 | Yes | Yes | 3 | Yes |
| **12** | -35.901657 | 146.864862 | Blakely's Red Gum | 80 | No | Yes | 3 | Yes |
| **13** | -35.901095 | 146.865137 | Blakely's Red Gum | 120 | No | Yes | 3 | Yes |
| **14** | -35.910537 | 146.877027 | Blakely's Red Gum | 120 | No | Yes | 3 | No |
| **15** | -35.915759 | 146.873602 | Blakely's Red Gum | 150 | No | Yes | 3 | Yes |
| **16** | -35.910318 | 146.859186 | Yellow Box | 25 | No | No | 2 | Yes |
| **17** | -35.914386 | 146.865704 | Blakely's Red Gum | 80 | No | Yes | 3 | Yes |
| **18** | -35.914319 | 146.865379 | Blakely's Red Gum | 80 | No | Yes | 3 | Yes |
| **19** | -35.913158 | 146.863098 | Yellow Box | 120 | No | Yes | 3 | Yes |
| **20** | -35.914166 | 146.885942 | Yellow Box | 100 | No | Yes | 3 | Yes |
| **21** | -35.91406 | 146.885011 | Yellow Box | 100 | No | Yes | 3 | Yes |
| **22** | -35.913961 | 146.88487 | Stag | 90 | Yes | Yes | 0 | Yes |
| **23** | -35.913329 | 146.882236 | Yellow Box | 150 | No | Yes | 3 | Yes |
| **24** | -35.913075 | 146.882183 | Yellow Box | 120 | Yes | Yes | 3 | Yes |
| **25** | -35.912467 | 146.883116 | Yellow Box | 150 | No | Yes | 3 | Yes |
| **26** | -35.916087 | 146.890404 | Blakely's Red Gum | 100 | No | Yes | 3 | Yes |
| **27** | -35.915125 | 146.904559 | Yellow Box | 60 | Yes | Yes | 3 | Yes |
| **28** | -35.917065 | 146.892461 | Yellow Box | 60 | No | Yes | 3 | No |
| **29** | -35.917115 | 146.892124 | Yellow Box | 60 | No | Yes | 3 | No |
| **30** | -35.904289 | 146.865435 | Yellow Box | 80 | No | Yes | 3 | Yes |
| **31** | -35.904524 | 146.867506 | Yellow Box | 80 | No | Yes | 3 | Yes |
| **32** | -35.913348 | 146.875636 | Exotic | 0 | - | - | 0 | Yes |
| **33** | -35.905317 | 146.862263 | Yellow Box | 60 | Yes | Yes | 3 | Yes |
| **34** | -35.906853 | 146.862444 | Angophora sp. | 40 | No | No | 2 | No |
| **35** | -35.912395 | 146.884021 | Blakely's Red Gum | 150 | No | Yes | 3 | No |
| **36** | -35.905705 | 146.867966 | Yellow Box | 60 | No | Yes | 3 | Yes |
| **37** | -35.910522 | 146.867795 | Blakely's Red Gum | 80 | Yes | Yes | 3 | Yes |
| **38** | -35.910673 | 146.867327 | Blakely's Red Gum | 80 | Yes | Yes | 3 | Yes |
| **39** | -35.911086 | 146.867237 | Blakely's Red Gum | 120 | Yes | Yes | 3 | Yes |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **40** | -35.913786 | 146.881013 | Yellow Box | 170 | Yes | Yes | 3 | No |
| **41** | -35.915722 | 146.900391 | Yellow Box | 15 | No | No | 1 | Yes |
| **42** | -35.915706 | 146.901342 | Exotic | 0 | - | - | 0 | Yes |
| **43** | -35.91569 | 146.901171 | Kurrajong | 60 | No | Yes | 3 | Yes |
| **44** | -35.898923 | 146.862229 | Yellow Box | 100 | No | Yes | 3 | Yes |

# APPENDIX D FAUNA SURVEY RESULTS

Table 12-3 Fauna records from August 2018 surveys.

| Species | BP1 | BP2 | BP3 | BP4 | BP5 | BP6 | BP7 | BP8 | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | D9 | D10 | D11 | D12 | D13 | Op. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BIRDS** | | | | | | | | | | | | | | | | | | | | | | |
| Australasian Darter *Anhinga novaehollandiae* | | | | X | | | | | | | | | | | | | | | | | | |
| Australasian Grebe *Tachybaptus novaehollandiae* | | | | X | | | | | | | | | | | | | | | X | X | | |
| Australian Magpie *Cracticus tibicen* | X | X | X | X | X | X | X | X | X | X | | | | X | X | X | X | X | X | | X | |
| Australian Raven *Corvus coronoides* | | X | X | X | | | | X | | | | | | | | | X | X | X | | | |
| Australian Shoveler *Spatula rhynchotis* | | | | X | | | | | | | | | | | | | | | | | | |
| Black Swan *Cygnus atratus* | | | | X | | | | | | | | | | | | | | | | X | | |
| Black-fronted Dotterel *Elseyornis melanops* | | | | X | | | | | | | | | | | | | | | | | | |
| Black-tailed Native-hen *Tribonyx ventralis* | | | | X | | | | | | | | | | | | | | | | | | |
| *Common Starling *Sturnus vulgaris* | | | X | | | | | | | | | | | | | X | | | | | | |
| Crested Pigeon *Ocyphaps lophotes* | X | | X | X | | X | | | | | | X | X | X | | | | X | | | | |
| Dusky Moorhen *Gallinula tenebrosa* | | | | X | | | | | | | | | | | | | | | | | | |
| Eastern Rosella *Platycercus eximius* | X | X | X | X | X | X | X | X | X | X | X | | X | | X | X | | | | X | X | |
| Eurasian Coot *Fulica atra* | | | | X | | | | | | | | | | | | | | | | X | | |
| Flame Robin *Petroica phoenicea* | | | | | | | X | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fork-tailed Kite *Milvus migrans* | | | | | | | | X | | | | | | | | | | | | X | | |
| Galah *Eolophus roseicapillus* | X | | X | X | X | X | X | | X | X | X | X | X | X | X | | X | X | | | | |
| Golden Whistler *Pachycephala pectoralis* | | | X | | | | | | | | | | | | | | | | | | | |
| Great Cormorant *Phalacrocorax carbo* | | | | X | | | | | | | | | | | | | | | | | | |
| Grey Butcherbird *Cracticus torquatus* | X | | | | | | | X | | | | X | | | | | | | | | | |
| Grey Shrike-thrush *Colluricincla harmonica* | | X | X | X | X | | X | | | X | | X | | | | X | | | X | | X | |
| Grey Teal *Anas gracilis* | | | | X | | | | | | | | | | | X | | | X | | X | | |
| Laughing Kookaburra *Dacelo novaeguineae* | X | X | X | | X | | | X | | | | | | | | | | | X | | | |
| Little Black Cormorant *Phalacrocorax sulcirostris* | | | | | | | | | X | | | | | | | | | | | | | |
| Little Corella *Cacatua sanguinea* | | | | X | | | | | | | | | | | | | | | | | | |
| Little Pied Cormorant *Microcarbo melanoleucos* | | | | X | | | | | | | | | | X | | | | | | | | |
| Little Raven *Corvus mellori* | | X | X | | | | | | | | | | | X | | | | X | | | | |
| Noisy Friarbird *Philemon corniculatus* | | | | X | | | | | | | | | | | | | | | | | | |
| Noisy Miner *Manorina melanocephala* | X | | | X | X | | | X | X | | X | X | | | X | | | | X | | | |
| Pacific Black Duck *Anas superciliosa* | | | | | | | | | X | | | | X | | | | | | | | | |
| Peewee *Grallina cyanoleuca* | X | X | | X | X | X | | X | | | | | X | X | | X | X | X | X | | | |
| Pied Butcherbird *Cracticus nigrogularis* | | | | | | X | | | | | | | | X | | | | | | | | |
| Red Wattlebird *Anthochaera carunculata* | X | X | | X | | | | | | | | | X | | | | | | X | | X | |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Red-capped Robin *Petroica goodenovii* | | | | | | X | | | | | | | | | | | | | | | | |
| Red-kneed Dotterel *Erythrogonys cinctus* | | | | X | | | | | | | | | | | | | | | | X | | |
| Red-rumped Parrot *Psephotus haematonotus* | | | | X | | X | | | | | | | | | | X | X | | | | | |
| Restless Flycatcher *Myiagra inquieta* | | | | X | | | | | | | | | | | | X | | X | X | | | |
| Rufous Whistler *Pachycephala rufiventris* | | | X | | | | | | | | | | | | | | | | | | | |
| Spur-winged Plover *Vanellus miles* | | | | X | | X | | | X | | | | | | X | X | | | X | X | | |
| Straw-necked Ibis *Threskiornis spinicollis* | | | | | | | | | | | | | | | | | | | | | | X |
| Striated Pardalote *Pardalotus striatus* | X | | | X | X | | | X | | X | | X | X | | X | X | X | | X | | | |
| Sulphur-crested Cockatoo *Cacatua galerita* | | X | | X | | | | | | | | | | | | X | | X | X | | | |
| Superb Blue Wren *Malurus cyaneus* | | X | | | X | X | | X | | | | | | | | | | | | | X | |
| Tawny Frogmouth *Podargus strigoides* | | | | | | | | | | | | | | | | | | | | | | X |
| Tree Martin *Petrochelidon nigricans* | | | | X | | | | | | | | | | | | | | | | | | |
| Weebill *Smicrornis brevirostris* | | | | | | | X | | | | | | | | | | | | | | | |
| Welcome Swallow *Hirundo neoxena* | | X | | X | X | | | | | | | | | | | X | | | X | | | |
| Whistling Kite *Haliastur sphenurus* | | | | | | | | | | | | | | | | | | | | | X | |
| White-eyed Duck *Aythya australis* | | | | X | | | | | | | | | | | | | | | | X | | |
| White-faced Heron *Egretta novaehollandiae* | | | | | | | | | | | | | X | | | | | | | | | |
| White-plumed Honeyeater *Lichenostomus penicillatus* | | X | | X | | | | | | | | | | | X | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| White-winged Chough *Corcorax melanocephalus* | X | X | | | | | | | X | | | | | | | | | | | | | |
| Willy Wagtail *Rhipidura leucophrys* | | | X | | X | X | | | | | X | | | X | | X | | | | X | | |
| Wood Duck *Chenonetta jubata* | | | | X | | X | | | X | X | X | X | X | | X | X | X | | | X | | |
| Yellow Thornbill *Acanthiza nana* | | | X | | | | | | | | | | | | | | | | | | | |
| Yellow-billed Spoonbill *Platalea flavipes* | | | | X | | X | | | | | | X | | | | | | | | | | |
| Yellow-rumped Thornbill *Acanthiza chrysorrhoa* | | | X | | | X | | | | | | | | X | | | | | | | | |
| **Mammals** | | | | | | | | | | | | | | | | | | | | | | |
| Common Brushtail Possum *Trichosurus vulpecula* | | | | | | | | | | | | | | | | | | | | | | X |
| Common Ringtail Possum *Pseudocheirus peregrinus* | | | | | | | | | | | | | | | | | | | | | | |
| *Feral Cat *Felis catus* | | | | | | | | | | | | | | | | | | | | | | X |
| **Amphibians** | | | | | | | | | | | | | | | | | | | | | | |
| Plains Froglet *Crinia parinsignifera* | | | | | | | | | | | | | | | | | | | X | X | X | |
| **Molluscs** | | | | | | | | | | | | | | | | | | | | | | |
| Flood Plain Mussel *Velesunio ambiguus* | | | | | | | | | X | | X | X | | | | | | | | | | |

# APPENDIX E PROTECTED MATTERS SEARCH REPORT

Australian Government
Department of the Environment and Energy

## EPBC Act Protected Matters Report

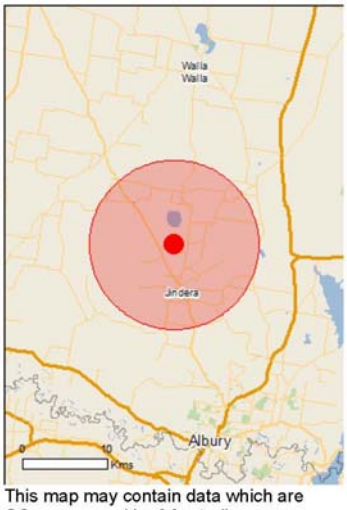
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 27/11/17 16:53:04



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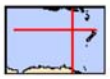
Coordinates
Buffer: 10.0Km



# Summary

## Matters of National Environmental Significance

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

| | |
|---|---|
| World Heritage Properties: | None |
| National Heritage Places: | None |
| Wetlands of International Importance: | 7 |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | None |
| Listed Threatened Ecological Communities: | 3 |
| Listed Threatened Species: | 22 |
| Listed Migratory Species: | 13 |

## Other Matters Protected by the EPBC Act

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

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

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

| | |
|---|---|
| Commonwealth Land: | None |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 19 |
| Whales and Other Cetaceans: | None |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Commonwealth Reserves Marine: | None |

## Extra Information

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

| | |
|---|---|
| State and Territory Reserves: | None |
| Regional Forest Agreements: | None |
| Invasive Species: | 34 |
| Nationally Important Wetlands: | None |
| Key Ecological Features (Marine) | None |

# Details

## Matters of National Environmental Significance

| Wetlands of International Importance (Ramsar) | [ Resource Information ] |
|---|---|
| Name | Proximity |
| Banrock station wetland complex | 600 - 700km upstream |
| Barmah forest | 100 - 150km upstream |
| Gunbower forest | 200 - 300km upstream |
| Hattah-kulkyne lakes | 400 - 500km upstream |
| Nsw central murray state forests | 100 - 150km upstream |
| Riverland | 500 - 600km upstream |
| The coorong, and lakes alexandrina and albert wetland | 600 - 700km upstream |

| Listed Threatened Ecological Communities | | [ Resource Information ] |
|---|---|---|
| For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps. | | |
| Name | Status | Type of Presence |
| Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia | Endangered | Community likely to occur within area |
| Weeping Myall Woodlands | Endangered | Community may occur within area |
| White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland | Critically Endangered | Community likely to occur within area |

| Listed Threatened Species | | [ Resource Information ] |
|---|---|---|
| Name | Status | Type of Presence |
| Birds | | |
| Anthochaera phrygia<br>Regent Honeyeater [82338] | Critically Endangered | Species or species habitat known to occur within area |
| Botaurus poiciloptilus<br>Australasian Bittern [1001] | Endangered | Species or species habitat known to occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Grantiella picta<br>Painted Honeyeater [470] | Vulnerable | Species or species habitat likely to occur within area |
| Lathamus discolor<br>Swift Parrot [744] | Critically Endangered | Species or species habitat likely to occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Polytelis swainsonii<br>Superb Parrot [738] | Vulnerable | Species or species habitat likely to occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Rostratula australis | | |
| Australian Painted Snipe [77037] | Endangered | Species or species habitat may occur within area |
| **Fish** | | |
| Galaxias rostratus | | |
| Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745] | Critically Endangered | Species or species habitat likely to occur within area |
| Maccullochella peelii | | |
| Murray Cod [66633] | Vulnerable | Species or species habitat may occur within area |
| Macquaria australasica | | |
| Macquarie Perch [66632] | Endangered | Species or species habitat may occur within area |
| **Frogs** | | |
| Litoria raniformis | | |
| Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828] | Vulnerable | Species or species habitat likely to occur within area |
| **Mammals** | | |
| Nyctophilus corbeni | | |
| Corben's Long-eared Bat, South-eastern Long-eared Bat [83395] | Vulnerable | Species or species habitat may occur within area |
| Petauroides volans | | |
| Greater Glider [254] | Vulnerable | Species or species habitat may occur within area |
| Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) | | |
| Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104] | Vulnerable | Species or species habitat known to occur within area |
| Pteropus poliocephalus | | |
| Grey-headed Flying-fox [186] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| **Plants** | | |
| Amphibromus fluitans | | |
| River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215] | Vulnerable | Species or species habitat may occur within area |
| Prasophyllum petilum | | |
| Tarengo Leek Orchid [55144] | Endangered | Species or species habitat may occur within area |
| Prasophyllum validum | | |
| Sturdy Leek-orchid [10268] | Vulnerable | Species or species habitat may occur within area |
| Swainsona recta | | |
| Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580] | Endangered | Species or species habitat may occur within area |
| **Reptiles** | | |
| Aprasia parapulchella | | |
| Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665] | Vulnerable | Species or species habitat likely to occur within area |
| Delma impar | | |
| Striped Legless Lizard [1649] | Vulnerable | Species or species habitat may occur within area |

| Listed Migratory Species | | [ Resource Information ] |
|---|---|---|
| * Species is listed under a different scientific name on the EPBC Act - Threatened Species list. | | |
| Name | Threatened | Type of Presence |
| **Migratory Marine Birds** | | |
| Apus pacificus | | |
| Fork-tailed Swift [678] | | Species or species |

| Name | Threatened | Type of Presence |
|---|---|---|
| | | habitat likely to occur within area |
| Migratory Terrestrial Species | | |
| Hirundapus caudacutus | | |
| White-throated Needletail [682] | | Species or species habitat likely to occur within area |
| Monarcha melanopsis | | |
| Black-faced Monarch [609] | | Species or species habitat known to occur within area |
| Motacilla flava | | |
| Yellow Wagtail [644] | | Species or species habitat may occur within area |
| Myiagra cyanoleuca | | |
| Satin Flycatcher [612] | | Species or species habitat likely to occur within area |
| Rhipidura rufifrons | | |
| Rufous Fantail [592] | | Species or species habitat may occur within area |
| Migratory Wetlands Species | | |
| Actitis hypoleucos | | |
| Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Calidris acuminata | | |
| Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris ferruginea | | |
| Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Calidris melanotos | | |
| Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Gallinago hardwickii | | |
| Latham's Snipe, Japanese Snipe [863] | | Species or species habitat may occur within area |
| Numenius madagascariensis | | |
| Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Tringa nebularia | | |
| Common Greenshank, Greenshank [832] | | Species or species habitat may occur within area |

## Other Matters Protected by the EPBC Act

Listed Marine Species [ Resource Information ]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

| Name | Threatened | Type of Presence |
|---|---|---|
| Birds | | |
| Actitis hypoleucos | | |
| Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Apus pacificus | | |
| Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Ardea alba<br>Great Egret, White Egret [59541] | | Breeding known to occur within area |
| Ardea ibis<br>Cattle Egret [59542] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Gallinago hardwickii<br>Latham's Snipe, Japanese Snipe [863] | | Species or species habitat may occur within area |
| Haliaeetus leucogaster<br>White-bellied Sea-Eagle [943] | | Species or species habitat known to occur within area |
| Hirundapus caudacutus<br>White-throated Needletail [682] | | Species or species habitat likely to occur within area |
| Lathamus discolor<br>Swift Parrot [744] | Critically Endangered | Species or species habitat likely to occur within area |
| Merops ornatus<br>Rainbow Bee-eater [670] | | Species or species habitat may occur within area |
| Monarcha melanopsis<br>Black-faced Monarch [609] | | Species or species habitat known to occur within area |
| Motacilla flava<br>Yellow Wagtail [644] | | Species or species habitat may occur within area |
| Myiagra cyanoleuca<br>Satin Flycatcher [612] | | Species or species habitat likely to occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Rhipidura rufifrons<br>Rufous Fantail [592] | | Species or species habitat may occur within area |
| Rostratula benghalensis (sensu lato)<br>Painted Snipe [889] | Endangered* | Species or species habitat may occur within area |
| Tringa nebularia<br>Common Greenshank, Greenshank [832] | | Species or species habitat may occur within area |

## Extra Information

### Invasive Species [ Resource Information ]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

| Name | Status | Type of Presence |
|---|---|---|
| **Birds** | | |
| Acridotheres tristis<br>Common Myna, Indian Myna [387] | | Species or species habitat likely to occur within area |
| Alauda arvensis<br>Skylark [656] | | Species or species habitat likely to occur within area |
| Anas platyrhynchos<br>Mallard [974] | | Species or species habitat likely to occur within area |
| Carduelis carduelis<br>European Goldfinch [403] | | Species or species habitat likely to occur within area |
| Carduelis chloris<br>European Greenfinch [404] | | Species or species habitat likely to occur within area |
| Columba livia<br>Rock Pigeon, Rock Dove, Domestic Pigeon [803] | | Species or species habitat likely to occur within area |
| Passer domesticus<br>House Sparrow [405] | | Species or species habitat likely to occur within area |
| Passer montanus<br>Eurasian Tree Sparrow [406] | | Species or species habitat likely to occur within area |
| Streptopelia chinensis<br>Spotted Turtle-Dove [780] | | Species or species habitat likely to occur within area |
| Sturnus vulgaris<br>Common Starling [389] | | Species or species habitat likely to occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Turdus merula<br>Common Blackbird, Eurasian Blackbird [596] | | Species or species habitat likely to occur within area |
| **Mammals** | | |
| Bos taurus<br>Domestic Cattle [16] | | Species or species habitat likely to occur within area |
| Canis lupus familiaris<br>Domestic Dog [82654] | | Species or species habitat likely to occur within area |
| Felis catus<br>Cat, House Cat, Domestic Cat [19] | | Species or species habitat likely to occur within area |
| Feral deer<br>Feral deer species in Australia [85733] | | Species or species habitat likely to occur within area |
| Lepus capensis<br>Brown Hare [127] | | Species or species habitat likely to occur within area |
| Mus musculus<br>House Mouse [120] | | Species or species habitat likely to occur within area |
| Oryctolagus cuniculus<br>Rabbit, European Rabbit [128] | | Species or species habitat likely to occur within area |
| Rattus rattus<br>Black Rat, Ship Rat [84] | | Species or species habitat likely to occur within area |
| Sus scrofa<br>Pig [6] | | Species or species habitat likely to occur within area |
| Vulpes vulpes<br>Red Fox, Fox [18] | | Species or species habitat likely to occur within area |
| **Plants** | | |
| Anredera cordifolia<br>Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643] | | Species or species habitat likely to occur within area |
| Asparagus asparagoides<br>Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473] | | Species or species habitat likely to occur within area |
| Cytisus scoparius<br>Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934] | | Species or species habitat likely to occur within area |
| Eichhornia crassipes<br>Water Hyacinth, Water Orchid, Nile Lily [13466] | | Species or species habitat likely to occur within area |
| Genista monspessulana<br>Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126] | | Species or species habitat likely to occur within area |
| Lycium ferocissimum<br>African Boxthorn, Boxthorn [19235] | | Species or species habitat likely to occur within area |
| Nassella neesiana<br>Chilean Needle grass [67699] | | Species or species habitat likely to occur |

| Name | Status | Type of Presence within area |
|---|---|---|
| Nassella trichotoma<br>Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884] | | Species or species habitat likely to occur within area |
| Pinus radiata<br>Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780] | | Species or species habitat may occur within area |
| Rubus fruticosus aggregate<br>Blackberry, European Blackberry [68406] | | Species or species habitat likely to occur within area |
| Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii<br>Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497] | | Species or species habitat likely to occur within area |
| Solanum elaeagnifolium<br>Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323] | | Species or species habitat likely to occur within area |
| Ulex europaeus<br>Gorse, Furze [7693] | | Species or species habitat likely to occur within area |

# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

# Coordinates

-35.9127 146.87776

## Acknowledgements

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

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

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

Please feel free to provide feedback via the Contact Us page.

# APPENDIX F EPBC HABITAT ASSESSMENT

| Species | Description of habitat[1] | Presence of habitat | Likelihood of occurrence | Possible impact? |
|---|---|---|---|---|
| **Flora** | | | | |
| Floating Swamp Wallaby-grass<br>*Amphibromus fluitans*<br>V EPBC | Grows mostly in permanent swamps. Needs wetlands which are at least moderately fertile, and which have some bare ground, conditions, produced by seasonally fluctuating water levels. Habitats in south-western NSW include swamp margins in mud, dam, and tank beds in hard clay and in semi-dry mud of lagoons. | Present<br>Wetland with hard clay and riparian vegetation within study area | Possible<br>Study area within known distribution of species. | No<br>Wetlands would not be impacted by development footprint. |
| Small Purple-pea<br>*Swainsona recta*<br>E EPBC | Occurs predominantly in grassy woodlands but sometimes extends into grassy open forest, usually with tree cover including Blakely's Red Gum, Yellow Box, and White Box. 80% of southern populations occur on railway easement. | Absent<br>Understory is highly disturbed and has undergone heavy grazing. | Unlikely<br>Study area within known distribution but not near any known populations. Not detected during site surveys. | No<br>No suitable habitat would be impacted by the proposal. |
| Sturdy Leek Orchid<br>*Prasophyllum validum*<br>V EPBC | Apparently highly susceptible to grazing. Grows in open sites within natural temperate grassland. | Absent<br>Understory is highly disturbed and has undergone heavy grazing. | Unlikely<br>Study area within known distribution of species but known populations not near study area. | No<br>No suitable habitat would be impacted by the proposal. |
| Tarengo Leek Orchid<br>*Prasophyllum petilum*<br>E EPBC | Apparently highly susceptible to grazing, being retained only at little-grazed travelling stock reserves. Grows in open sites within natural temperate grassland. | Absent<br>Understory is highly disturbed and has undergone heavy grazing. | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| **Ecological Communities** | | | | |

[1] Information sourced from species profiles on NSW OEH's threatened species database or the Australian Government's Species Profiles and Threats database (SPRAT) unless otherwise stated.

OEH threatened species database: http://www.threatenedspecies.environment.nsw.gov.au/index.aspx
SPRAT: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

| Species | Description of habitat[1] | Presence of habitat | Likelihood of occurrence | Possible impact? |
|---|---|---|---|---|
| White Box Yellow Box Blakey's Red Gum Woodland<br>CE EPBC | Characterised by the occurrence of *Eucalyptus albens* (White Box), *E. melliodora* (Yellow Box) and/or *E. blakelyi* (Blakely's Red Gum). The trees may occur as mixtures of the three species, dominated by one of the three or in mixtures with other trees such as *E. microcarpa* (Grey Box), *E. mannifera* (Brittle Gum), *E. bridgesiana* (Apple Box), *E. rubida* (Candlebark), and *E. macrorrhyncha* (Red Stringybark) *E. cinerea* (Argyle Apple). | Present<br>Yellow Box and Blakely's Red Gum present in the study area. | Unlikely<br>Yellow Box and Blakely's Red Gum Woodland does not meet condition threshold for EPBC listed community. | No<br>No suitable habitat would be impacted by the proposal. |
| Grey Box (Eucalyptus macrocarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia<br>E EPBC | Inland Grey Box Woodland is characterised by the dominance of Inland grey box (*Eucalyptus macrocarpa)* often found in association with bimble box (*E. populnea* subsp. *Bimbil)*, while cypress pine (*Callitris glaucophylla)*, kurrajong (*Brachychiton populneus*), bulloak (*Allocasuarina luehmannii*), yellow box (*E. melliodora)* and white box (*E. albens*). A variable ground layer of grass and herbaceous species is present at most sites, while a shrub middle story layer is sparse or absent. | Absent<br>Characteristic species not present in study area. | Unlikely<br>Study area within known distribution of ecological community but site survey revealed absence of characteristic species. | No<br>No suitable habitat would be impacted by the proposal. |
| Weeping Myall Woodlands<br>E EPBC | The structure of the community varies from sparse woodland to low open woodland dominated by *Acacia pendula* (Weeping Myall or Boree), which may or may not be the only tree species present. The understorey includes an open layer of chenopod shrubs and other woody plant species and an open to continuous groundcover of grasses and herbs. | Absent<br>Characteristic species not present in study area. | Unlikely<br>Study area within known distribution of ecological community, though survey did not record characteristic spp. | No<br>No suitable habitat would be impacted by the proposal. |

E TSC = listed as Endangered under Schedule 1 of the NSW *Threatened Species Conservation Act 1995*

E EPBC = listed as Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

V TSC = listed as Vulnerable under Schedule 2 of the NSW *Threatened Species Conservation Act 1995.*

V EPBC = listed as Vulnerable under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

EEC TSC = Endangered Ecological Community listed under Schedule 1 of the NSW *TSC Act 1995*

CE EPBC = listed as Critically Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

| Species and Status | Description of habitat[2] | Presence of habitat | Likelihood of occurrence | Potential for impact? |
|---|---|---|---|---|
| **Birds** | | | | |
| Australasian Bittern<br>*Botaurus poiciloptilus*<br>E EPBC | Favour permanent freshwater wetlands with tall, dense vegetation, particularly bulrushes (*Typha* spp.) and spike-rushes (*Eleocharis* spp.). | Absent<br>Favoured riparian vegetation absent from study area. | Unlikely<br>Study area within known distribution of species however no suitable habitat. | No<br>No suitable habitat would be impacted by the proposal. |
| Eastern Curlew<br>*Numenius madagascariensis*<br>CE EPBC | Suitable habitat for this migratory wetland species includes most of Australia's coastline. Breeding occurs in China, returning to Australia in August to feed on crabs and molluscs in intertidal mudflats. | Absent<br>No mudflat of wetland forage habitat in study area. | Unlikely<br>Study area within known or predicted distribution of species however no suitable habitat. | No<br>No suitable habitat would be impacted by the proposal. |
| Swift Parrot<br>*Lathamus discolor*<br>CE EPBC | Areas where eucalypts are flowering profusely or where there are abundant sap-sucking bug infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, and White Box. Commonly used lerp infested trees include Grey Box and Blackbutt. | Present<br>Associated Box Gum and River Red Gum communities present in study area. | Possible<br>Study area within known distribution of species. | Yes<br>Assessment of Significance undertaken |
| Superb Parrot<br>*Polytelis swainsonii*<br>V EPBC | Box-Gum, Box-Cypress, and Boree Woodlands and River Red Gum Forests. Nest in hollows of large trees in tall open forest or woodland. | Present<br>Box and red river gums present in study area. | Possible<br>Species or habitat likely to occur. | Yes<br>Assessment of Significance undertaken. |

[2] Information sourced from species profiles on NSW OEH's threatened species database or the Australian Government's *Species Profiles and Threats* database (SPRAT) unless otherwise stated.

OEH threatened species database: http://www.threatenedspecies.environment.nsw.gov.au/index.aspx
SPRAT: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

| Species and Status | Description of habitat[2] | Presence of habitat | Likelihood of occurrence | Potential for impact? |
|---|---|---|---|---|
| Australian Painted Snipe<br>*Rostratula australis*<br>E EPBC | Fringes of swamps, dams and nearby marshy areas with cover of grasses, low scrub or open timber. Permanent and ephemeral shallow (<50 cm) wetlands and waterbodies or inundated grassland and paddocks. | Present<br>Wetland with riparian species present in study area. | Possible<br>Study area within known distribution of species. | No<br>Wetlands would not be impacted by development footprint. |
| Regent Honeyeater<br>*Anthochaera phrygia*<br>CE EPBC | Temperate woodlands and open forests of the inland slopes of south eastern Australia. Also found in drier coastal woodlands and forests in some years. In NSW, distribution is very patchy and mainly confined to the two main breeding areas at Capertee Valley and the Bundarra-Barraba region and surrounding fragmented woodlands. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species, with significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. | Absent<br>Tree cover too sparse to support. | Unlikely<br>Breeding not known to occur in the locality. Study area within known distribution of species.<br>Not within a mapped important area (OEH). | No<br>No suitable habitat would be impacted by the proposal. |
| Painted Honeyeater<br>*Grantiella picta*<br>V EPBC | Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. 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. | Absent<br>Mistletoes not abundant in development site. | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| Curlew Sandpiper<br>*Calidris ferruginea*<br>CE EPBC<br>M EPBC | Littoral and estuarine habitats and in NSW is known to be found in intertidal mudflats of sheltered coasts. This migratory wetland species can be found foraging on the edge of shallow water, on exposed algal mats or on banks of beach cast seagrass or seaweed. | Absent<br>No coastal or estuarine habitat in study area. | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| **Mammals** | | | | |
| Koala<br>*Phascolarctos cinereus*<br>V EPBC | Range of eucalypt forest and woodland communities, including coastal forests, the woodlands of the tablelands and western slopes, and the riparian communities of the western plains. | Present<br>Food trees present within study area but in low density | Possible<br>Study area within known distribution of species. | Yes<br>Assessment of Significance completed. |

| Species and Status | Description of habitat[2] | Presence of habitat | Likelihood of occurrence | Potential for impact? |
|---|---|---|---|---|
| Corben's Long-eared Bat<br>*Nyctophilus corbeni*<br>V EPBC | Variety of vegetation types, most commonly Mallee, Bulloke, and Box-dominated communities, but are most common in vegetation which has a distinct canopy and dense understorey. They roost in tree hollows, crevices, and under loose bark. | Absent<br>Wooded habitat but with a lack of dense understorey in study area. | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| Grey-headed Flying-fox<br>*Pteropus poliocephalus*<br>V EPBC | Subtropical and temperate rainforests, tall sclerophyll forests and woodlands. They feed on the nectar and pollen of native trees, Eucalyptus, Melaleuca and Banksia in particular. Forage up to 50 km from camp, although typically roosting camps are within 20 km of regular food source. | Present<br>Associated Box Gum and River Red Gum Woodland present in development site | Possible<br>Study area within known or predicted distribution of species. | Yes<br>Assessment of Significance completed. |
| Spotted-tailed Quoll<br>*Dasyurus masculatus masculatus* (SE mainland population)<br>E EPBC | Range of habitats, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from subalpine zone to coastline. Den in hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky cliff-faces. | Absent<br>Woodland areas in study area but with a lack of shrubby understorey. | Unlikely<br>Previously recorded in locality. | No<br>No suitable habitat would be impacted by the proposal. |
| Greater Glider<br>*Petauroides volans*<br>V EPBC | Inhabits eucalypt forest and woodlands with older trees and abundant hollows. Prefers habitat with tree species diversity. Require at least 2-4 den trees for every 2 ha. | Absent<br>Insufficient den-tree density in wooded areas of study area. | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| **Fish** | | | | |
| Flathead Galaxias<br>*Galaxias rostratus*<br>CE EPBC | Inhabits running inland waters including the southern part of the Murray Basin. Have also been recorded in the Macquarie, Lachlan and Murrumbidge river systems. | Absent<br>No lentic habitat within the study area | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| Macquarie Perch<br>*Macquaria australasica*<br>E EPBC | Previously recorded, particularly in the upstream reaches, of the Lachlan, Murrumbidge and Murray Rivers. | Absent<br>No lentic habitat within the study area. | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |

| Species and Status | Description of habitat[2] | Presence of habitat | Likelihood of occurrence | Potential for impact? |
|---|---|---|---|---|
| **Amphibians** | | | | |
| Southern Bell Frog<br>*Litoria raniformis*<br>E EPBC | Only known to occur in isolated populations in Coleambally Irrigation Area, Lowbidgee floodplain, and around Lake Victoria. Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps or billabongs along floodplains and river valleys, and in irrigated rice crops where there is no available natural habitat. | Absent<br>No Black Box/Lignum/Nitre goosefoot swamp, billabongs or rice crops in study area. | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| **Reptiles** | | | | |
| Pink-tailed Legless Lizard<br>*Aprasia parapulchella*<br>V EPBC | Sloping, open woodland areas with predominantly native grassy ground layers, particularly those dominated by Kangaroo Grass *Themeda australis*. Well-drained, with rocky outcrops or scattered, partially buried rocks. 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. | Absent<br>Study area lacking rocky habitat and kangaroo grass | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| Striped Legless Lizard<br>*Delmar impar*<br>V EPBC | Limited to grassland: Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass *Themeda australis*, spear-grasses *Austrostipa* spp. and poa tussocks *Poa* spp., and occasionally wallaby grasses *Austrodanthonia* spp. White Box-Yellow Box-Blakely's Red Gum Grassy Woodland is one preferred plant type community. | Absent<br>No perennial native or exotic grasses in development site. | Possible<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| **Migratory Marine Birds** | | | | |
| Fork-tailed Swift<br>*Apus pacificus*<br>M EPBC | This migratory marine species is a non-breeding visitor to Australia and has been recorded in all regions of NSW, mainly over inland plains. They are mainly exclusively aerial flying from < 1m to 300 m above ground. | Present<br>Aerial species with resilience to vegetation variation. | Possible<br>Study area within known or predicted distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| **Migratory Terrestrial Species** | | | | |

| Species and Status | Description of habitat[2] | Presence of habitat | Likelihood of occurrence | Potential for impact? |
|---|---|---|---|---|
| White-throated Needletail<br>*Hirundapus caudacutus*<br>M EPBC | This migratory terrestrial species occurs in Australia from late spring to early autumn and feeds on the wing at height. | Present<br>Aerial species without specific vegetation requirements | Possible<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| Black-faced Monarch<br>*Monarcha melanopsis*<br>M EPBC | Vagrant to Australia. Prefers dense rainforest vegetation. Breeds in dense vegetation within Eastern Australia | Absent<br>No dense, rainforest vegetation within study area. | Possible<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| Yellow Wagtail<br>*Motacilla flava*<br>M EPBC | This migratory terrestrial species migrates from Africa to Australia in summer and breeds in Europe. Habitat decline in the UK has resulted in declining numbers. | Absent<br>Study area highly disturbed. | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| Satin Fly-catcher<br>*Myiagra cyanoleuca*<br>M EPBC | This migratory terrestrial species is found in Australia, Indonesia and Papua New Guinea. The species inhabits moist lowland forests and tropical forests over the eastern half of NSW. | Absent<br>Trees within study area too scattered to support this species. | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| Rufus Fantail<br>*Rhipidura rufifrons*<br>M EPBC | This migratory terrestrial species inhabits the dense understorey of moist eucalypt forest. The species breeds in Australia in suitable vegetated areas around the coastal half of NSW, Victoria/South Australia boarder and norther NSW towards Queensland. | Absent<br>Lack of dense understorey in study area. | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| **Migratory Wetland Species** | | | | |
| Common Sandpiper<br>*Actitis hypoleucos*<br>M EPBC | This migratory wetland species is found along all Australian coastlines and many inland areas. They are active birds that will pursue invertebrates over rocks. Breeding habitat is mainly in Europe. | Absent<br>No coastal or rocky habitat in study area | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| Sharp-tailed Sandpiper<br>*Caldris acuminata*<br>M EPBC | This migratory wetland species wades mud in estuarine habitats feeding on invertebrates. They are widespread throughout much of NSW but are sparse in the south-central and lower western regions. Breeding habitat is in Northern Siberia. | Absent<br>No estuarine wetland habitat in study area. | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |

| Species and Status | Description of habitat[2] | Presence of habitat | Likelihood of occurrence | Potential for impact? |
|---|---|---|---|---|
| Pectoral Sandpiper<br>*Calidris melanotos*<br>M EPBC | The population is generally widespread but scattered in NSW. Breeding occurs in Russia and North America. | Absent<br>No coastal or wetland habitat in study area. | Unlikely<br>Study area within known distribution of species. | No<br>No suitable habitat would be impacted by the proposal. |
| Latham's Snipe<br>*Gallinago hardwickii*<br>M EPBC | This migratory wetland species is a non-breeding visitor to much of eastern Australia. Distribution is naturally fragmented as preferred habitat including freshwater wetlands occur in patches. | Present<br>Freshwater wetland with suitable riparian vegetation for supporting invertebrates. | Possible<br>Study area within known distribution of species. | No<br>Wetland areas would not be impacted by development footprint |
| Common Greenshank<br>*Tringa nebularia*<br>M EPBC | Does not breed in Australia but occurs in all types of wetlands within distribution area, usually in large numbers. | Present<br>Wetland habitat within study area. | Possible<br>Study area within known distribution of species. | No<br>Wetland areas would not be impacted by development footprint |

E EPBC = listed as Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

*V EPBC = listed as Vulnerable under the Commonwealth Environment Protection & Biodiversity Conservation Act 1999.*

M EPBC = listed as Migratory under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

CE EPBC = listed as Critically Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

CAMBA = Chinese-Australia Migratory Bird Agreement

JAMBA = Japan-Australia Migratory Bird Agreement

# APPENDIX G EPBC ASSESSMENT OF SIGNIFICANT IMPACT

The *Environment Protection and Biodiversity Conservation Act* 1999 specifies factors to be taken into account in deciding whether a development is likely to significantly affect EECs, threatened species and migratory species, listed at the Commonwealth level. The following assessment assesses the significance of the likely impacts associated with the proposed works on:

### Threatened Species

- Swift Parrot *Lathamus discolor* – Critically Endangered
- Superb Parrot (*Polytelis swainsonii*) - Vulnerable
- Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable
- Fork-tailed Swift *(Apus pacificus)* - Migratory
- White-throated Needletail (*Hirundapus caudacutus*)- Migratory

### Threatened Ecological Communities

- White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands (Box-gum Woodlands) – Critically Endangered

**Swift Parrot**

| a) Will the action lead to a long-term decrease in the size of a population of a species? |
|---|
| Potential foraging habitat for Swift Parrot occurs within the development site and would be removed by the proposal. Surveys did not detect these species and so the development site is not considered known habitat but provides potential foraging habitat.<br>The proposal would involve the removal of around 16.3 ha of woodland vegetation. There would also be some disturbance associated with construction, including noise, vibration, light. The quality of potential habitat for these species is low, being largely cleared, with few mature or hollow-bearing trees, and highly disturbed by agriculture. Given the relatively small amount of habitat to be removed, and with the recommended mitigation measures, the likelihood of the proposal leading to a long-term decrease in the size of a population of these species is minimal. |
| **b) Will the action reduce the area of occupancy of the species?** |
| The proposal would involve the removal of around 16.3 ha of habitat. There would also be some disturbance associated with construction. The development site is not considered known habitat.<br>The quality of potential habitat for these species is low, and the area of habitat to be removed is relatively small in the context of the Swift Parrots range across South Eastern Australia. In this context, while removal of this habitat could reduce the area of occupancy, it would not be enough to have a significant impact on these species. |
| **c) Will the action fragment an existing population into two or more populations?** |
| The proposal would involve the removal of around 16.3 ha of habitat. There would also be some disturbance associated with construction. The development site is not considered known habitat and the likelihood of occurrence of these species is low. |

The quality of potential habitat is low, and the area of habitat to be removed is relatively small and would not disrupt habitat connectivity for the migratory Swift Parrot. The proposal would not fragment an existing population of this species into two or more populations.

**d) Will the action adversely affect habitat critical to the survival of a species?**

The Register of Critical Habitat established under the EPBC Act does not list any critical habitat for this species. The proposed development is not located near any critical habitat for and species listed on the register.

**e) Will the action disrupt the breeding cycle of an important population of the species?**

Swift Parrots breed only in Tasmania, migrating to the mainland in autumn and winter. The likelihood of the action disrupting the breeding cycle of a population of these species is minimal.

**f) Will the action modify, destroy, remove, isolate or decrease the availability of quality habitat to the extent that the species is likely to decline?**

The proposal would involve the removal of around 16.3 ha of foraging habitat. There would also be some disturbance associated with construction, which could decrease the quality of some habitat. The development site is not considered known habitat and is considered potential habitat only.

The quality of potential habitat is low, and the area of habitat to be removed is relatively small and would not disrupt habitat connectivity for canopy species. With the implementation of the recommended mitigation measures, the likelihood of the action modifying, destroying, removing, isolating, or decreasing the availability or quality of habitat to the extent that these species would be likely to decline is minimal.

**g) Will the action result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat?**

There is a risk that invasive weed or pest species could be introduced to the proposal area via machinery, vehicles, and materials during construction, however, the quality of potential habitat within the subject land is low, being largely cleared and disturbed. With the implementation of the recommended mitigation measures, including restricting vehicle movements to sealed tracks, the likelihood of the action resulting in harmful invasive species becoming established in the vulnerable species' habitat is minimal. The development site already contains a high weed burden, but no vegetation or soil will be taken offsite.

**h) Will the action introduce disease that may cause the species to decline?**

Beak and Feather Disease could impact the Swift Parrot; however, the proposal is not considered likely to act as a vector for the disease. With the implementation of the recommended mitigation measures, the likelihood of the action resulting in the introduction of diseases that may cause the species to decline is minimal.

**i) Will the action interfere substantially with the recovery of the species?**

The National Recovery Plan for the Swift Parrot lists the following objectives:

1. To identify and prioritise habitats and sites used by the species across its range, on all land tenures.
2. To implement management strategies to protect and improve habitats and sites on all land tenures.
3. To monitor and manage the incidence of collisions, competition and Beak and Feather Disease (BFD).

4. To monitor population trends and distribution throughout the range.

The proposal would not interfere with any of these objectives.

**Conclusion**

A significant impact to this species is considered unlikely, on the basis that the proposal would not:

- Lead to a reduction of the size or area of occupancy of a population, or fragment or disrupt the breeding cycle of a population
- Affect habitat critical to the survival of these species
- Affect habitat or introduce disease such that these species would decline
- Introduce invasive species harmful to the species
- Interfere with the recovery of these species.

A referral to the Federal Department of Environment is not considered necessary.

**Superb Parrot - Vulnerable**

**Grey-headed Flying-fox - Vulnerable**

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

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

**a) Will the action lead to a long-term decrease in the size of an important population of a species?**

**Superb Parrot (*Polytelis swainsonii*)**

The breeding population of Superb Parrots Polytelis swainsonii is approximately 6500. The species is somewhat mobile, and typically utilises foraging habitat within 10km of breeding habitat (SPRAT, 2017). No records of the Superb Parrot occur within the proposal area. No known population of Superb Parrot occurs within the proposal area. The quality of potential habitat is low, largely cleared, dominated by exotic species and disturbed as a result of agricultural activity including cropping and grazing on the site. The development site is not part of a core breeding area for the Superb Parrot (Baker Gabb, 2011). Thus, an important population is not considered to occur in the development site and no impacts are anticipated to an important population of Superb Parrot.

**Grey-headed Flying Fox (*Pteropus poliocephalus*)**

No breeding camps were detected within the development site; however, the Grey-headed Flying Fox may forage on site on occasion. Nationally important populations of the grey-headed flying fox are listed on the Department of Environment's interactive flying fox viewer (DoE, 2015). No important population of Grey-headed Flying Fox is known in the development site. The nearest known flying fox camp is located in Albury Botanic Gardens, approximately 16km South, which is considered an important population. Grey-headed Flying Fox can forage within a range of up to 50km from their roosts (OEH, 2017) and individuals from the breeding camp may forage or travel over the development site on occasion.

No impacts are anticipated to an important population of Grey-headed Flying Fox.

**b) Will the action reduce the area of occupancy of an important population of the species?**

**Superb Parrot (*Polytelis swainsonii*)**

As an important population is not considered to occur within the development site, the action is not considered to reduce the area of occupancy of an important population. The broader proposal area will continue to contain suitable areas of breeding and foraging habitat of a sufficient size and quality to maintain individuals of the species within the proposal area and the wider locality.

**Grey-headed Flying Fox (*Pteropus poliocephalus*)**

The nearest known important population of Grey-headed Flying Fox occurs approximately 16km south, in Albury. Grey-headed Flying Fox generally forage within a range of around 15km from their roosts but can forage up to 50km.

The proposal would involve the removal of up to 16.3 ha of foraging habitat for the species. The quality of potential habitat for these species is low, and the area of habitat to be removed is relatively small within their foraging range. No barriers to movement would be created by the development. The action will not reduce the area of occupancy of an important population of this species.

**c) Will the action fragment an existing important population into two or more populations?**

**Superb Parrot (*Polytelis swainsonii*)**

As the individuals of the species are not considered to form an important population, the action is not considered to fragment an existing important population. Native vegetation will be planted along the perimeter of the development area to screen solar farm infrastructure, adding to the habitat potential of the site. As the species is highly mobile, the proposal will not impact on its movement within or across the development site.

**Grey-headed Flying Fox (*Pteropus poliocephalus*)**

The nearest known important population of Grey-headed Flying Fox occurs approximately 16km south, in Albury. The proposal would involve the removal of up to 16.3 ha of potential foraging habitat. The quality of potential habitat for this species is low, and the area of habitat to be removed is relatively small within their foraging range. The proposal would not fragment an existing important population of this species into two or more populations.

**d) Will the action adversely affect habitat critical to the survival of a species?**

**Superb Parrot (*Polytelis swainsonii*)**

The Register of Critical Habitat established under the EPBC Act does not list any critical habitat for this species.

**Grey-headed Flying Fox (*Pteropus poliocephalus*)**

The Register of Critical Habitat established under the EPBC Act does not list any critical habitat for this species.

**e) Will the action disrupt the breeding cycle of an important population of the species?**

**Superb Parrot (*Polytelis swainsonii*)**

No known important population occurs within the proposal area. Three main breeding areas for the superb parrot occur in NSW. The nearest known breeding area to the proposal area occurs in the South West Slopes near Wagga Wagga, around 100km north of Jindera (Baker Gabb, 2011). Within the South West Slopes, the Superb Parrot breeds in hollows in River Red Gum, Blakely's Red Gum, Apple Box, Grey Box, White Box and Red Box species. The nests are usually located near water and the same nest hollows are used in successive years. The action would not disrupt the breeding cycle of an important population.

**Grey-headed Flying Fox (*Pteropus poliocephalus*)**

There is no breeding camp for this species in the development site. The proposal would not disrupt the breeding cycle of the Grey-headed Flying Fox.

**f) Will the action modify, destroy, remove, isolate or decrease the availability of quality habitat to the extent that the species is likely to decline?**

**Superb Parrot (*Polytelis swainsonii*)**

The proposal will remove approximately 16.3 ha of woodland vegetation in the development site. 30.9 ha of similar or better quality habitat would remain in the development site. Additionally, the potential foraging area for the species would be reduced as cropping would no longer occur within the development site. This modification and removal of habitat is not considered likely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, as extensive habitat will remain in the locality.

**Grey-headed Flying Fox (*Pteropus poliocephalus*)**

The proposal would involve the removal of up to 16.3 ha of habitat. Grey-headed Flying Foxes forage a range of 15km from their breeding camps but can travel up to 50km from the camp to forage (OEH, 2017). The quality of potential habitat for this species is low, and the area of habitat to be removed is relatively small within their foraging range and would be unlikely to lead to a substantial decrease to foraging habitat for the Grey-headed Flying Fox.

**g) Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?**

**Superb Parrot (*Polytelis swainsonii*)**

The proposal is not considered likely to result in invasive species becoming established within the Superb Parrot's habitat. Competition with Noisy Miners for breeding and foraging habitat and resources is a major threat to the species and cause for the decline in population numbers. Noisy Miners are already present at the development site. The proposal is unlikely to result in invasive species such as these that are harmful to the habitat of the Superb Parrot.

The proposal will modify the current land use, potentially creating additional shelter habitat for predatory invasive species such as foxes and cats, which are considered likely to be locally prevalent regardless of the proposal. Management protocols will be prepared and implemented as part of the Flora and Fauna Management Plan for the proposal which will monitor and manage these species within the development site.

**Grey-headed Flying Fox (*Pteropus poliocephalus*)**

There is a risk that invasive weed or pest species could be introduced to the proposal area via machinery, vehicles, and materials during construction, however, the quality of potential habitat within the subject land is low, being largely cleared and disturbed. With the implementation of the recommended mitigation measures, including restricting vehicle movements to sealed tracks, the likelihood of the action resulting in harmful invasive species becoming established in the vulnerable species' habitat is minimal. The development site already contains a high weed burden but no vegetation or soil will be taken offsite.

**h) Will the action introduce disease that may cause the species to decline?**

**Superb Parrot (*Polytelis swainsonii*)**

Beak and Feather Disease has been proven to impact the Superb Parrot (DoE, 2017), however the proposal is not considered likely to act as a vector for the disease.

**Grey-headed Flying Fox (*Pteropus poliocephalus*)**

There is a risk that diseases could be introduced to the proposal area via machinery, vehicles, and materials during construction and operation. The quality of potential habitat is low, being largely cleared and disturbed. With the implementation of the recommended mitigation measures, the likelihood of the action resulting in the introduction of diseases that may cause the species to decline is minimal.

**i) Will the action interfere substantially with the recovery of the species?**

**Superb Parrot (*Polytelis swainsonii*)**

Core breeding areas and surrounding habitat are considered important to the recovery of the species. The nearest known breeding area to the proposal area occurs in the South West Slopes near Wagga Wagga, approximately 100km north of the proposal area. Habitats across the broader proposal area will remain available to the species and given its mobility, the proposal would not restrict the movements of the species across the development site. The proposal is unlikely to interfere with the recovery of the Superb Parrot.

**Grey-headed Flying Fox (*Pteropus poliocephalus*)**

The draft National Recovery Plan for Grey-headed Flying Fox lists the following overall objectives:

1. Improve the Grey-headed Flying Fox national population trend by reducing the impact of threatening processes on Grey-headed Flying Foxes through habitat identification, protection, restoration, and monitoring.
2. Assist communities and Grey-headed Flying Foxes to coexist through better education, stakeholder engagement, research, policy and continued support to fruit growers.

The proposal would not interfere with any of these objectives.

**Conclusion**

**Superb Parrot (*Polytelis swainsonii*)**

As the individuals of the species that could potentially utilise the development site are not considered to constitute an important population of the species, the proposal is not considered likely to impact on an important population. Though there will be the removal of up to 16.3 ha of habitat, the extent of vegetation removal is not considered likely to impact the species to the degree that they would no longer utilise the

proposal area as habitat. As such, impacts to the Superb Parrot are unlikely to be significant, and a referral under the EPBC Act is not required.

**Grey-headed Flying Fox (*Pteropus poliocephalus*)**

As the individuals of the species that could potentially utilise the development site are not considered to constitute an important population of the species, the proposal is not considered likely to impact on an important population. Though there will be the removal of up to 16.3 ha of habitat, the extent of vegetation removal is not considered likely to impact the species to the degree that they would no longer utilise the proposal area as habitat. As such, impacts to the Grey-headed Flying Fox are unlikely to be significant, and a referral under the EPBC Act is not required.

**Fork-tailed Swift (Apus pacificus) - Migratory**

**White-throated Needletail (Hirundapus caudacutus)- Migratory**

An assessment of significance for migratory species must establish whether the habitat on the proposed site is considered "important habitat" as defined in the EPBC Act.

"Important habitat" for migratory species is described as:

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

The habitat within the proposal site is not considered important habitat for the Fork-tailed Swift or the White-throated Needletail.

**a) Will the action substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy, or isolate an area of important habitat for a migratory species?**

**Fork-tailed Swift & White-throated Needletail**

The Fork-tailed Swift and the White-throated Needletail are almost exclusively aerial and are considered unlikely to rely on the habitats present within the proposal site. The habitats within the proposal site are not considered important habitat. Therefore, the action is unlikely to substantially modify, destroy or isolate an area of important habitat for either species.

**b) Will the action result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species?**

**Fork-tailed Swift & White-throated Needletail**

The Fork-tailed Swift and the White-throated Needletail are almost exclusively aerial and are considered unlikely to rely on the habitats present within the proposal site. The habitats within the proposal site are not considered important habitat. Therefore, the action is unlikely to substantially modify, destroy or isolate an area of important habitat for either species.

**c) Will the action seriously disrupt the lifecycle (breeding, feeding, migration, or resting behaviour) of an ecologically significant proportion of the population of a migratory species?**

**Fork-tailed Swift & White-throated Needletail**

The Fork-tailed Swift and the White-throated Needletail are almost exclusively aerial and are considered unlikely to rely on the habitats present within the proposal site. The area is not considered to support an ecologically significant proportion of the population of the species. Therefore, the action is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of either species.

**Conclusion**

The project site area contains habitat that could potentially be used by the Fork-tailed Swift or the White-throated Needletail. Of the four criteria for significant impact for a migratory species, the project is unlikely to cause a significant impact to any criteria. The proposal is therefore considered unlikely to significantly impact the Fork-tailed Swift or the White-throated Needletail.

### Threatened Ecological Communities - White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands (Box-gum Woodlands) – Critically Endangered

**a) Will the action reduce the extent of the ecological community?**

**Box-gum Woodlands**

The proposal would result an area of 0.4 ha cleared through the construction of the proposed transmission line. Vegetation within this is area is predominantly disturbed woodland as a result of the previous construction of the existing substation. As the area around the TransGrid substation was unable to surveyed, this assessment considers the habitat as part of the EPBC listed Box-gum Woodland (PCT 277). Thus, providing a precautionary approach in the unlikely event of Box-gum Woodland presence inside the development footprint.

As the area of potential habitat to be removed for this ecological community is very small in the local context and suitable habitat will be retained on site, it is considered unlikely that the proposal would adversely affect habitat critical to the survival of this ecological community.

**b) Will the action fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?**

**Box-gum Woodlands**

The proposal would result an area of 0.4 ha cleared through the construction of the proposed transmission line. Vegetation within this is area is predominantly disturbed woodland as a result of the previous construction of the existing substation. Given this, and the greater occurrence of Box-Gum Woodland in the local area, the minimal area to be disturbed and the implementation of the safeguards and mitigation measures, the proposal would not increase fragmentation or isolation of Box-Gum Woodland.

**c) Will the action adversely affect habitat critical to the survival of an ecological community?**

**Box-gum Woodlands**

The proposal would result an area of 0.4 ha cleared through the construction of the proposed transmission line. Vegetation within this is area is predominantly disturbed woodland as a result of the previous construction of the existing substation. As 0.4 ha is a minimal amount of land, and as the habitat on the development site is already heavily modified and disturbed, the proposal would not adversely affect habitat critical to the survival of this ecological community.

**d) Will the action modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?**

**Box-gum Woodlands**

The proposal would result an area of 0.4 ha cleared through the construction of the proposed transmission line. Vegetation within this is area is predominantly disturbed woodland as a result of the previous construction of the existing substation. As the proposal would occur on previously disturbed land, abiotic factors have already been modified drastically at the site. Similarly, groundwater levels, and surface water drainage patterns have already been modified, due to the sites' history.
Therefore, it is unlikely for the proposal to modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.

**e) Will the action cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?**

**Box-gum Woodlands**

The proposal would result an area of 0.4 ha cleared through the construction of the proposed transmission line. Vegetation within this is area is predominantly disturbed woodland as a result of the previous construction of the existing substation. Due to the sites' history, functionally important species have already been eliminated from the site. Therefore, it is unlikely that the proposal would cause a substantial change in the species composition of the ecological community, including causing a decline or loss of functionally important species.
No burning or harvesting of plant or animal species would occur.

**f) Will the action cause a substantial reduction in the quality or integrity of the occurrence of the ecological community, including, but not limited to:**

- **i. assisting invasive species, that are harmful to the listed ecological community, to become established, or,**
- **ii. causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community**

**Box-gum Woodlands**

i. The proposal would result an area of 0.4 ha cleared through the construction of the proposed transmission line. Vegetation within this is area is predominantly disturbed woodland as a result of the previous construction of the existing substation. Environmental weeds impacting on Box-gum Woodland include species such as Coolatai Grass (*Hyparrhenia hirta*), Phalaris (*Phalaris aquatica*), and African Lovegrass (*Eragrostis curvula*) (Australian Government DEE 2004, RBG 2019). It is possible for the proposed operations to assist spread of invasive weeds from construction vehicles. However, as the site is already disturbed, and with the implementation of the safeguards and mitigation measures (Table 8.1), it is considered unlikely that the proposal would cause a substantial reduction in the quality or integrity of the occurrence of Box-gum Woodland.

i. Direct threats such as grazing, soil disturbance and nutrient enrichment also facilitate weed invasion for Box-gum Woodland (NSW Scientific Committee 2000). The proposal would not fertiliser, nor use herbicides or other chemicals or pollutants in the development footprint.

Therefore, it is unlikely that the proposal would cause a substantial reduction in the quality or integrity of the occurrence of the ecological community.

**g) Will the action result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat?**

**Box-gum Woodlands**

The proposal would result an area of 0.4 ha cleared through the construction of the proposed transmission line. Vegetation within this is area is predominantly disturbed woodland as a result of the previous construction of the existing substation. Due to the previously cleared and highly disturbed habitat, the occurrence of critically endangered species occurring on site is unlikely. Thus, the proposal would not cause invasive species to harm critically endangered species in the EEC.

**h) Will the action introduce disease that may cause the species to decline?**

**Box-gum Woodlands**

There is a risk that pathogens could be established or spread within the site via site machinery during construction. However, with the recommended mitigation measures of cleaning construction equipment and machinery prior to entering the site, the action is unlikely to introduce any disease which may cause these species to decline.

**i) Will the action interfere substantially with the recovery of the species?**

**Box-gum Woodlands**

The proposal would result an area of 0.4 ha cleared through the construction of the proposed transmission line. Vegetation within this is area is predominantly disturbed woodland as a result of the previous construction of the existing substation. Given the current degraded, and previously cleared state of the development footprint, it is considered unlikely that the proposal would interfere substantially with the recovery of the species.

**Conclusion**

**Box-gum Woodlands**

The impacts of the proposal on the assessed Critically Endangered Ecological Community listed under the EPBC Act are considered to be manageable. A significant impact is considered unlikely based on the following conclusions:

1. The amount of habitat to be removed or disturbed by the proposal is minimal.
2. The proposal area occurs on land that has been previously disturbed through the construction of the existing substation.
3. Mitigation measures would be implemented to prevent the introduction of pathogens or invasive weeds on site.

# APPENDIX H PERSONNEL

Personnel involved in the report are:

| Name | Title | Qualifications | Roles |
|---|---|---|---|
| Mitch Palmer | Senior Ecologist (Technical Lead) | • BAM Accredited Assessor<br>• B.Science (Geology and Geography) | Review and approval of BDAR |
| Julie Gooding | Environmental Consultant - Ecologist | • BAM Accredited Assessor<br>• B. Science (Biology) | Field Work including PCT identification, vegetation mapping, vegetation integrity plots and threatened flora surveys.<br>Author of BDAR |
| Jess Murphy | Environmental Consultant - Ecologist | • B. Science<br>• Master Environmental Science and Management<br>• | Field Work including threatened Fauna surveys. |
| Erin Davies | Environmental Consultant - Graduate | • B. Science (Land and Heritage Management)<br>• Master. Environmental Science | Assisting with Field Work |
| Jessie Whieldon | Environmental Consultant - Graduate | • B. Applied Science<br>• M. Wildlife Management | Assisting with Field Work |

# APPENDIX I BAM CALCULATOR CREDIT REPORT

# BAM Biodiversity Credit Report (Like for like)

## Proposal Details

| | | |
|---|---|---|
| Assessment Id | Proposal Name | BAM data last updated * |
| 00011762/BAAS18074/19/00011763 | Jindera Solar Farm | 04/07/2019 |
| Assessor Name | Assessor Number | BAM Data version * |
| Julie Gooding | BAAS18074 | 12 |
| Proponent Names | Report Created | BAM Case Status |
| Symon Grasby, Green Switch Australia Pty LTD | 26/08/2019 | Finalised |
| Assessment Revision | Assessment Type | Date Finalised |
| 0 | Major Projects | 26/08/2019 |

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

## Potential Serious and Irreversible Impacts

| Name of threatened ecological community | Listing status | Name of Plant Community Type/ID |
|---|---|---|
| White Box Yellow Box Blakely's Red Gum Woodland | Endangered Ecological Community | 277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion |

Nil

## Additional Information for Approval

PCTs With Customized Benchmarks

# BAM Biodiversity Credit Report (Like for like)

No Changes

Predicted Threatened Species Not On Site
No Changes

## Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

| Name of Plant Community Type/ID | Name of threatened ecological community | Area of impact | Number of credits to be retired |
|---|---|---|---|
| 277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion | White Box Yellow Box Blakely's Red Gum Woodland | 14.7 | 201.00 |
| 9-River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion | Not a TEC | 2.7 | 26.00 |

| **9-River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion** | **Like-for-like credit retirement options** | | | |
|---|---|---|---|---|
| | Class | Trading group | HBT | IBRA region |
| | Inland Riverine Forests<br>This includes PCT's:<br>2, 9, 36, 78, 112, 249, 356, 362 | Inland Riverine Forests - ≥ 50% - < 70% cleared group (including Tier 6 or higher). | Yes | Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |

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# BAM Biodiversity Credit Report (Like for like)

| | |
|---|---|
| **9-River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion** | |
| **277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion** | **Like-for-like credit retirement options** |

| Name of offset trading group | Trading group | HBT | IBRA region |
|---|---|---|---|
| White Box Yellow Box Blakely's Red Gum Woodland<br>This includes PCT's:<br>2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698 | - | Yes | Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |

# BAM Biodiversity Credit Report (Like for like)

**277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion**

## Species Credit Summary

| Species | Area | Credits |
|---|---|---|
| **Cercartetus nanus** / Eastern Pygmy-possum | 2.3 | 63.00 |
| **Cullen parvum** / Small Scurf-pea | 4.9 | 93.00 |
| **Myotis macropus** / Southern Myotis | 0.7 | 7.00 |
| **Petaurus norfolcensis** / Squirrel Glider | 9.1 | 105.00 |
| **Swainsona recta** / Small Purple-pea | 1.8 | 53.00 |
| **Swainsona sericea** / Silky Swainson-pea | 1.8 | 53.00 |

| | | | |
|---|---|---|---|
| **Cercartetus nanus**/ Eastern Pygmy-possum | 277_Benchmark | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |
| | | **Cercartetus nanus**/Eastern Pygmy-possum | Any in NSW |
| | 277_Creekline | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |

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# BAM Biodiversity Credit Report (Like for like)

| | | | |
|---|---|---|---|
| | | **Cercartetus nanus**/Eastern Pygmy-possum | Any in NSW |
| | 277_Roadside | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |
| | | **Cercartetus nanus**/Eastern Pygmy-possum | Any in NSW |
| **Cullen parvum**/ Small Scurf-pea | 277_Benchmark | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |
| | | **Cullen parvum**/Small Scurf-pea | Any in NSW |
| | 277_Creekline | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |
| | | **Cullen parvum**/Small Scurf-pea | Any in NSW |

NSW GOVERNMENT

# BAM Biodiversity Credit Report (Like for like)

| | | | |
|---|---|---|---|
| **Cullen parvum**/ Small Scurf-pea | 277_Creekline | | |
| | 277_Roadside | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |
| | | **Cullen parvum**/Small Scurf-pea | Any in NSW |
| | 9_Grassland | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |
| | | **Cullen parvum**/Small Scurf-pea | Any in NSW |
| | 9_Woodland | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |
| | | **Cullen parvum**/Small Scurf-pea | Any in NSW |

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## BAM Biodiversity Credit Report (Like for like)

| | | | |
|---|---|---|---|
| **Myotis macropus**/ Southern Myotis | 277_Grazed | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |
| | | **Myotis macropus**/Southern Myotis | Any in NSW |
| | 9_Woodland | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |
| | | **Myotis macropus**/Southern Myotis | Any in NSW |
| **Petaurus norfolcensis**/ Squirrel Glider | 277_Creekline | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |
| | | **Petaurus norfolcensis**/Squirrel Glider | Any in NSW |
| | 277_Grazed | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |

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# BAM Biodiversity Credit Report (Like for like)

| | | | |
|---|---|---|---|
| | | **Petaurus norfolcensis**/Squirrel Glider | Any in NSW |
| **Swainsona recta**/ Small Purple-pea | 277_Benchmark | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |
| | | **Swainsona recta**/Small Purple-pea | Any in NSW |
| | 277_Roadside | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |
| | | **Swainsona recta**/Small Purple-pea | Any in NSW |
| **Swainsona sericea**/ Silky Swainson-pea | 277_Benchmark | **Like-for-like credit retirement options** | |
| | | Spp | IBRA region |
| | | **Swainsona sericea**/Silky Swainson-pea | Any in NSW |

# BAM Biodiversity Credit Report (Like for like)

| | | |
|---|---|---|
| **Swainsona sericea**/ Silky Swainson-pea | 277_Benchmark | |
| | 277_Roadside | **Like-for-like credit retirement options** |

| Spp | IBRA region |
|---|---|
| **Swainsona sericea**/Silky Swainson-pea | Any in NSW |

# BAM Credit Summary Report

## Proposal Details

| | | |
|---|---|---|
| Assessment Id | Proposal Name | BAM data last updated * |
| 00011762/BAAS18074/19/00011763 | Jindera Solar Farm | 04/07/2019 |
| Assessor Name | Report Created | BAM Data version * |
| Julie Gooding | 26/08/2019 | 12 |
| Assessor Number | BAM Case Status | Date Finalised |
| BAAS18074 | Finalised | 26/08/2019 |
| Assessment Revision | Assessment Type | |
| 0 | Major Projects | |

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

## Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

| Zone | Vegetation zone name | Vegetation integrity loss / gain | Area (ha) | Constant | Species sensitivity to gain class (for BRW) | Biodiversity risk weighting | Potential SAII | Ecosystem credits |
|---|---|---|---|---|---|---|---|---|
| **Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion** | | | | | | | | |
| 1 | 277_Grazed | 22.2 | 12.5 | 0.25 | High Sensitivity to Potential Gain | 2.00 | TRUE | 138 |
| 4 | 277_Roadside | 48.4 | 1.4 | 0.25 | High Sensitivity to Potential Gain | 2.00 | TRUE | 33 |
| 5 | 277_Creekline | 40.0 | 0.5 | 0.25 | High Sensitivity to Potential Gain | 2.00 | TRUE | 10 |

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# BAM Credit Summary Report

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6 | 277_Benchmark | 100.0 | 0.4 | 0.25 | High Sensitivity to Potential Gain | 2.00 | TRUE | 20 |
| | | | | | | | **Subtotal** | **201** |
| **River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion** | | | | | | | | |
| 2 | 9_Woodland | 19.8 | 1.6 | 0.25 | High Sensitivity to Potential Gain | 1.75 | | 14 |
| 3 | 9_Grassland | 24.7 | 1.1 | 0.25 | High Sensitivity to Potential Gain | 1.75 | | 12 |
| | | | | | | | **Subtotal** | **26** |
| | | | | | | | **Total** | **227** |

## Species credits for threatened species

| Vegetation zone name | Habitat condition (HC) | Area (ha) / individual (HL) | Constant | Biodiversity risk weighting | Potential SAII | Species credits |
|---|---|---|---|---|---|---|
| ***Cercartetus nanus / Eastern Pygmy-possum ( Fauna )*** | | | | | | |
| 277_Roadside | 48.4 | 1.38 | 0.25 | 2 | False | 33 |
| 277_Creekline | 40.0 | 0.49 | 0.25 | 2 | False | 10 |
| 277_Benchmark | 100.0 | 0.4 | 0.25 | 2 | False | 20 |
| | | | | | **Subtotal** | **63** |
| ***Cullen parvum / Small Scurf-pea ( Flora )*** | | | | | | |
| 9_Woodland | 19.8 | 1.57 | 0.25 | 2 | False | 16 |
| 9_Grassland | 24.7 | 1.1 | 0.25 | 2 | False | 14 |
| 277_Roadside | 48.4 | 1.38 | 0.25 | 2 | False | 33 |
| 277_Creekline | 40.0 | 0.49 | 0.25 | 2 | False | 10 |
| 277_Benchmark | 100.0 | 0.4 | 0.25 | 2 | False | 20 |

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# BAM Credit Summary Report

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | **Subtotal** | **93** |
| ***Myotis macropus / Southern Myotis ( Fauna )*** | | | | | | |
| 277_Grazed | 22.2 | 0.44 | 0.25 | 2 | False | 5 |
| 9_Woodland | 19.8 | 0.21 | 0.25 | 2 | False | 2 |
| | | | | | **Subtotal** | **7** |
| ***Petaurus norfolcensis / Squirrel Glider ( Fauna )*** | | | | | | |
| 277_Grazed | 22.2 | 8.6 | 0.25 | 2 | False | 95 |
| 277_Creekline | 40.0 | 0.49 | 0.25 | 2 | False | 10 |
| | | | | | **Subtotal** | **105** |
| ***Swainsona recta / Small Purple-pea ( Flora )*** | | | | | | |
| 277_Roadside | 48.4 | 1.38 | 0.25 | 2 | False | 33 |
| 277_Benchmark | 100.0 | 0.4 | 0.25 | 2 | False | 20 |
| | | | | | **Subtotal** | **53** |
| ***Swainsona sericea / Silky Swainson-pea ( Flora )*** | | | | | | |
| 277_Roadside | 48.4 | 1.38 | 0.25 | 2 | False | 33 |
| 277_Benchmark | 100.0 | 0.4 | 0.25 | 2 | False | 20 |
| | | | | | **Subtotal** | **53** |