Biodiversity Development Assessment Report

JINDERA SOLAR FARM



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ACRONYMS AND ABBREVIATIONS

BAM	**Biodiversity Assessment Methodology**
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 to construct 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 revised Biodiversity Development Assessment Report (BDAR) has been prepared by NGH on behalf of the proponent, Jindera Solar Farm Pty Ltd. This updated BDAR includes the further biodiversity considerations in relation to the substation and the entry/exit points on Urana Road and Walla Walla Jindera Road into Jindera Solar Farm and responds to additional issues raised by Biodiversity Conservation Division (BCD), post public exhibition of the State Significant Development (SSD) Environmental Impact Statement (EIS) for the project.

Primarily, 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 the EIS, 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.

Approximately 338 ha of the development site is comprised of exotic vegetation; validated through completion of the Land Category Assessment (NGH 2020).

Around 78 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:

- 18.11 ha of PCT 277 - Blakely's Red Gum – Yellow Box Grassy Tall Woodland
- 2.67 ha of PCT 9 - River Red Gum – Wallaby Grass tall Woodland Wetland
- 34 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 - **216 credits**
- PCT 9 - River Red Gum – Wallaby Grass tall Woodland Wetland – **33 credits**

- 33 paddock trees (1 did not generate credits) – **27 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 and in the adjoining property of the substation. The woodland patch has been avoided by the development footprint, however 6.02 ha of connected woodland including woodland surrounding the substation would need to be removed to facilitate the installation of the solar panels and connection to the substation.

Targeted surveys were undertaken for an additional 18 candidate credit species. Only the Squirrel Glider was observed during these targeted surveys within the development site. Five species were unable to be surveyed 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*) – **72 credits**
- Eastern Pygmy Possum (*Cercartetus nanus*) – **52 credits**
- Southern Bell Frog *Litoria raniformis)* - 0 credits
- Small Scurf Pea (*Cullen parvum*) – **96 credits**
- Silky Swainson-pea (*Swainsona sericea*) – **49 credits**
- Small Purple-pea (*Swainsona recta*) – **49 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.

This BDAR is an update to the original BDAR and supersedes any previous versions of the BDAR (V1.0-2.1). Feedback received on the amendment report BDAR V2.1 submitted on 17 June 2020, acknowedged by DPIE on 18 June 2020, prompted amendments, that have subsequently been made by the proponent. Amendments were made in order to reduce impacts on PCT 277 and retain Squirrel Glider habitat and vegetation connectivity across the development site and are presented in this BDAR V3.0.

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 426 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 546 ha.
- **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 546 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, 152, 153, 154, 155 and 201 of DP 753342,
- Lot 1 and 2 of DP 213465,
- Lots 1, 2, and 3 of DP 1080215,
- Lot 1 of DP 1252930
- Lot 1 of DP588720
- Lot 1 of DP 828242
- 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 426 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, and
- 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.

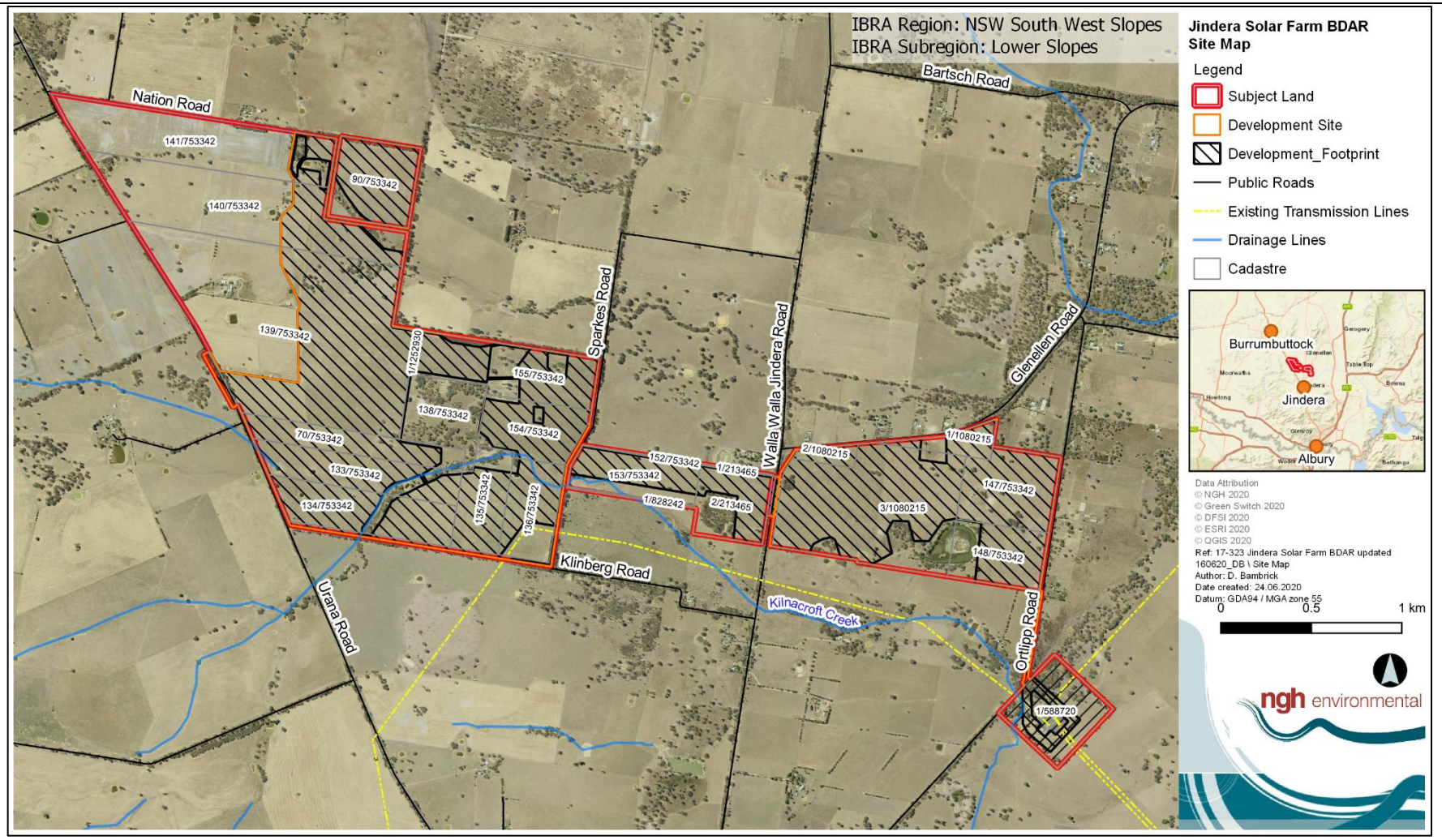


Figure 1-1 Site Map

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: 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), 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; a. The total number and classes of biodiversity credits required to be retired for the development/project; b. The number and classes of like-for-like biodiversity credits proposed to be retired; c. The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules; d. Any proposal to fund a biodiversity conservation action; e. Any proposal to make a payment to the Biodiversity Conservation Fund. 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 IBRA 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 Ordovician 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.

2.2 MITCHELL LANDSCAPES

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

2.3 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 2-1 Deadhorse Creek in the development site



Figure 2-2 Kilnacroft Creek in the development site

2.4 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 2-3 Man-made wetland in the development site



Figure 2-4 Ephemeral wetland in the development site



Figure 2-5 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.

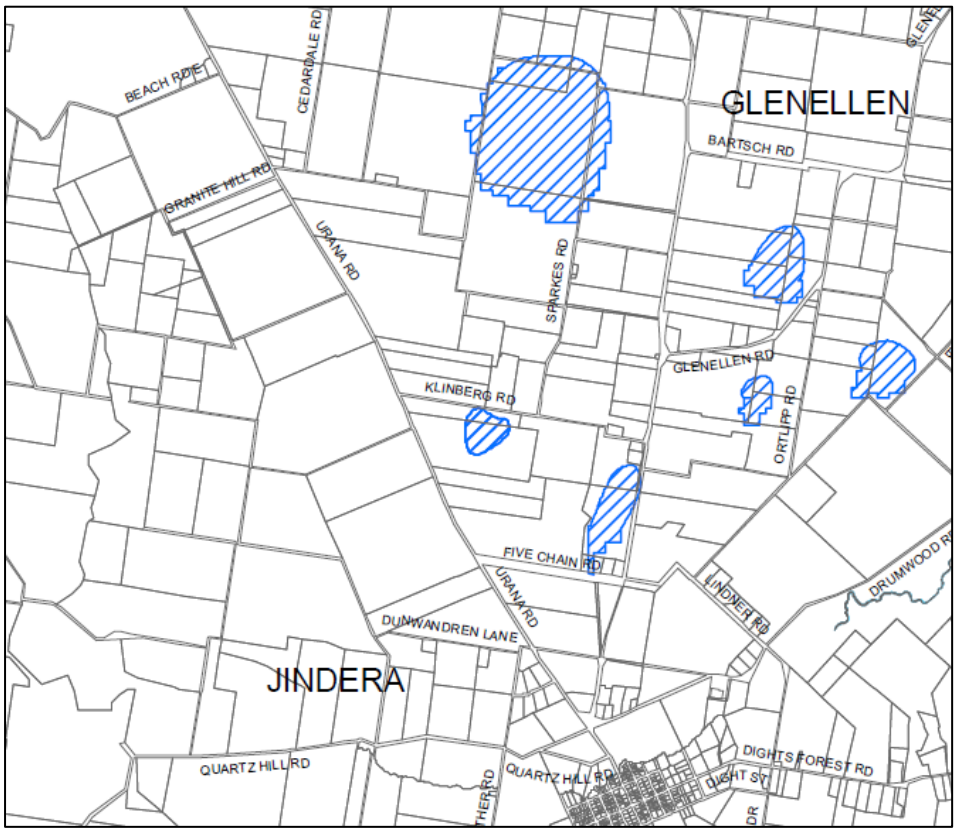


Figure 2-6 Wetlands identified in the Greater Hume LEP.

2.5 CONNECTIVITY OF DIFERENT AREAS OF HABITAT

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.

2.6 AREAS OF GEOLOGICAL SIGNIFICANCE

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

2.7 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 2-7). 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.

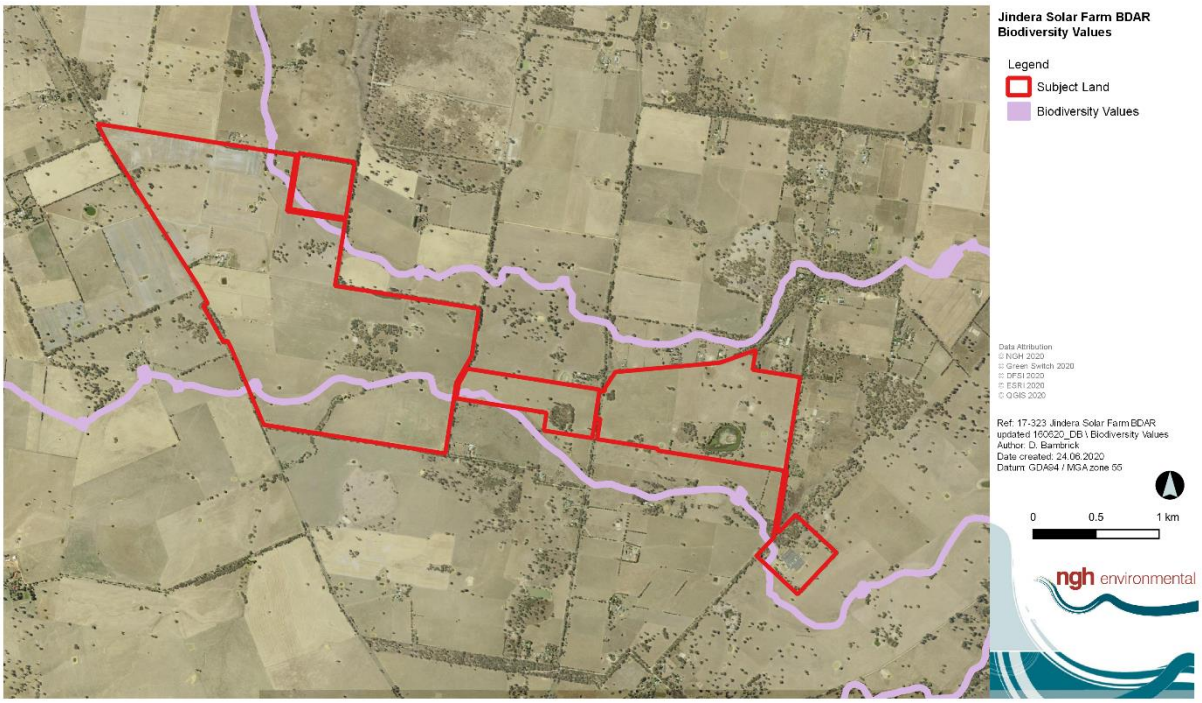


Figure 2-7 Areas listed as high biodiversity value.

2.8 DETERMINING SITE CONTEXT

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.

2.9 NATIVE VEGETATION

As determined by aerial imagery and GIS Mapping, the 1500 m buffer area around the development site comprises as area of 3432 ha. The native vegetation cover is. approximately 746 ha in the 1500 m buffer area (See 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.

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*).

2.10 CLEARED AREAS

Within the 1500 m buffer around the development site, around 2686 ha has been cleared of native vegetation (estimated from aerial imagery and local site inspections). 338 ha of cleared areas occurs within the development site. Cleared areas are primarily agricultural land, used for cropping and grazing.

Land Category Assessment

A land category assessment was completed for the exotic vegetation within the development site (estimated 338 ha) in consideration of the category 1-exempt land. The regulatory land map provided by LLS as part of the EIS submission response shows there is no category 1 exempt land currently mapped for the locality of Jindera. A Land Category Assessment was completed in January 2020, specific to the proposed project (Appendix J), to identify native vegetation present since 1990. The Land Category Assessment shows aerial imagery from 1990, 2003, 2014 and 2019 to determine the native vegetation extent from 1990 to 2019. The results demonstrate that exotic vegetation cover is approximately 338 ha of the Jindera Solar Farm development site. This area does not require further assessment under the BAM.





Figure 2-8 Examples of cleared areas in the development site

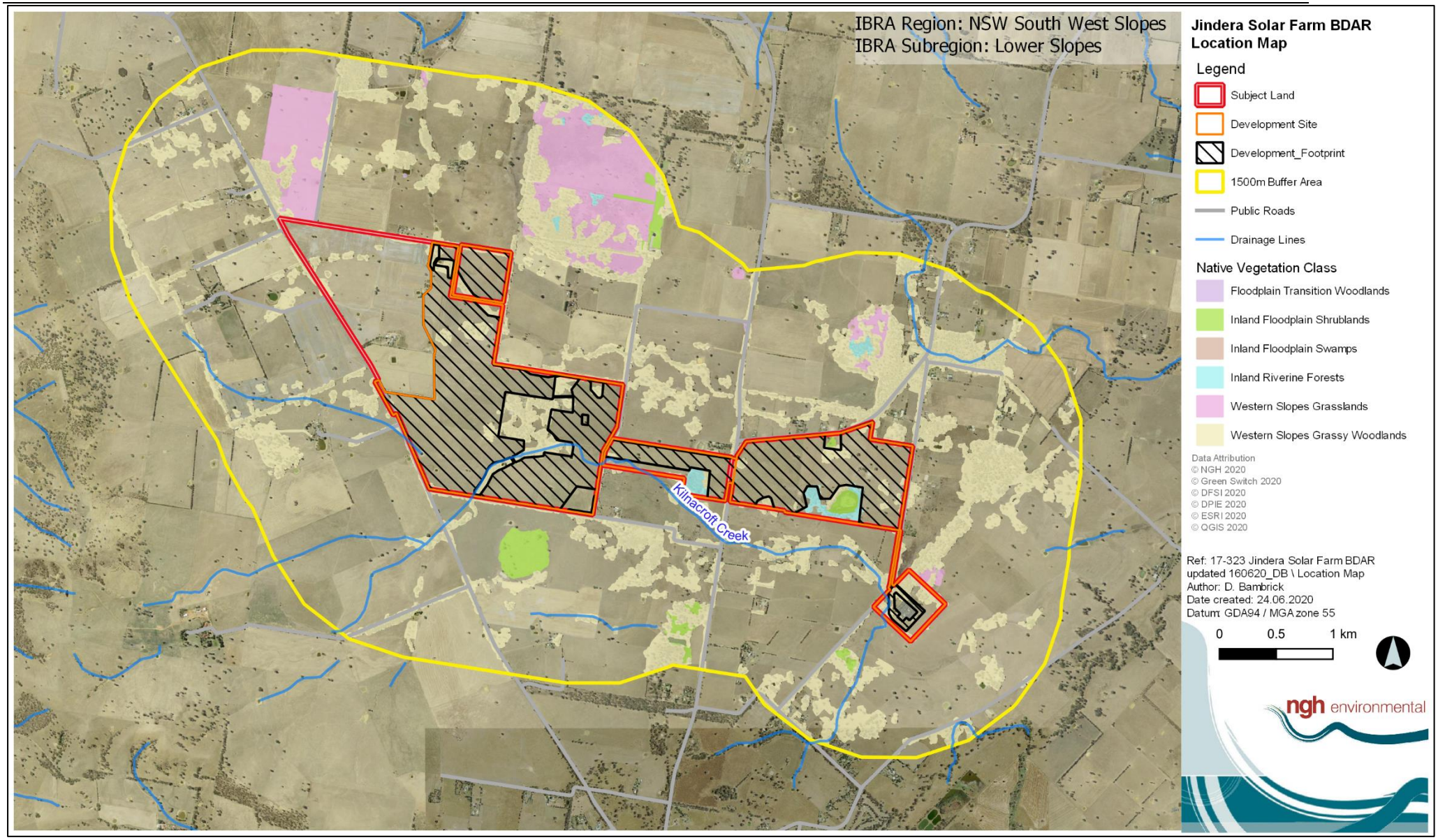


Figure 2-9 Location Map

3 NATIVE VEGETATION

3.1 NATIVE VEGETATION EXTENT

Approximately 78 ha of native vegetation occurs within the development site. This is comprised of:

- 10.14 ha of River Red Gum – wallaby grass tall woodland wetland on the outer River Red Gum zone, mainly in the Riverina Bioregion
- 65.99 ha of Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

1.29 ha of Gilgai wetland mosaic in the southern NSW South Western Slopes Bioregion41 scattered paddock trees occur within the development site (Figure 3-1). 34 Paddock trees are located within the development footprint and will be impacted by the development. 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 footprint (34 total) 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.

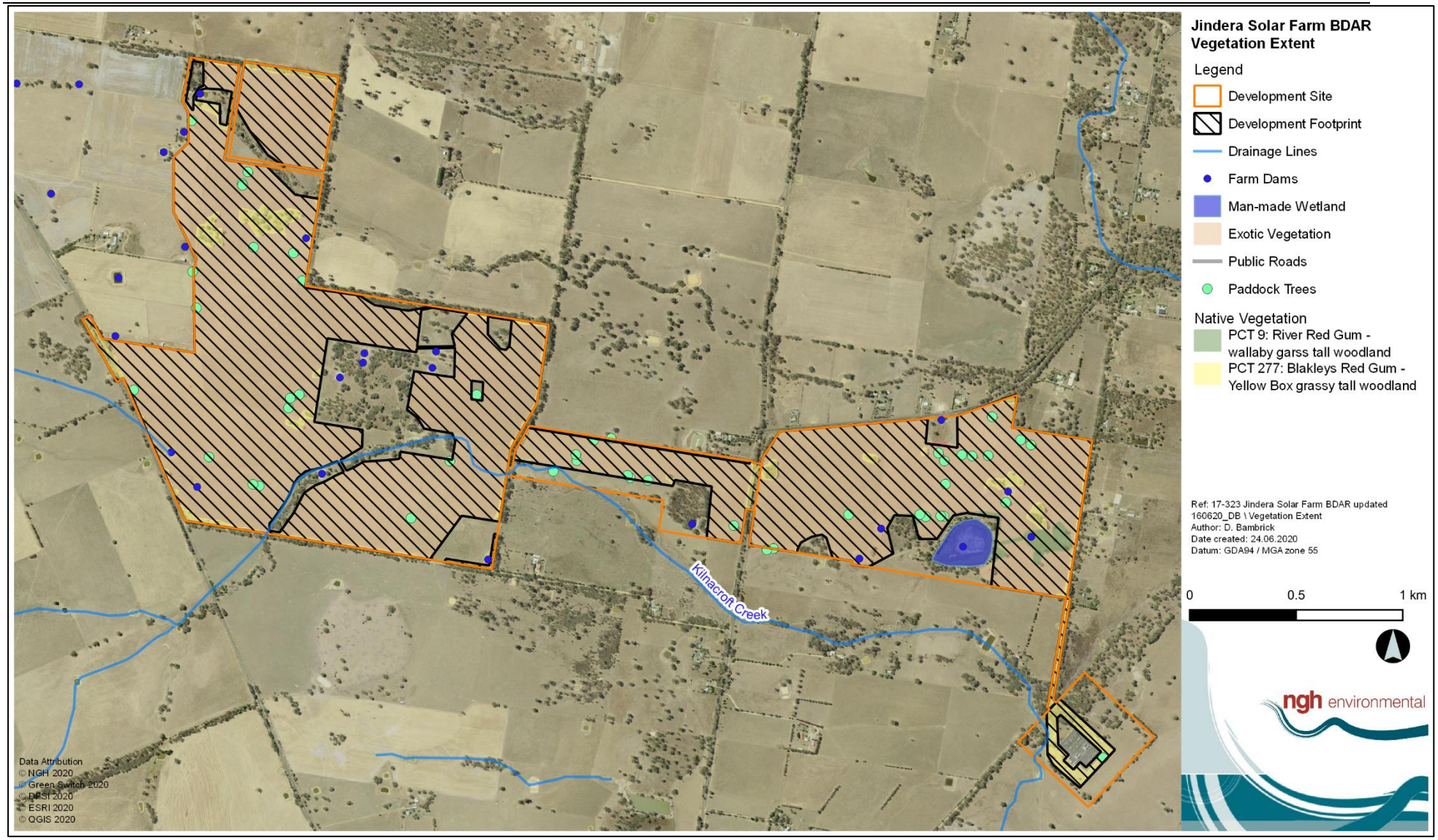


Figure 3-1 Native and exotic vegetation extent within the development footprint.

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.

Further floristic surveys were undertaken on January 21st and 22nd, 2020 for the substation, Urana Road entrance and Walla Walla Jindera Road entrance. These three areas were not previously surveyed so the PCTs were determined and vegetation integrity plots, of 20 m by 50 m, were established in each vegetation zone or location.

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; andPCT 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 footprint	3.35 ha of this PCT occurs in the south eastern corner of the development footprint. This is comprised of; 1.57 ha as woodland (moderate) adjacent the wetland area 1.10 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%

River Red Gum – Wallaby Grass tall woodland wetland on the outer River Red Gum zone, mainly in the Riverina Bioregion (PCT 9)	
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. 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 considered that have River Red Gum as the dominant species in the NSW South Western Slopes. These are: *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* *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* *PCT 7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion* *PCT 9 - River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion* PCT 9 was considered the best match for the PCT based on the following criteria present in the community: • Occurs on outer floodplains rather than rivers • Dominance of Wallaby Grass rather than Warrego Grass • Brown grey clay soils • Located within the lower slopes IBRA subregion • Plant species listed above characteristic to this PCT 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 a total of 65.99 ha. Within the development footprint a total of21.92 ha is present across multiple patches including the substation.	
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. PCT 277 is considered to be the most appropriate PCT based on; • Yellow Box and Blakely's Red gum codominant in the community • Located in the Lower Slopes IBRA subregion. • Occurs on flats • Existing vegetation mapping consistent with this PCT. 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

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. This area has been excluded from the development footprint.	
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. Two PCTS were short listed. There were; • Gilgai Wetland mosaic in the Southern NSW south western slopes bioregion (PCT 360) • 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). 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; • the presence of upper stratum species, *Eucalyptus Blakelyi* at the site • the location in the Jindera district • grey cracking clays • Shallow depression • Ephemeral wetland not appearing to be regularly flooded As such, PCT 360 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

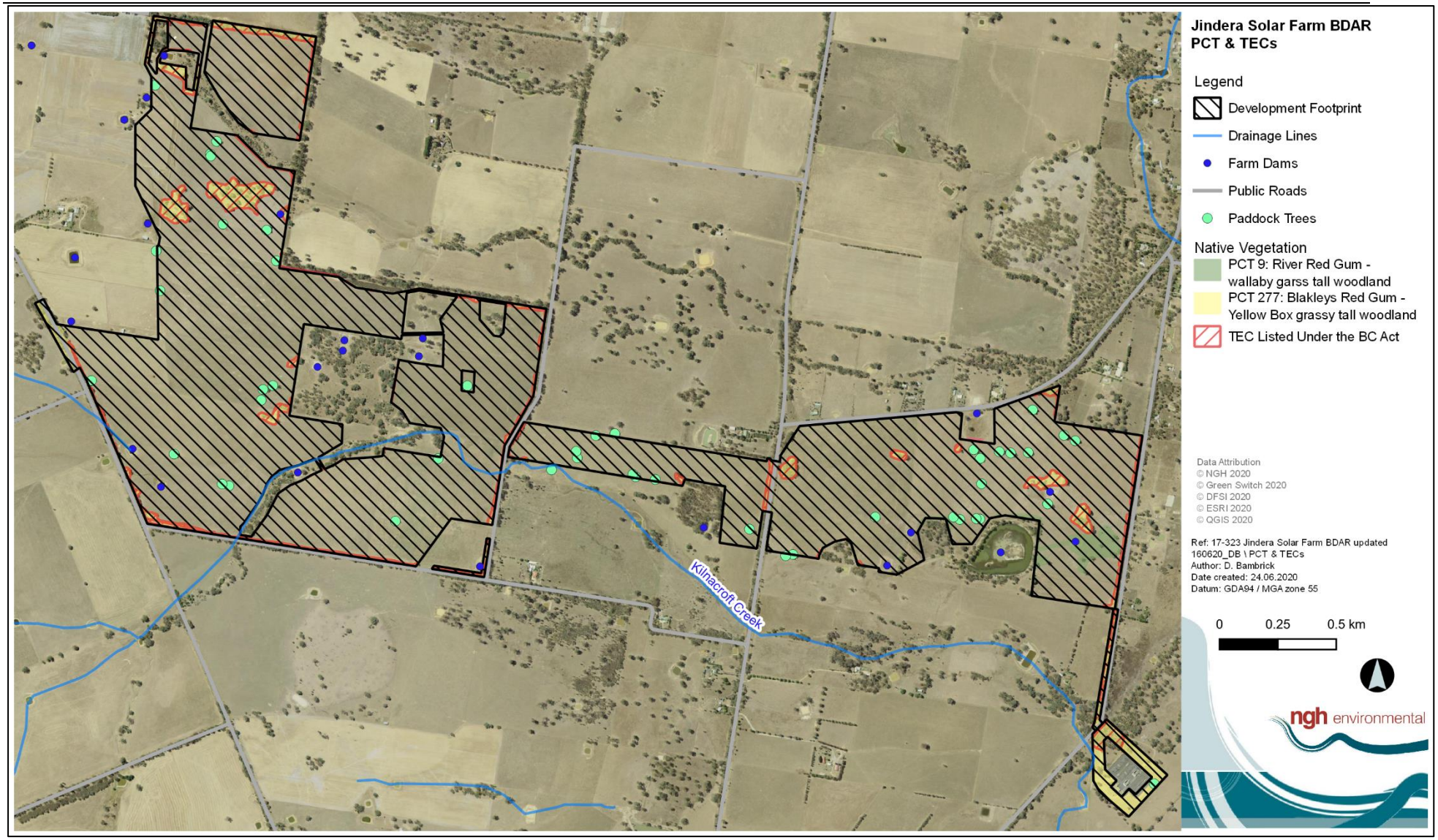


Figure 3-5 PCTs and TECs at the development site

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 3-3, & Table 3-4). PCT 9 was stratified into three zones, on the basis of tree cover, grassland and wetland. PCT 277 was stratified into four zones based on understory condition and site management. PCT360 was considered to be a homogenous zone.

Nineteen plots were undertaken throughout the ten zones in the development site in November 2017. 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.

An additional seven plots were undertaken in January 2020. Five plots were in the substation, one at the Urana Road entrance and an additional plot in vegetation Zone 6 (PCT 9).

Table 3-3 Vegetation zones in the development site

Zone ID	PCT ID	Stratification unit / condition	Area in develop-ment site (ha)	Area in develop-ment footprint (ha)	Survey effort (# plots)	Patch size (ha)	Example
1	277	**Grazed understory** 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. This woodland is an EEC listed under the BC Act.	30.66	8.57	6	100+	
2	277	**Roadside vegetation** 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*). This zone also occurs along Urana Road and Walla Walla-Jindera Road where site access road upgrades are required. This woodland is an EEC listed under the BC Act.	8.52	4.31	2	100+	

Zone ID	PCT ID	Stratification unit / condition	Area in develop-ment site (ha)	Area in develop-ment footprint (ha)	Survey effort (# plots)	Patch size (ha)	Example
3	277	**Creek line** 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*). This woodland is an EEC listed under the BC Act.	9.88	0.52	4	100+	
4	277	**Regrowth** 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. This woodland is an EEC listed under the BC Act.	0.64	0	1	100+	

Zone ID	PCT ID	Stratification unit / condition	Area in develop-ment site (ha)	Area in develop-ment footprint (ha)	Survey effort (# plots)	Patch size (ha)	Example
5	9	**Wetland** 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. This PCT is not listed under the BC Act or EPBC Act as a TEC.	6.71	0	3	9.7	
6	9	**Woodland** 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*). This PCT is not listed under the BC Act or EPBC Act as a TEC.	2.22	1.57	2	100+	

Zone ID	PCT ID	Stratification unit / condition	Area in develop-ment site (ha)	Area in develop-ment footprint (ha)	Survey effort (# plots)	Patch size (ha)	Example
7	9	**Derived Grassland** Remnant native vegetation comprising grassy groundcover of the lower strata only amongst a heavy exotic weed burden. This PCT is not listed under the BC Act or EPBC Act as a TEC.	1.21	1.10	1	1	
8	360	**Wetland** 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. This PCT is not listed under the BC Act or EPBC Act as a TEC.	1.29	0.06	1	1.3	

Zone ID	PCT ID	Stratification unit / condition	Area in develop-ment site (ha)	Area in develop-ment footprint (ha)	Survey effort (# plots)	Patch size (ha)	Example
9	277	**Substation Woodland** This zone occurs around the substation where the proposed transmission line will connect. It is comprised of an overstorey of Blakely's Red Gum *Eucalyptus Blakeleyii* and Yellow Box *Eucalyptus melliodora*. This area was assessed in 2020, the BAM plot data results were added to the BAM calculator.	8.8	1.62	3	8.76	
10	N/A	**Exotic Vegetation** 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.). These areas were not considered to represent a PCT or TEC. A Land Category Assessment has been completed for this zone and can be found in Appendix J.	340	338	1 (land category assessment deemed it not required to be assessed using BAM)	N/A	

Zone ID	PCT ID	Stratification unit / condition	Area in develop-ment site (ha)	Area in develop-ment footprint (ha)	Survey effort (# plots)	Patch size (ha)	Example
11	277	**Substation Derived Grassland** This zone is the derived grassland area around the substation where the Eucalypts are absent. This area is highly modified but there is a small number of native grasses present which includes Spear Grass *Austrostipa scabra,* Wallaby Grass *Rytidosperma spp.* and and Wheat Grass *Elymus scaber*.	9.22	3.09	2	9.22	

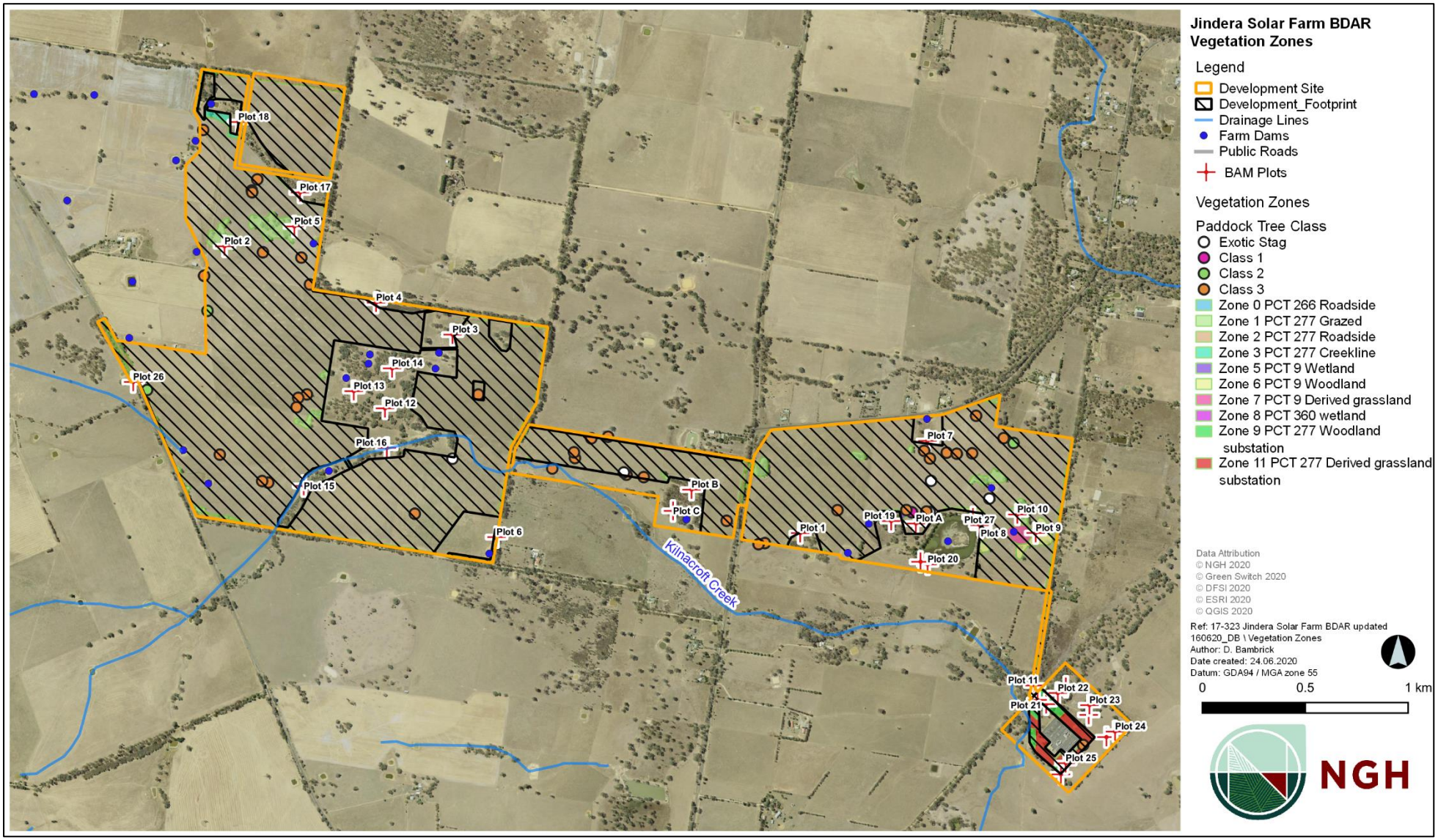


Figure 3-6 Vegetation zones at the development site

3.2.4 Paddock Trees

45 isolated paddock trees occur throughout the exotic agricultural land in the development site (Appendix C). 42 of these trees are native species, and 4 are either dead stags or exotic trees.

The 41 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.

According the BAM criteria, these paddock trees have been defined as Category 2 land surrounded by Category 1 land based on the Land Category Assessment in Appendix J.

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 have 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 based on the BAM paddock trees assessment method. The large tree benchmark for PCT277 is 50 cm DBH. There were three classes on site (Class 1 <20cm DBH, Class 2 >20cm DBH but <50cm DBH, Class 3 >50cm DBH) and these classes have been included in the BAM Calculation. The trees were visually assessed from the ground to determine whether any hollows were present. The paddock trees occurring in the development footprint are shown in Appendix C and Figure 3-6. A total of 34 paddock trees were entered into the calculator as being present within the development footprint.

3.2.1 Vegetation integrity assessment results

81 plant species were identified within the thirty 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 3-4.

Table 3-4 Table of current vegetation integrity scores for each vegetation zone within the development footprint.

Zone ID	Composition score	Structure score	Function score	Vegetation Integrity Score
1 PCT277_Grazed	6	32.7	56	22.2
2 PCT277_Roadside	29.7	36.5	70.3	42.4
3 PCT277_Creekline	22.7	34.8	80.8	40.0
6 PCT9_Woodland	9.6	74.9	36.9	29.8
7 PCT9_Derived Grassland	34.8	28.9	15	24.7
9 PCT 277_Substation_Woodland	15.2	32.9	28.9	24.3
11 PCT 277_Substation_Grassland	11	1.4	3.9	3.9

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 *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 *Ninox connivens*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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) *Melithreptus gularis gularis*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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) *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 *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 *Stagonopleura guttata*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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 *Artamus cyanopterus cyanopterus*	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		
Flame Robin *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 *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) *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 Flying Fox *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) *Melanodryas cucullata cucullata*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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 *Phascolarctos cinereus*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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 *Hieraaetus morphnoides*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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 *Glossopsitta pusilla*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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
Little Pied Bat *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
Major Mitchell's Cockatoo *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 *Tyto novaehollandiae*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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 *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 *Anthochaera phrygia*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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 *Petroica boodang*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Vulnerable	Not listed
Speckled Warbler *Chthonicola sagittata*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Vulnerable	Not listed
Spotted Harrier *Circus assimilis*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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 *Dasyurus maculatus*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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)

Ecosystem credit species	Associated PCT	NSW listing status	National listing status
Square-tailed Kite *Lophoictinia isura*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion	Vulnerable	Not listed
Superb Parrot *Polytelis swainsonii*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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 *Lathamus discolor*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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 *Neophema pulchella*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Vulnerable	Not listed
Varied Sittella *Daphoenositta chrysoptera*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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 *Haliaeetus leucogaster*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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 *Saccolaimus flaviventris*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 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 *Grantiella picta*	277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Vulnerable	Vulnerable

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		

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.

Inclusion of additional species January 2010:

Based on the response from BCD (post public exhibition of the EIS; 2019), an additional calculation was requested. A BAM Credit Calculator calculation was completed for vegetation zones in the development site *that will not be impacted from the development*. There were four additional species, two flora and two fauna. The flora species are Swamp Wallaby Grass (*Amphibromus fluitans)* and Clay-pan Daisy (*Brachyscome muelleroides*). The two fauna species are Sloane's froglet (*Crinia sloanei) (*as previously mentioned*)* and Southern Bell Frog (*Litoria raniformis*). These species have been included in Table 4.2 and identified as **BAMC additions (Revision1)*.

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

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
	including lakes, rivers, and coastlines. Known to roost in locality.						
Koala *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 *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 *Hieraaetus morphnoides* (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. 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 *Lophochroa leadbeateri* (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

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
Masked Owl *Tyto novaehollandiae* (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 *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 *Anthochaera phrygia*	Mapped important areas	High	Critically Endangered	Critically Endangered	Not within mapped important areas	Excluded	Not within mapped important areas.
*Sloane's Froglet ***Crinia sloanei***	Semi-permanent/ephemeral wet areas Containing relatively shallow sections with submergent and emergent vegetation, or within 500 m of wet area swamps. Within 500 m of swamps or waterbodies	Moderate	Vulnerable	Endangered	Wetland areas	Included	Within geographic distribution.
*Southern Bell Frog ***Litoria raniformis***	Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys.	Moderate	Endangered	Vulnerable	Wetland areas	Included	Within geographic distribution.
Southern Myotis *Myotis macropus*	Dependent on waterways with pools of 3m wide or greater. Hollow Bearing trees within 200m of riparian zone.	High	Vulnerable	Not listed	Manmade wetland providing permanent water present in development site.	Included	Habitat components on site.

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
	Bridges, caves or artificial structures within 200m of riparian zone.						
Square-tailed Kite *Lophoictinia isura* (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 *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. Known records within development site.	Included	Habitat components on site.
Superb Parrot *Polytelis swainsonii* (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 *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 *Haliaeetus leucogaster* (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.

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
FLORA							
Ausfeld's Wattle *Acacia ausfeldii*	Footslopes and low rises on sandstone. 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.
Floating Swamp Wallaby-grass *Amphibromus fluitans	Semi-permanent/ephemeral wet areas Periodically inundated sites (including table drains and farm dams), notably wetlands on riverine floodplain)	High	Vulnerable	Vulnerable	Wetland areas	Included	Within geographic distribution.
Austral Pillwort *Pilularia novae-hollandiae*	Semi-permanent/ephemeral wet areas Periodically waterlogged sites (including table drains and farms dams)	High	Endangered	Not listed	Wetlands present in development site.	Included	Habitat components on site.
Claypan Daisy *Brachyscome muelleroides	Floodplains on grey-brown or red-brown clays and claypan Semi-permanent /ephemeral wet areas Wetland-grassland communities on grey-brown or red-brown clays and claypans	High	Vulnerable	Vulnerable	Wetlands present in development site.	Included	Within geographic distribution.

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
Silky Swainson-pea *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 *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 *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.

*BAMC additions (Revision1)

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 **Small Purple-pea**	Zone 1	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 **Silky Swainson-Pea**	Zone 1	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 **Small Scurf Pea**	Zone 1	These zones have been subject to heavy grazing by livestock for many years and ploughed for crops. The understory is

Species Credit Species	Zones Excluded	Reason for exclusion
		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 **Austral Pillwort**	Zone 1, 2 & 6	No ephemeral wet areas in these zones.
Fauna		
Eastern Pygmy Possum ***Cercartetus nanus***	**Zone 1, 5, 6, 7, 8, 9, 11**	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 *Ninox connivens*	2.00	May-Dec	Surveyed August 2018	No	0
Bush Stone-curlew *Burhinus grallarius*	2.00	Jan-Dec	Surveyed August 2018	No - unlikely due to the habitat modification.	0
Eastern Pygmy Possum *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)	2.91 ha (1.38 ha PCT 277 roadside, 0.49 ha PCT

Species credit species	Biodiversity risk rating	Survey period	Assumed to occur/survey/expert report	Present on site?	Species polygon area or count
					277 creekline, 1.04 ha PCT 277 substation woodland)
Gang-gang Cockatoo *Callocephalon fimbriatum*	2.00	Oct-Jun	Surveyed November 2017	No	0
Glossy Black-cockatoo *Calyptorhynchus lathami*	2.00	Mar-Aug	Surveyed August 2018	No	0
Grey-headed Flying-fox *Pteropus poliocephalus*	2.00	Oct - Dec	Surveyed August 2018 and January 2020	No known camps	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	Jul-Aug	Surveyed August 2018	No	0
Southern Myotis *Myotis macropus*	2.00	Oct-Mar	Survey January 2020	No	0
Southern Bell Frog ***Litoria raniformis***	2	Oct-Jan	Not surveyed (assumed present)	Assumed to occur in wetland areas (zone 5 & 8), habitat excluded from footprint, however possible indirect impacts	0
Square-tailed Kite *Lophoictinia isura*	1.50	Sep-Jan	Surveyed November 2017	No	0

Species credit species	Biodiversity risk rating	Survey period	Assumed to occur/survey/expert report	Present on site?	Species polygon area or count
Squirrel Glider *Petaurus norfolcensis*	2.00	All	Surveyed August 2018 Known to occur in development site.	Yes, identified in the development site	6.02 ha (4.35 ha PCT 277 grazed, 0.18 ha PCT 277 roadside, 0.32 ha PCT 277 creekline, 1.17 ha PCT 277 substation woodland)
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
Clay-pan Daisy (*Brachyscome muelleroides*)	3	All year	Surveyed January 2020	No	0
Silky Swainson-pea *Swainsona sericea*	2.00	Sep-Feb	Surveyed November 2017 and January 2020. Not surveyed in transmission line.	Assumed presence in transmission line easement (zone 2 and zone 9)	3.0 ha (1.38 ha PCT 277 roadside, 1.62 ha PCT 277 substation woodland)
Small Purple-pea *Swainsona recta*	1.00	Sep-Nov	Surveyed November 2017 and January 2020. Not surveyed in transmission line.	Assumed presence in transmission line easement (zone 2 and zone 9)	3.0 ha (1.38 ha PCT 277 roadside, 1.62 ha PCT 277 substation woodland)

Species credit species	Biodiversity risk rating	Survey period	Assumed to occur/survey/expert report	Present on site?	Species polygon area or count
Small Scurf-pea *Cullen parvum*	2.00	Dec-Jan	Surveyed November 2017 and January 2020 – not during recommended survey time.	Assumed present in Zone 2, 3, 6, 7 & 9	6.16 ha (1.57 ha PCT 9 woodland, 1.10 PCT 9 grassland, 1.38 ha PCT 277 roadside, 0.49 ha PCT 277 creekline, 1.62 PCT 277 substation woodland)
Swamp Wallaby Grass (*Amphibromus fluitans)*	2	Dec-Mar	Surveyed January 2020	No	0

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 and 20 and 21 of January 2020 for a total of approximately 10-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 8-person hours, and foot surveys for 4-person hours. Weather conditions recorded for 22 and 23 August 2018 at the nearest weather station included minimum temperature of 1.4°C, maximum temperature of 14.1°C, and 0.2 mm of rainfall. The weather for 20 and 21 of January 2020 was a minimum of 17°C and a maximum 27°C with rainfall within the previous 24 hours.

SURVEY RESULTS

One Squirrel Glider was observed during the January 2020 surveys. During 2018, no nocturnal mammals were observed. 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.

Southern Bell Frog

SURVEY EFFORT AND RESULT

The Southern Bell Frog was generated by BAMC for areas that will not impacted from the development proposal and therefore has not been surveyed for in these areas. It is noted that targeted frog surveys in 2018 did not record the Southern Bell Frog on site and no calls were heard during January 2020 surveys. However targeted surveys for this species were not completed. In January 2020, after a considerable dry spell, there were very few areas with permanent water to survey for this species. Therefore this species is assumed present.

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.

The survey timing was outside of the recommended survey period for the Bush Stone Curlew however, the development site is highly modified with limited ground habitat such as litter and logs that suit the Bush Stone Curlew. It is unlikely the development site provides suitable habitat for the species.

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.

During the January 2020 bird surveys, no threatened species were observed.

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.

During the January 2020 survey, an Anabat was put out for one night to the south west of the artificial dam on the edge of the Woodland 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.

No Southern Myotis were not detected during the January 2020 surveys but seven species of microbat were recorded. None of these species are threatened and the results are in Appendix D.

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 surveys.

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.

These species were not observed during the January 2020 surveys around the substation or the road reserve. However suitable habitat was assumed to be present in PCT 277 roadside areas and PCT 277 substation woodland areas for Small Purple Pea and Silky Swainson-Pea and habitat for Small Scurf Pea was assumed to be present in PCT 9 woodland and derived grassland, PCT277 roadside, creekline and substation woodland.

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 mid-storey 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.

Further flora survey work

SURVEY EFFORT

Additional flora surveys were undertaken for Swamp Wallaby Grass (*Amphibromus fluitans)* and Clay-pan Daisy (*Brachyscome muelleroides*) in the artificial dams where there was water present particularly around Zones 5 and 8. The development footprint avoids these zones but these areas for surveyed, to address BCD comments about species generated from zones not impacted by the development.

SURVEY RESULTS

Neither species were present and due to the highly modified areas around Zone 5, it is considered highly unlikely these species are present on site.

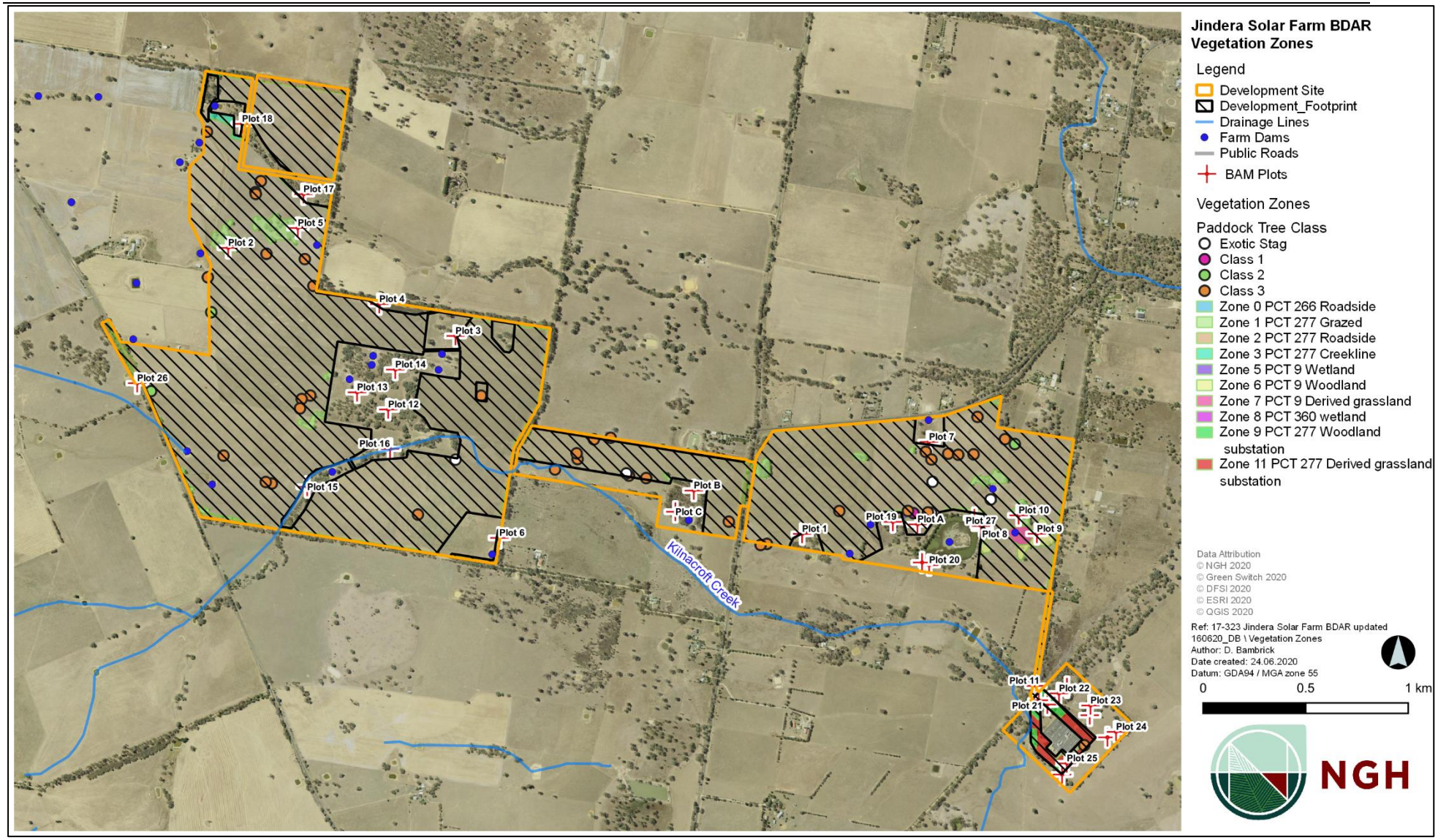


Figure 4-1 Threatened species polygons and targeted survey locations

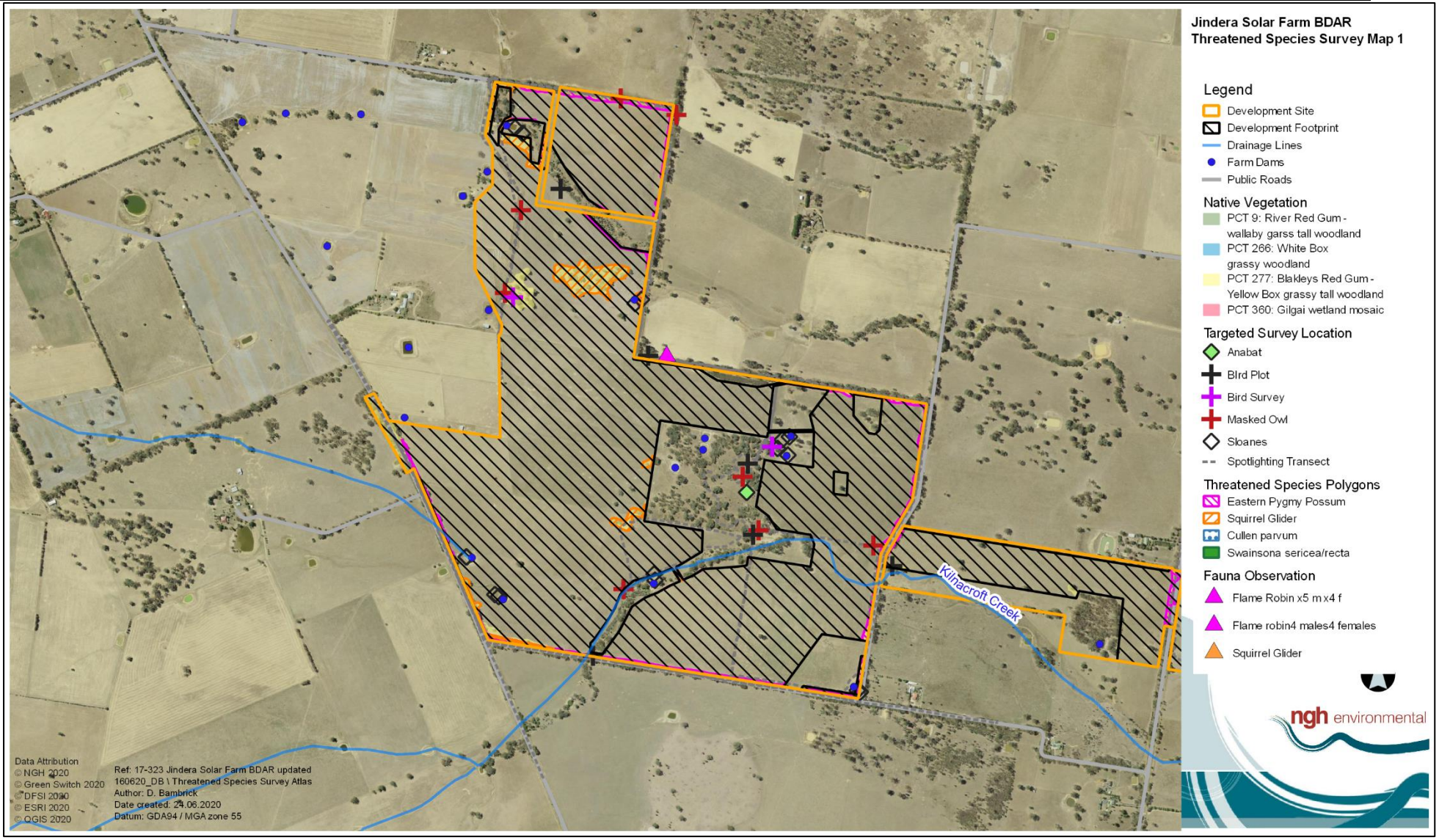


Figure 4-2 Threatened Species Polygons and targeted survey locations (Western side of development site).

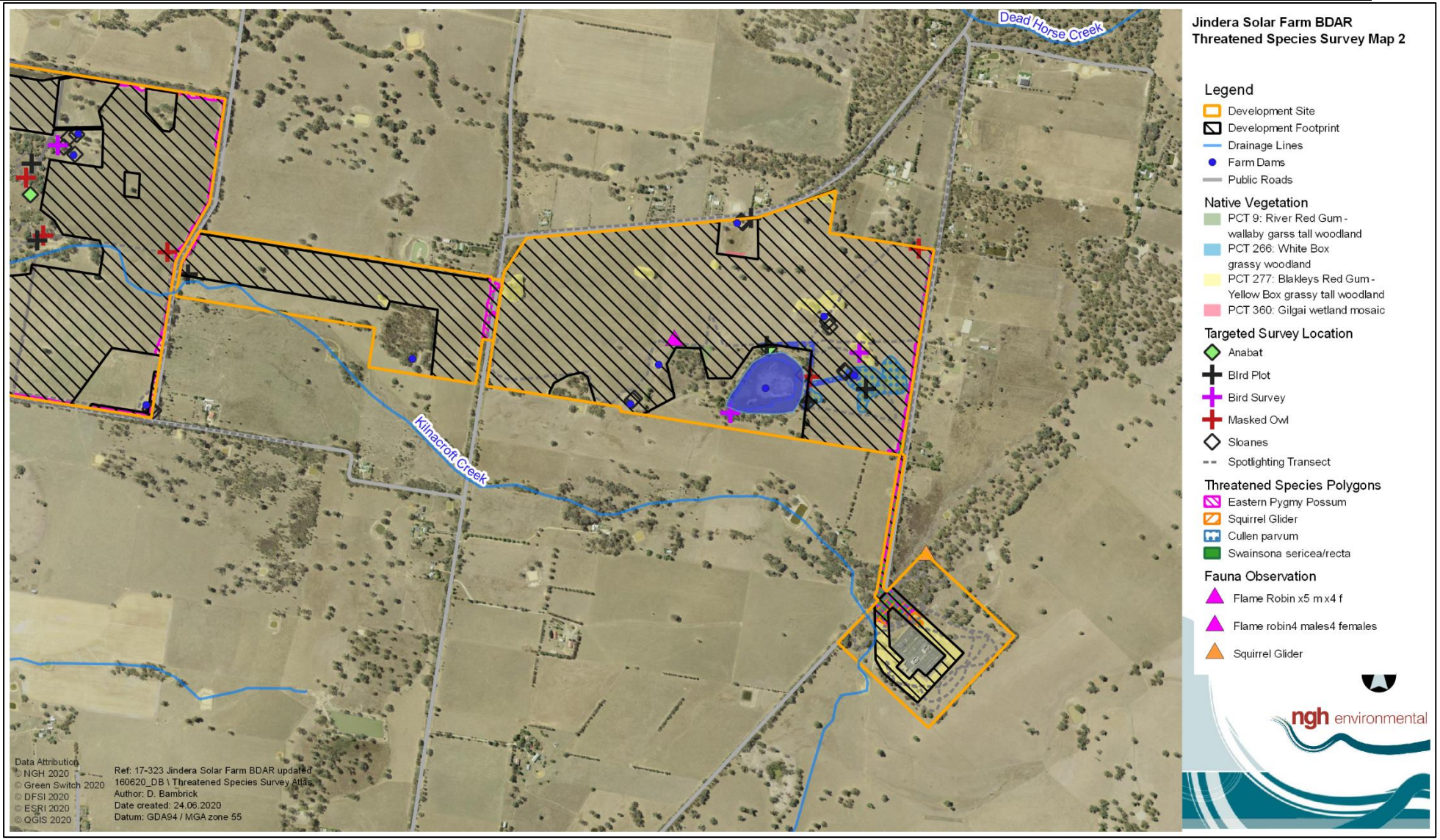


Figure 4-3 Threatened Species Polygons and targeted survey locations (Eastern side of development site).

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 January 28, 2020 with 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 for both reports). Relevant to Biodiversity these include:

- Wetlands of International Importance – 7;
- Threatened Ecological Communities – 6;
- Threatened fauna species – 22;
- Threatened flora species – 7; 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

Six 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 (Zone 1) is degraded in the understory with almost 100% exotic groundcover. The woodland patches along the creek line (Zone 3) also has 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 surveyed in January 2020. The floristic plots undertaken show the understorey was low in diversity (<50%) and the area did not met the EEC criteria.

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 (PCT 277_ Grazed)	Zone 2 (PCT 277 _Roadside)	Zone 3 (PCT 277_ Creekline)	*Zone 9 (PCT 277_Substation Woodland)	Zone 11 (PCT 277 _Substation Derived Grassland)	*Zone 2 (PCT 277_Urana Road Roadside)
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.	Yes, Yellow Box and Blakley's Red Gum common in the overstorey.	No – not present	Yes, Yellow Box and Blakley's Red Gum common in the overstorey.
Does the patch have a predominantly native understory	No – no native understory species present. The understory is dominated by exotic weed species. **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. **Not the listed ecological community**	No – no native understory species present. The understory is dominated by exotic weed species. **Not the listed ecological community**	No - Native Wallaby Grass (*Rytidosperma spp.*), Spear Grass (*Austrostipa spp.*) and *Anthosachne scabra* (Common Wheatgrass) are present but the cover is <10% perennial native vegetation cover. **Not the listed ecological community**	No – some native understory species present but provide less than 2% cover of perennial native vegetation cover. **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. **Not the listed ecological community**				

5.3 THREATENED SPECIES

Twenty-nine 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	0.64
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	6.71
8	360- Gilgai wetland mosaic in the southern NSW South Western Slopes Bioregion	PCT360_Wetland	66.2	n/a	1.29

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.

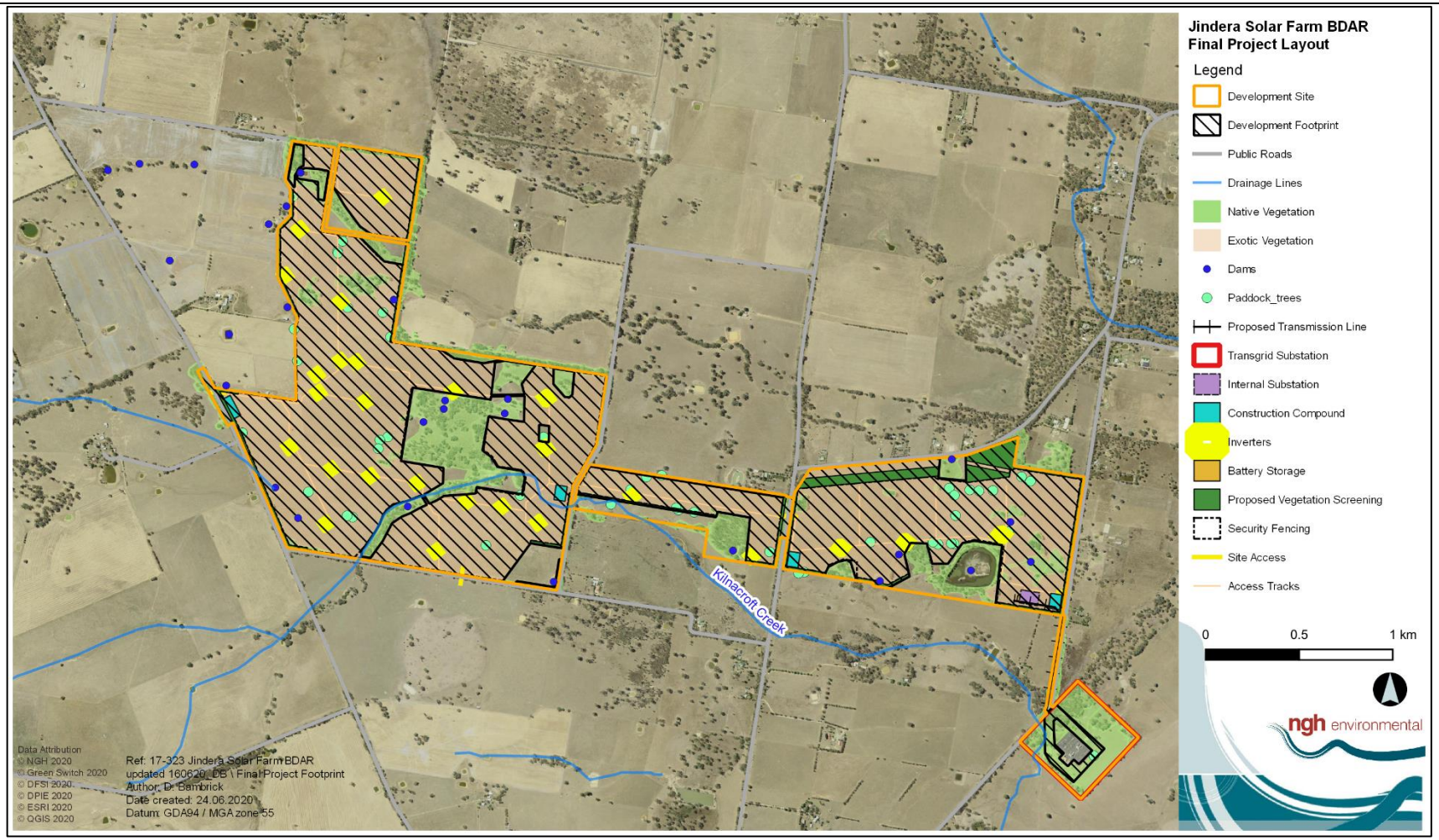


Figure 6-1 Final project layout

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.

Other threatened fauna such as Owls, Little Eagles or other birds and bats may use areas of non-native vegetation for foraging, but these species are capable of continuing to move through the landscape into surrounding locations and the impacts will be minimal. The paddock trees with hollows that will be impacted from the development have been assessed and these hollows will be replaced one to one or relocated to the woodland areas that will be retained.

The squirrel glider Woodland habitat will be retained, and this species does not forage into open pasture.

Potential areas of Sloane's froglet and Southern Bell Frog wetland habitat will also be retained (noting neither of these species were confirmed to be present on site). The Southern Bell Frog moves out of the wetland areas into the outer landscape in drier periods, but the open pasture areas do not provide adequate habitat to support the population so this species would be limited to Woodland areas around the wetlands and dams.

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. These connections and replanting are important for woodland birds.

The woodland areas and connecting creek lines and roadside vegetation provides habitat for Squirrel Gliders, potentially other arboreal fauna, bats and amphibians. With mitigation measures the development does not limit these species moving across their range. Further crossing points at the boundary fence are proposed for Squirrel Gliders. The infrastructure may include poles, ropeways and PVC piping over barbed wire on the boundary fence to ensure the Squirrel Gliders can move across their range without injury.

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.

The only threatened fauna species that may be impacted by the development restricting their movement and thus possible lifecycle is the Squirrel Glider. But as previously mentioned, the woodland vegetation and connecting remnant vegetation will retained with appropriate mitigation at the boundary fence junction.

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 of 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. This may indirectly impact threatened amphibians. These potential impacts are discussed in Section 7.3.4 and are unlikely to significantly impact on water quality and therefore continued protection of habitat for threatened amphibians.

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. A requirement for wildlife handlers during construction has been included in the mitigation measures to ensure appropriate relocation if required.

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)	24.50 ha	Regular	Construction	• Direct loss of native flora and fauna habitat • Potential over-clearing of habitat outside proposed development footprint • Injury and mortality of fauna during clearing of fauna habitat and habitat trees • Disturbance to stags, fallen timber, and bush rock
Displacement of resident fauna	Unknown	Regular	Construction, operation	• Direct loss of native fauna • Decline in local fauna populations
Injury or death of fauna	Unknown	Regular	Construction	• Direct loss of native fauna • Decline in local fauna populations
Removal of habitat features e.g. HBTs	>12 HBTs	Regular	Construction	• Direct loss of native fauna habitat • 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) • Reduced fauna movements across landscape due to fencing • Collision risks to birds and microbats (fencing).

7.1.1 Changes in vegetation integrity scores

24.50 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 Squirrel Glider	8.57	**22.0**	**0**
2	PCT277_Roadside	Box-Gum Woodland EEC Eastern Pygmy Possum (Assumed) *Cullen parvum* (assumed) *Swainsona sericea* (assumed) *Swainsona recta* (assumed)	4.31	**42.2**	**0**
3	PCT277_Creekline	Box-Gum Woodland EEC Squirrel Glider Eastern Pygmy Possum (Assumed)	0.52	**40.0**	**0**
6	PCT9_Woodland	Southern Myotis (Assumed) *Cullen parvum* (assumed)	1.57	**29.8**	**0**
7	PCT9_Derived Grassland	*Cullen parvum* (Assumed)	1.10	**24.7**	**0**
9	PCT277_Substation Woodland	Box-Gum Woodland EEC Eastern Pygmy Possum (Assumed) Squirrel Glider *Cullen parvum* (assumed) *Swainsona sericea* (assumed) *Swainsona recta* (assumed)	1.62	**24.3**	**0**
11	PCT277_Substation Grassland	Box-Gum Woodland Derived Grassland	3.10	**3.9**	**0**
		TOTAL:	**20.79**		

7.1.2 Loss of Paddock Trees

41 native Paddock trees were recorded within the development site. The paddock tree inventory is shown in Appendix C. 34 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	4.35 ha in Zone 1: PCT 277 grazed 0.18 ha in Zone 2 PCT 277 roadside, 0.32 ha PCT 277 creekline, 1.17 ha PCT 277 substation woodland)
Eastern Pygmy Possum (*Cercartetus nanus*) – assumed present	2.00	1.38 ha in Zone 2: 277_roadside 0.49 ha in Zone 3: 277_creekline 1.04 ha in Zone 9 277_Substation Woodland
Small Scurf Pea (*Cullen parvum*) – assumed present	2.00	1.38 ha in Zone 2: 277_roadside 0.49 ha in Zone 3: 277_creekline 1.57 ha in Zone 6: 9_woodland 1.10 ha in Zone 7: 9_derived grassland 1.62 ha in Zone 9 277_Substation Woodland
Silky Swainson-pea (*Swainsona sericea*) – assumed present	2.00	1.38 ha in Zone 2: 277_roadside 1.62 ha in Zone 9 277_Substation Woodland
Small Purple-pea (*Swainsona recta*) – assumed present	1.00	0.90 ha in Zone 2: 277_roadside 1.62 ha in Zone 9 277_Substation Woodland

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; • Disturbance to stags, fallen timber; and • 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. • Flame Robin • Squirrel Glider	• Loss of connectivity between remnant 277 within and around development footprint; and • 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 • Southern Myotis • Flame Robin	• May alter fauna activities and/or movements; • 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 • 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 • Southern Myotis • Flame Robin	• Loss of foraging habitat; • Exposure to predators when moving between segmented patches of vegetation; and • Loss of access to water (loss of dams).
Loss of breeding habitats	12 HBT	Constant	Construction Phase: Long-Term	• Squirrel Glider • Southern Myotis	• Loss of potential breeding habitat including fallen and hollow logs at height; • 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 • Alternation of surface watercourses (isolating high biodiversity value communities).

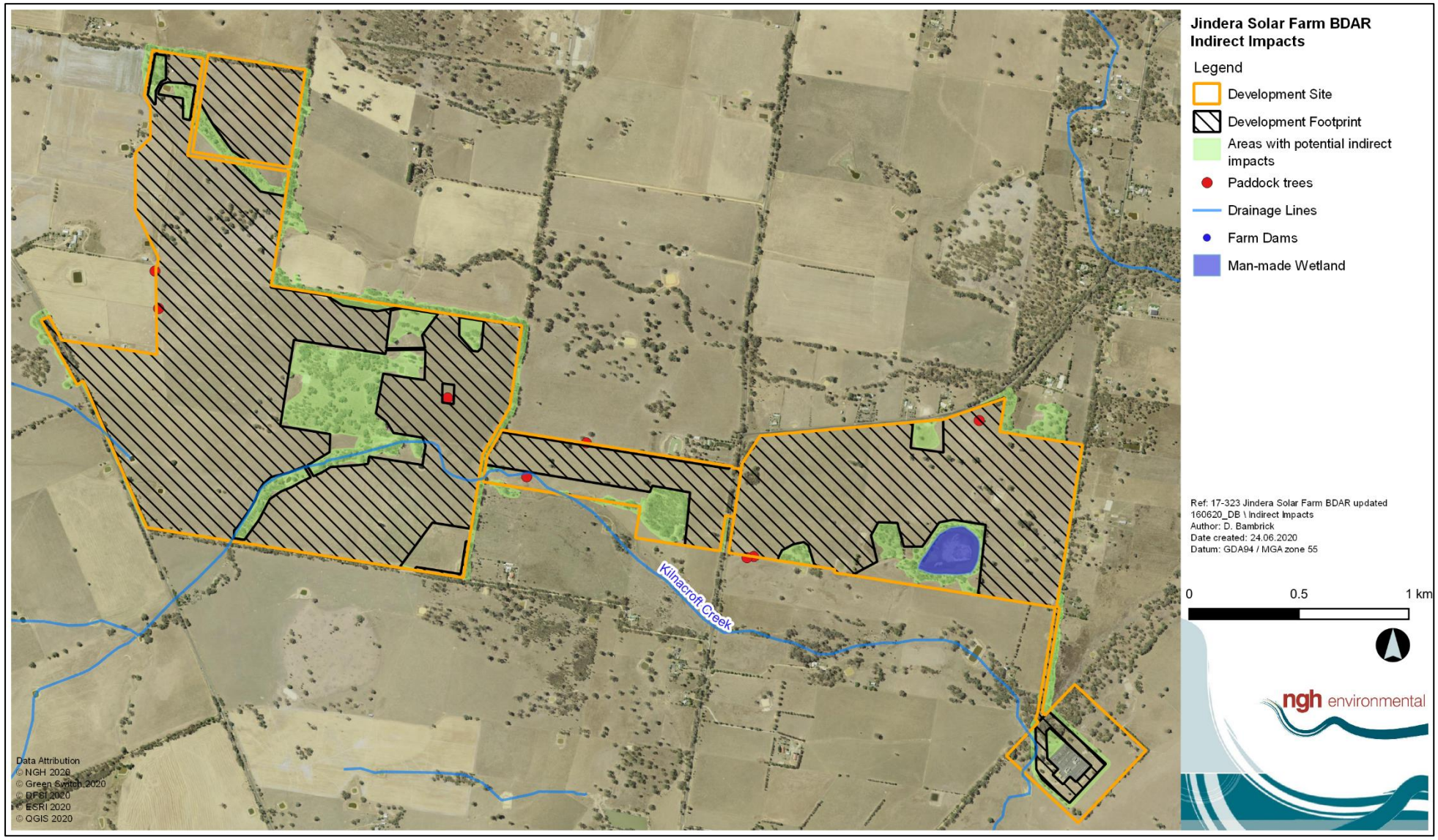


Figure 7-1 Estimated zones of indirect impact for the proposal

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) and in the adjoining vegetation to the substation.

To facilitate the movement of squirrel gliders through the development site to the woodland located in the centre of the western side of the development site, a corridor of vegetation has been retained. The northern patch of woodland (on the development boundary will connect to woodland patches in the development site. The woodland in the centre (where the squirrel gliders have been recorded), connect to these patches and the vegetation along Kilnacroft Creek. The vegetation on Kilnacroft Creek connects to Klinberg Road roadside vegetation. This corridor minimises impact to the Squirrel Glider population by

retaining this known habitat for the Squirrel Glider and the adjoining vegetation to the north and south. The connecting vegetation along Kilnacroft Creek requires movement over wire fences and across the site. It is noted that the solar farm perimeter fencing requires barbed wire for security, but the top wire may be able to be covered with PVC piping to protect gliders who may get caught on the fence. Therefore, a Squirrel Glider management plan has been committed to in order to investigate the following, during the detailed design stage to minimise risks to this species:

- Barbed wire would not be used on internal fences surrounding retained native vegetation.
- Investigate the best practice use of squirrel glider poles and ropeways and construct to suit, to protect from predators and allow movement in the landscape.
- Investigate the locations where squirrel gliders are crossing existing fences to connect to roadside vegetation/riparian vegetation to determine appropriate placement of glider poles and ropeways.
- Install protective measures (such as PVC piping) on the top two strands of barbed wire on the security fence at the investigated crossing locations.
- Investigate revegetation to ensure future generations of trees in the road reserve.

Scattered paddock trees occur to the north of the known patch connecting with the linear remnant vegetation. These paddock trees would be retained by the development.

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.

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. A one to one ratio of hollows removed to hollows or nest boxes (mounted) to mitigate the loss of hollow bearing trees.

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

The vegetation on site is not listed as EPBC listed *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Box-gum Woodland).

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.	✓ 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** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	✓ 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.	
	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	

Attribute	Score	Inland	Applicable to the proposal?
		occurrence. 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** Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.	✓ 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** 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.	✓ 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 and signage to protect significant environmental features such as riparian zones;
4. Installation of sediment controls to prevent sediment runoff into creeks;
5. Hygiene protocols to prevent the spread of weeds or pathogens between infested areas and un-infested areas; and
6. Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.
7. No barbed wire to be used on internal fencing. The only barbed wire will be the boundary security fence.

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 between the Woodland area, site boundary and substation
3. Install hollows of felled trees onto younger trees in retained vegetation patches.
4. Hollows removed during clearing would be salvaged where possible and remounted to allow continued use by hollow dependant fauna within or adjacent to the project site. A one to one (hollows removed to hollows or nest boxes mounted) would be achieved.
5. Sediment barriers and spill management protocols to control the quality of water runoff from the site into the receiving environment; and
6. 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 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 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 preferable in situations where partial clearing is proposed	Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing No stockpiling or storage within dripline of any mature trees In areas to clear adjacent to areas to be retained, chainsaws would be used rather than heavy machinery to	Construction	Regular	Contractor	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	minimise risk of unauthorised disturbance; Access to the Box-Gum Woodland EEC would not be permitted via vehicles to reduce understorey impacts and clearing; and 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 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 Construction would cease if dust observed being blown from site until control measures were implemented; and All activities relating to the proposal would be undertaken with the objective of preventing visible dust emissions from the development site.	Construction	Regularly	Contractor	Moderate	Sedimentation in ephemeral waterways and dams.
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

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
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: Management protocol for declared priority weeds under the *Biosecurity Act 2015* during and after construction; Weed hygiene protocol in relation to plant, machinery, and fill; Wash down site vehicles prior to entering the site; Any occurrences of pathogens such as Myrtle Rust and Phytophthora would be monitored, treated, and reported; and 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 features to be protected and measures to be implemented	Site induction; and Toolbox talks.	Construction	Regular	Contractor	Moderate	Impacts to native vegetation or threatened 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: Protection of native vegetation to be retained; Best practice removal and disposal of vegetation;	Construction	One-off	Contractor	Moderate	Impacts to native vegetation or threatened species for Biodiversity Management Plan not being followed.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist; Weed management; Unexpected threatened species finds; Exclusion of vehicles through sensitive areas; Best practice clearing of overstorey vegetation for construction of the transmission line to avoid understorey impacts; and Rehabilitation of disturbed areas.					
Barbed wire would not be used on internal fences surrounding retained native vegetation.	Retained native vegetation would be considered as an offset site	Construction	Regular	Client	Low	None
Prescribed biodiversity 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 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	A rehabilitation plan for Box Gum Woodland areas to determine: Weed control Grazing regimes Location of hollows and logs Installation of nestboxes Replanting and natural regeneration	Operation	Regular	Client	Moderate	Plants not surviving

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	Landscape plantings will be comprised of local indigenous species					
Installation of Glider Poles and ropeways to maintain connectivity within development site, adjoining roadsides and substation.	Complete a Squirrel Glider management plan to: • Barbed wire would not be used on internal fences surrounding retained native vegetation. • Investigate the best practice use of squirrel glider poles and ropeways and construct to suit, to protect from predators and allow movement in the landscape. • Investigate the locations where squirrel gliders are crossing existing fences to connect to roadside vegetation/riparian vegetation to determine appropriate placement of glider poles and ropeways. • Install protective measures (such as PVC piping) on the top two strands of barbed wire on the security fence at the investigated crossing locations. • Investigate revegetation to ensure future generations of trees in the road reserve.	Construction	Once	Contractor	Moderate	Squirrel Gliders may not use poles during construction.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
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 Hollows removed during clearing would be salvaged where possible and remounted to allow continued use by hollow dependant fauna within or adjacent to the project site. A one to one (hollows removed to hollows or nest boxes mounted) would be achieved.	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 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

Scattered patches of remnant Box-gum Woodland are present in the development site, covering a combined total area of around 66 ha, some are partly isolated and some have retained some connectivity through the development site. The larger, more intact patches of Box-gum Woodland have been avoided by the proposal. Around44 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.

Other actions and measures that can be taken to avoid direct and indirect impact on Box Gum Woodland include:

- Exclusion fencing remaining Woodland areas prior to construction
- As part of a site induction, inform construction staff these areas are exclusion zones and therefore not to be disturbed.
- Ensure the Woodland areas are periodically grazed for biomass management to encourage natural regeneration to improve the floristic diversity. The grazing should be to graze the remaining exotic grasses in early to mid-spring.
- Place logs from trees that are to be removed in the development site in the Woodland areas to be retained.
- Complete a Rehabilitation Plan for the Woodland areas to manage
    - Weed control
    - Replanting or regeneration
    - Location of hollows from tree removal
    - Location of nest boxes
    - Location of logs.

These measures will improve the vegetation quality of the Box Gum Woodland but also provide habitat for other threatened species that are known to occur in the area.

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

The Box Gum Woodland is modified with the presence of eucalypts, minimal shrub layer and sparse native grasses and herbs. The vegetation quality of the majority of this TEC does not qualify as EPBC listed. Approximately 1 ha is likely to be listed as EPBC Box Gum Woodland . The highest quality Box Gum Woodland is the roadside vegetation which may be due to reduced grazing. The direct impact is up to 14.99 ha of Box-gum Woodland. 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	8.57	22.2
2	PCT 277_Roadside	4.31	42.4
3	PCT 277_Creekline	0.49	40.0
9	PCT277_Substation Woodland	1.62	24.3
	TOTAL:	**14.99**	

Indirect impacts from the proposal can be mitigated through exclusion fencing prior to construction commencing to protect the remaining 44 ha. These areas can also be enhanced through revegetation, weed management and stock exclusion. Revegetation will reduce any prescribed impacts on small mammals and Woodland birds that breed in the Box Gum Woodland area.

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 203 ha of Box-gum Woodland occurs within an area of 1000 ha surrounding the proposed development footprint, and 1463 ha 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 14.99 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 481 ha 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 14.99 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 44 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 14.99 ha of Box-gum Woodland would be removed. It is likely the remaining 44 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 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 14.99 ha of Box-gum Woodland to be removed would be offset by 216 ecosystem credits to be used for management of another area of Box-gum Woodland in the same IBRA region.

As previously mentioned, a Box Gum Woodland rehabilitation plan with weed control, replanting or regeneration and strategic placement of logs, hollows and nestboxes to provide habitat for threatened species within the locality.

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 and aims to improve the overall Box Gum Woodland remaining on site through appropriate mitigation and rehabilitation.

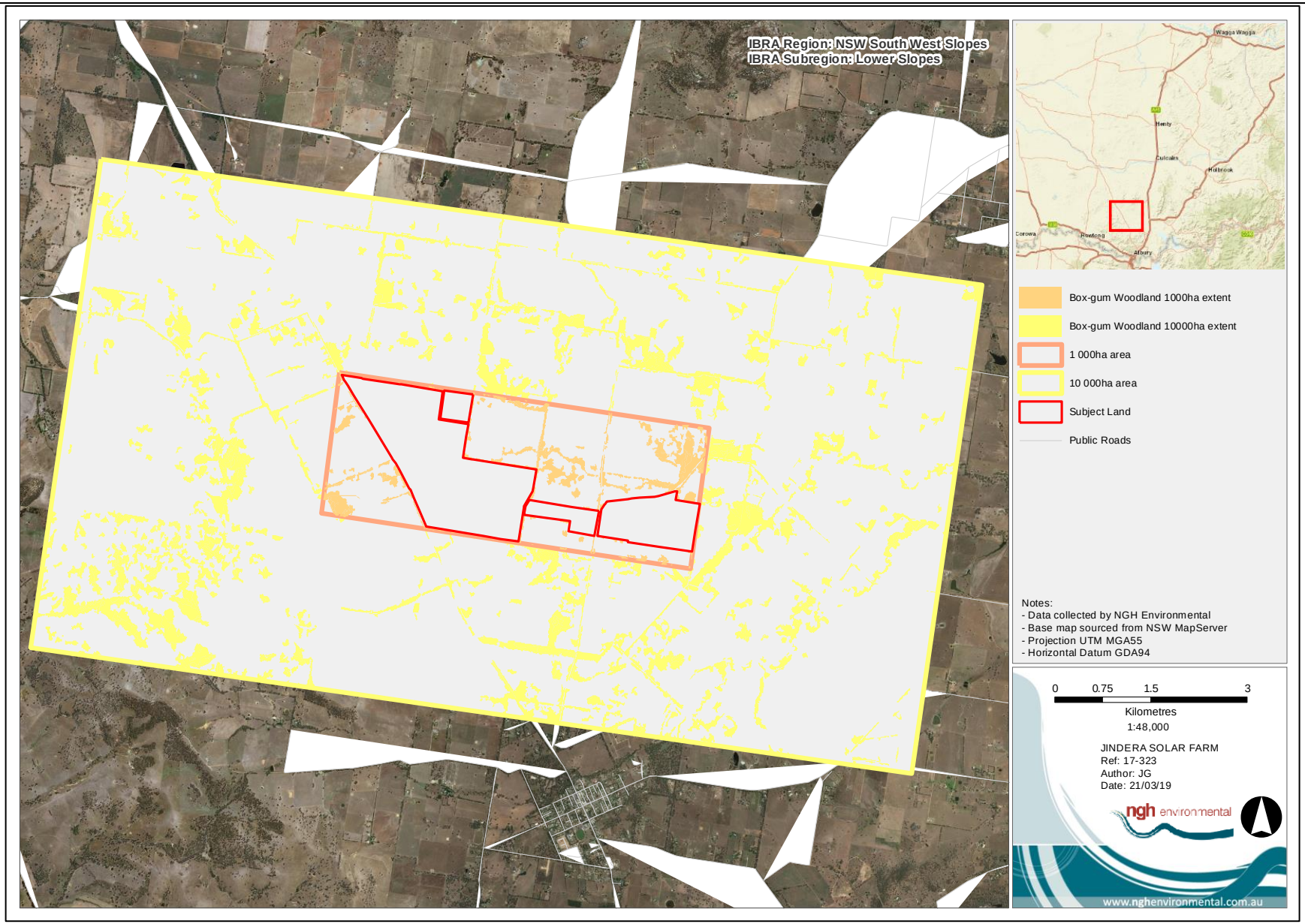


Figure 9-1 Location of serious and irreversible impacts

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	8.57	22.0	0	95
2	277	Roadside	4.31	42.4	0	91
3	277	Creek line	0.49	40.0	0	10
6	9	Woodland	1.57	29.8	0	21
7	9	Derived Grassland	1.10	24.7	0	12
9	277	Substation Woodland	1.6	24.3	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 (<20cm DBH)	No	1	0	0
Class 2 (>20cm DBH and < 50cm DBH)	No	2	0.5	1
Class 2 **(>20cm DBH and < 50cm DBH)**	Yes	0	0.75	0
Class 3 **>50cm DBH**	No	21	0.75	16
Class 3 **>50cm DBH**	Yes	10	1	10
			TOTAL:	**27**

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	6.02 ha	72
Southern Bell Frog *Litoria raniformis)*	2.0	0 ha	0
Eastern Pygmy Possum (*Cercartetus nanus*)	2.0	2.9 ha	52
Small Scurf Pea (*Cullen parvum*)	2.0	6.16 ha	96
Silky Swainson-pea (*Swainsona sericea*)	2.0	3.0 ha	49
Small Purple-pea (*Swainsona recta*)	1.0	3.0 ha	49

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 338 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	216
PCT 277: Paddock Trees - Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	27
PCT 9: River Red Gum – wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion	33
TOTAL:	**276**
Species Credits	Offset Credits required
Squirrel Glider (*Petaurus norfolcensis*)	72
Southern Bell Frog *Litoria raniformis)*	0
Eastern Pygmy Possum (*Cercartetus nanus*)	52
Small Scurf Pea (*Cullen parvum*)	96
Silky Swainson-pea (*Swainsona sericea*)	49
Small Purple-pea (*Swainsona recta*)	49
TOTAL:	**318**

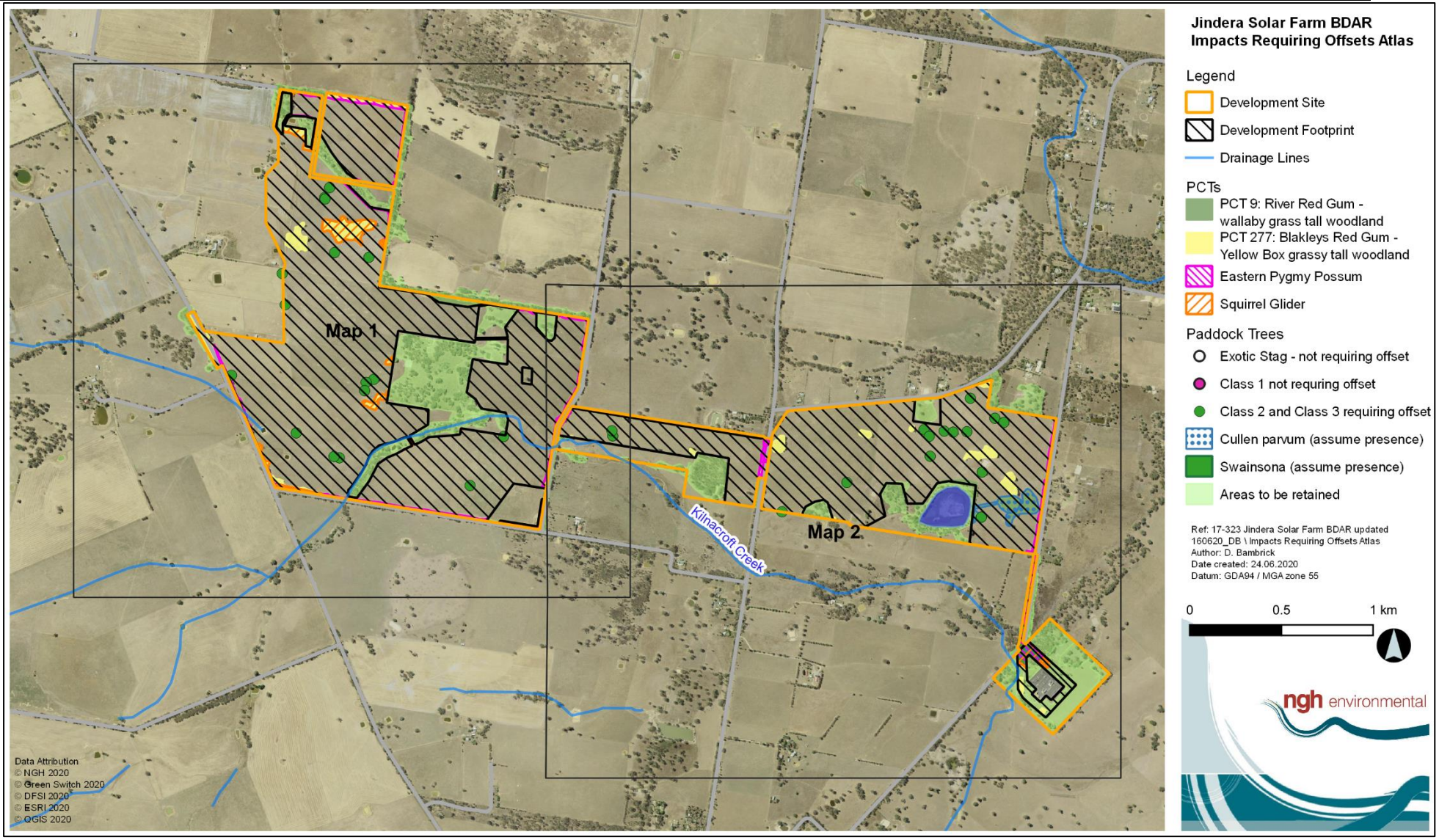


Figure 10-1 Impacts requiring offset, not requiring offset and not requiring assessment

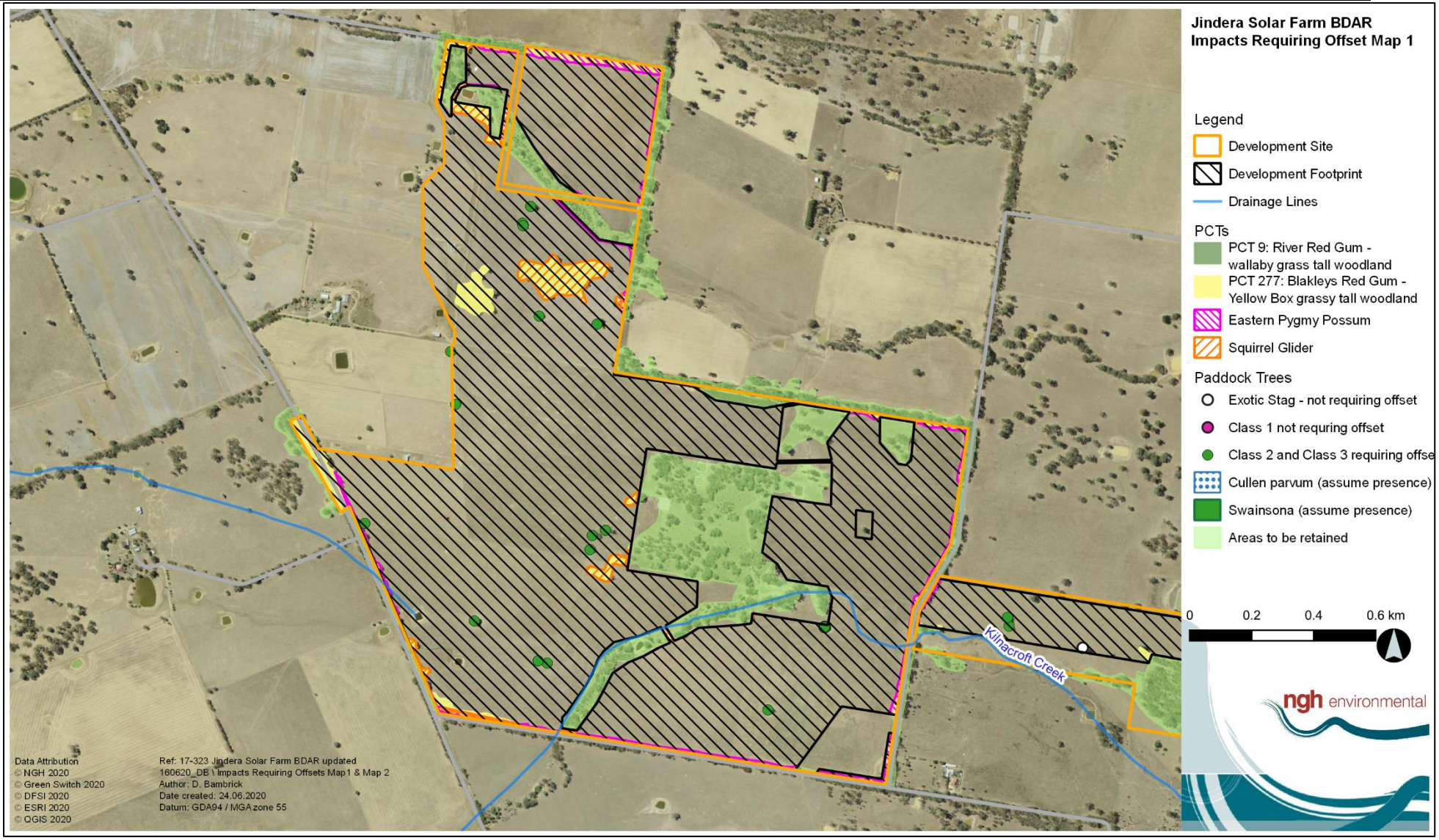


Figure 10-2 Impacts requiring offsets and not requiring offsets (Western side of development site)

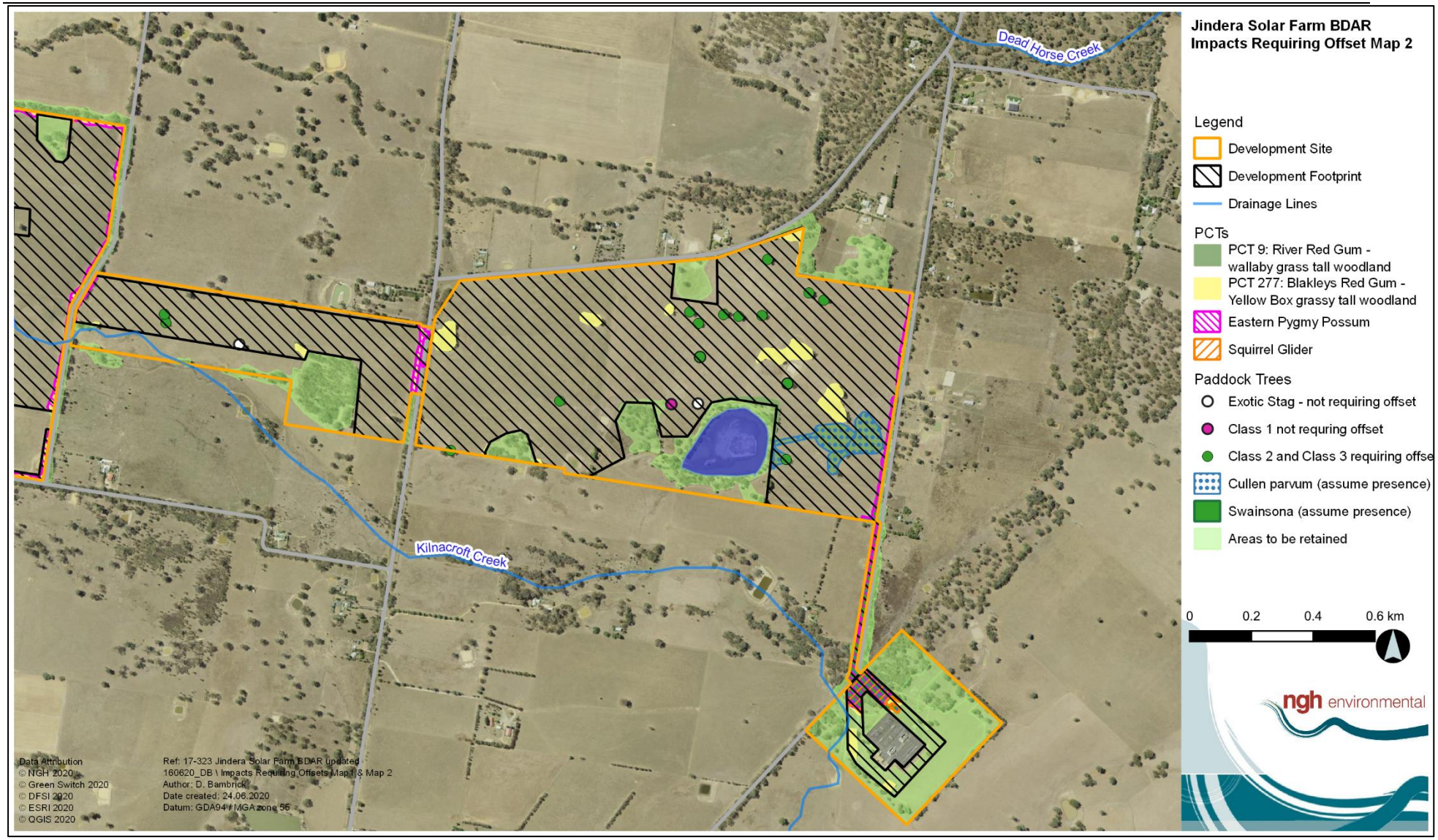


Figure 10-3 Impacts requiring offsets and not requiring offsets (Eastern side of development site)

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 one 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 249 Ecosystem Credits within the development site, and 378 Species credits which will need to be offset:
    - PCT 277 - Blakely's Red Gum – Yellow Box Grassy Tall Woodland - **216 credits**
    - PCT 9 - River Red Gum – Wallaby Grass tall Woodland Wetland – **33 credits**
    - Squirrel Glider (*Petaurus norfolcensis*) – **72 credits**
    - Eastern Pygmy Possum (*Cercartetus nanus*) – **52 credits**
    - Southern Bell Frog *Litoria raniformis)* - 0 credits
    - Small Scurf Pea (*Cullen parvum*) – **96 credits**
    - Silky Swainson-pea (*Swainsona sericea*) – **49 credits**
    - Small Purple-pea (*Swainsona recta*) – **49 credits**

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 entities 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

Table 12-3 Flora Species recorded Plot 21 – 27.

	Scientific Name	Common Name	Family	Plot 21		Plot 22		Plot 23		Plot 24		Plot 25		Plot 26		Plot 27	
				PCT 277		PCT277		PCT 277		PCT277		PCT277		PCT9		PCT 9	
				C	A	C	A	C	A	C	A	C	A	C	A	C	A
	Eucalyptus blakelyi	Blakely's Red Gum	Myrtaceae	5	2	35	23	3	3					25	11	70	24
	Eucalyptus melliodora	Yellow Box	Myrtaceae	25	20	2	1							5	5		
FORBS																	
	Dianella spp.	Flax Lily	Phormiaceae													0.1	62
	Goodenia spp.	Goodenia	Goodeniaceae					0.1	15								
*Δ	*Hypericum perforatum*	St John's Wort	Hypericaceae											0.1	3		
*	*Hypochaeris radicata*	Catsear	Asteraceae							0.2	20	1	50				
	Rumex brownii	Swamp Dock	Polygonaceae									0.1	3				
*	*Trifolium repens*	White Clover	Fabaceae (Faboideae)	0	0					0	0						
GRASS AND GRASS LIKE																	
	Anthosachne scabra	Common Wheat Grass	Poaceae							2	100	0.1	20	0.1	5		
	Austrostipa scabra	Spear Grass	Poaceae											0.5	15		
*	*Avena fatua*	Wild Oats	Poaceae											2	300	0.01	3
* Δ	*Bromus diandrus*	Great Brome	Poaceae	3	100	2	50	0.1	10	0.1	20			2	100		
*	*Bromus hordeaceus*	Soft Brome	Poaceae	2	400	0.1	20	0.1	10	0.1	20			0.1	20		
	Cynodon dactylon	Common Couch	Poaceae													0.01	11
*	*Dactylus glomerata*	Cocksfoot	Poaceae							0.1	3						
*	*Hordeum leporinum*	Barley Grass	Poaceae			0.1	1			0.1	5						

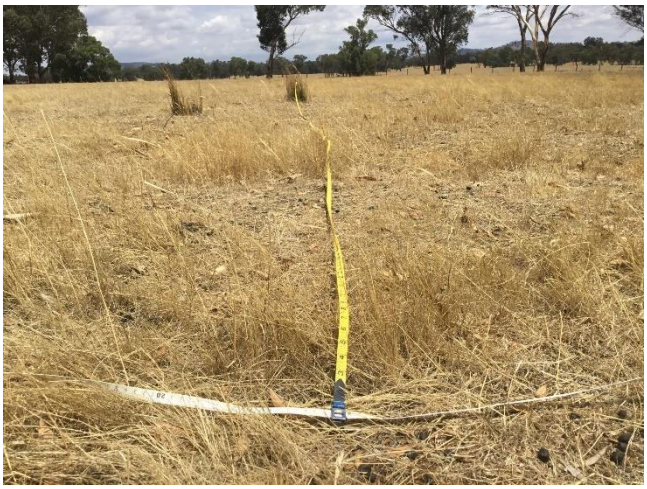
*	*Hordeum spp.*	Barley Grass	Poaceae													0.1	200
	Juncus sp.	Rush	Juncaceae	0.1	1	3	20	0.1	3	2	50	0.1	4	0.1	1	0.1	41
*	*Lolium perenne*	Perennial Ryegrass	Poaceae	15	500	10	200	2	20	1	100	2	50				
*	*Lolium spp.*	Ryegrass	Poaceae													0.5	5000
	Panicum effusum	Hairy Panic	Poaceae	0	0	0	0	0	0								
*	*Phalaris aquatica*	Phalaris	Poaceae											10	50		
*	*Phalaris spp.*	Phalaris	Poaceae													0.01	1
* Δ	*Romulea rosea*	Onion grass	Iridaceae			0.1	1	0.1	15	0.1	1	0.5	100	0	0	0.5	2000
	Rytidosperma caespitosum	Ringed Wallaby Grass	Poaceae	0.1	1	0.1	20	0.1	15	3	200	3	200	0.1	10		
	Rytidosperma monticola	Mountain Wallaby Grass	Poaceae													1	5000
	Rytidosperma sp.	Wallaby Grass	Poaceae					0.1	20	3	200	0.1	20	1	30		
*	*Vulpia myuros*	Rat's Tail Fescue	Poaceae	2	100	0.1	20	1	50	1	20	40	500	5	200	0.5	1000

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	**Plot 21 PCT 277 Zone 9_Substation Woodland**
	
Plot 22 PCT 277 Zone 9_Substation Woodland	**Plot 23 PCT 277 Zone 9_Substation Woodland**
	
Plot 24 PCT 277 Zone 11_Substation Grassland	**Plot 25 PCT 277 Zone 11_Substation Grassland**
	

Plot 26 PCT 277 Zone 2_Roadside	Plot 27 PCT 9 Zone 6_Woodland
	

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
45	-35.925929	146.909605	Yellow Box	180	Yes	Yes	3	Yes

APPENDIX D FAUNA SURVEY RESULTS

Table 12-3 Fauna records from August 2018 and January 2020 surveys.

Species	BP1	BP2	BP3	BP4	BP5	BP6	BP7	BP8	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	AN	Op.
BIRDS																								
Apostle bird *Struthidea cinerea*																								X
Australasian Darter *Anhinga novaehollandiae*																								
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			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			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						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					X
Little Black Cormorant *Phalacrocorax sulcirostris*									X															
Little Corella *Cacatua sanguinea*				X																				
Little Lorikeet *Glossopsitta pusilla*																								X
Little Pied Cormorant *Microcarbo melanoleucos*				X										X										

Little Raven *Corvus mellori*		X	X											X				X						X
Magpie Lark *Grallina cyanoleuca*																								X
Noisy Friarbird *Philemon corniculatus*				X																				
Noisy Miner *Manorina melanocephala*	X			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				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			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		X
Common Ringtail Possum *Pseudocheirus peregrinus*																								
*Feral Cat *Felis catus*																								X
Squirrel Glider *Petaurus norfolcensis*																						X		
Amphibians																								
Plains Froglet *Crinia parinsignifera*																			X	X	X			
Molluscs																								
Flood Plain Mussel *Velesunio ambiguus*									X		X	X												
Bats																								
Austronomous australis																							X	
Chalinolobus gouldii																							X	

Chalinolobus morio																							X	
Ozimops planiceps																							X	
Scotorepens balstoni																							X	
Vespadelus darlingtoni																							X	
Vespadelus vulturnus																							X	
Crustacean																								
Yabby *Cherox destructor*																								
Turtle																								
Long-necked turtle *Chelodina sp.*																								

APPENDIX E PROTECTED MATTERS SEARCH REPORT

E.1 MNES REPORT 2017

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

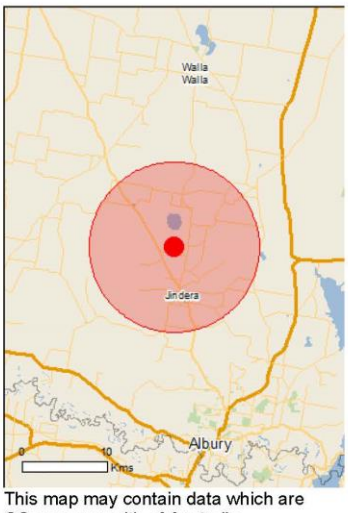
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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.

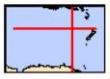
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Summary
Details
Matters of NES
Other Matters Protected by the EPBC Act
Extra Information
Caveat
Acknowledgements



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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 Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Polytelis swainsonii 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 Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		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
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may 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
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Tringa nebularia 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 Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area

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

Name	Status	Type of Presence within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Solanum elaeagnifolium 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 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.

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E.2 MNES REPORT 2020

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.

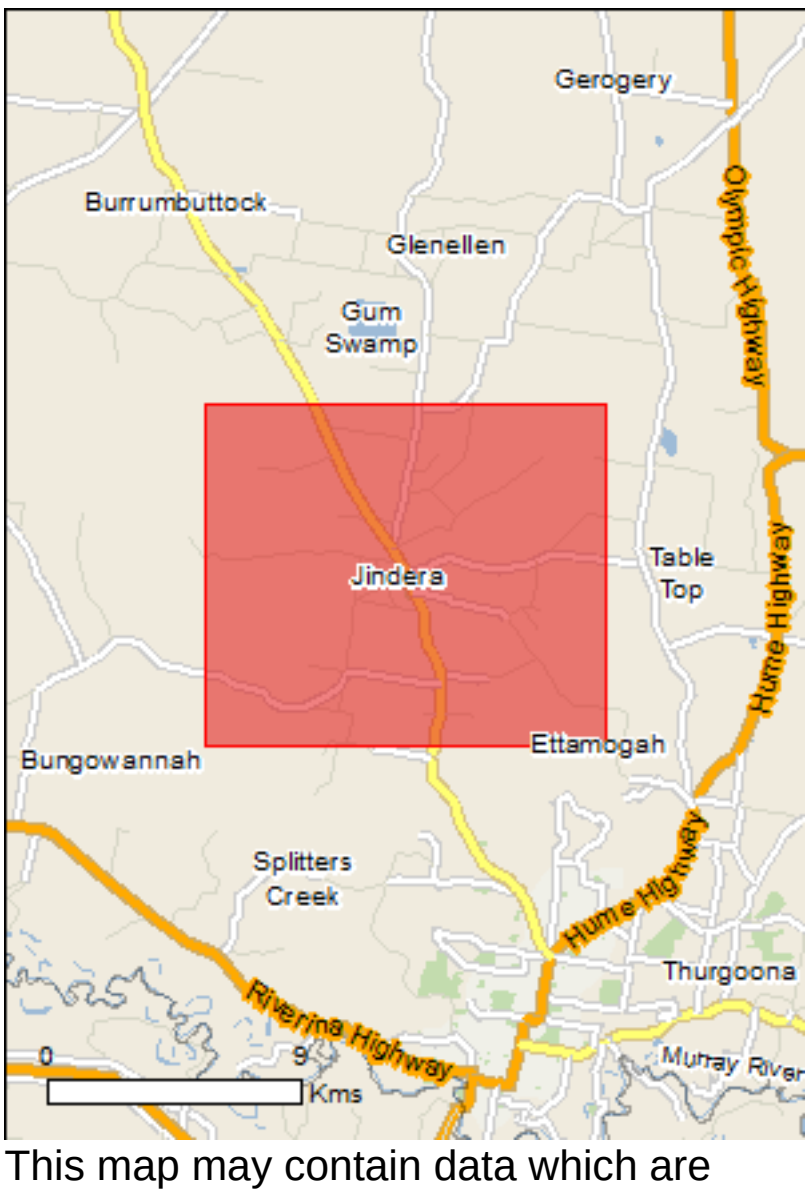
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

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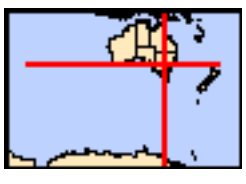
Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



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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:	6
Listed Threatened Species:	29
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.

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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:	11
Commonwealth Heritage Places:	1
Listed Marine Species:	20
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	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:	2
Regional Forest Agreements:	2
Invasive Species:	37
Nationally Important Wetlands:	1
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	150 - 200km 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
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Community may occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Natural Grasslands of the Murray Valley Plains	Critically Endangered	Community may occur within area
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically 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 Regent Honeyeater [82338]	Critically Endangered	Breeding known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pedionomus torquatus		
Plains-wanderer [906]	Critically Endangered	Species or species habitat likely to occur within area
Polytelis swainsonii		
Superb Parrot [738]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat known to 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 known to occur within area
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Frogs		
Crinia sloanei		
Sloane's Froglet [59151]	Endangered	Species or species habitat known to occur within area
Litoria raniformis		
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat known to occur within area
Insects		
Synemon plana		
Golden Sun Moth [25234]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	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	Roosting known to occur within area
Plants		
Ammobium craspedioides		
Yass Daisy [20758]	Vulnerable	Species or species habitat may occur within area
Amphibromus fluitans		
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat known to occur within area
Caladenia concolor		
Crimson Spider-orchid, Maroon Spider-orchid [5505]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
[Caladenia tensa](#) Greencomb Spider-orchid, Rigid Spider-orchid [24390]	Endangered	Species or species habitat likely to 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 known to occur within area
Reptiles		
[Aprasia parapulchella](#) Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat known to occur within area
[Delma impar](#) Striped Legless Lizard, Striped Snake-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 habitat likely to occur within area
Migratory Terrestrial Species		
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	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 known to occur within area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat likely to occur within area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat known to 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

Name	Threatened	Type of Presence
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

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Commonwealth Land - Airservices Australia
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Postal Corporation
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Trading Bank of Australia
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Defence Service Homes Corporation
Commonwealth Land - Director of War Service Homes
Defence - ARMY RECRUITING OFFICE - ALBURY
Defence - WIRLINGA ORDNANCE DEPOT

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Albury Post Office	NSW	Listed place

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 likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
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
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may 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 known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
River Murray Reserve	VIC
River Murray Reserve (non-PV)	VIC

Regional Forest Agreements	[Resource Information]

Note that all areas with completed RFAs have been included.

Name	State

Name	State
North East Victoria RFA	Victoria
Southern RFA	New South Wales

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 Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Feral deer		
Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis		
Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus		
House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus		
Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa		
Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes		
Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides		
Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia		
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		
Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera		
Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Cytisus scoparius		
Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Eichhornia crassipes		
Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista monspessulana		
Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Lycium ferocissimum		
African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana		
Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma		
Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Pinus radiata		
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area

Name	Status	Type of Presence
Rubus fruticosus aggregate		
Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Solanum elaeagnifolium		
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		
Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Lake Hume	VIC

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

-35.91084 146.82427,-35.91084 146.9513,-35.99811 146.9513,-35.99811 146.82427,-35.91084 146.82427

Acknowledgements

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

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

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

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

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APPENDIX F EPBC HABITAT ASSESSMENT

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Flora				
Floating Swamp Wallaby-grass *Amphibromus fluitans* 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 Wetland with hard clay and riparian vegetation within study area	Possible Study area within known distribution of species.	No Wetlands would not be impacted by development footprint.
Small Purple-pea *Swainsona recta* 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 Understory is highly disturbed and has undergone heavy grazing.	Unlikely Study area within known distribution but not near any known populations. Not detected during site surveys.	No No suitable habitat would be impacted by the proposal.
Sturdy Leek Orchid *Prasophyllum validum* V EPBC	Apparently highly susceptible to grazing. Grows in open sites within natural temperate grassland.	Absent Understory is highly disturbed and has undergone heavy grazing.	Unlikely Study area within known distribution of species but known populations not near study area.	No No suitable habitat would be impacted by the proposal.
Tarengo Leek Orchid *Prasophyllum petilum* 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 Understory is highly disturbed and has undergone heavy grazing.	Unlikely Study area within known distribution of species.	No 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 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 Yellow Box and Blakely's Red Gum present in the study area.	Unlikely Yellow Box and Blakely's Red Gum Woodland does not meet condition threshold for EPBC listed community.	No No suitable habitat would be impacted by the proposal.
Grey Box (Eucalyptus macrocarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia 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 Characteristic species not present in study area.	Unlikely Study area within known distribution of ecological community but site survey revealed absence of characteristic species.	No No suitable habitat would be impacted by the proposal.
Weeping Myall Woodlands 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 Characteristic species not present in study area.	Unlikely Study area within known distribution of ecological community, though survey did not record characteristic spp.	No 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 *Botaurus poiciloptilus* E EPBC	Favour permanent freshwater wetlands with tall, dense vegetation, particularly bulrushes (*Typha* spp.) and spike-rushes (*Eleocharis* spp.).	Absent Favoured riparian vegetation absent from study area.	Unlikely Study area within known distribution of species however no suitable habitat.	No No suitable habitat would be impacted by the proposal.
Eastern Curlew *Numenius madagascariensis* 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 No mudflat of wetland forage habitat in study area.	Unlikely Study area within known or predicted distribution of species however no suitable habitat.	No No suitable habitat would be impacted by the proposal.
Swift Parrot *Lathamus discolor* 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 Associated Box Gum and River Red Gum communities present in study area.	Possible Study area within known distribution of species.	Yes Assessment of Significance undertaken
Superb Parrot *Polytelis swainsonii* 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 Box and red river gums present in study area.	Possible Species or habitat likely to occur.	Yes 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 *Rostratula australis* 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 Wetland with riparian species present in study area.	Possible Study area within known distribution of species.	No Wetlands would not be impacted by development footprint.
Regent Honeyeater *Anthochaera phrygia* 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 Tree cover too sparse to support.	Unlikely Breeding not known to occur in the locality. Study area within known distribution of species. Not within a mapped important area (OEH).	No No suitable habitat would be impacted by the proposal.
Painted Honeyeater *Grantiella picta* 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 Mistletoes not abundant in development site.	Unlikely Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Curlew Sandpiper *Calidris ferruginea* CE EPBC 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 No coastal or estuarine habitat in study area.	Unlikely Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Mammals				
Koala *Phascolarctos cinereus* 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 Food trees present within study area but in low density	Possible Study area within known distribution of species.	Yes 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 *Nyctophilus corbeni* 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 Wooded habitat but with a lack of dense understorey in study area.	Unlikely Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Grey-headed Flying-fox *Pteropus poliocephalus* 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 Associated Box Gum and River Red Gum Woodland present in development site	Possible Study area within known or predicted distribution of species.	Yes Assessment of Significance completed.
Spotted-tailed Quoll *Dasyurus masculatus masculatus* (SE mainland population) 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 Woodland areas in study area but with a lack of shrubby understorey.	Unlikely Previously recorded in locality.	No No suitable habitat would be impacted by the proposal.
Greater Glider *Petauroides volans* 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 Insufficient den-tree density in wooded areas of study area.	Unlikely Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Fish				
Flathead Galaxias *Galaxias rostratus* 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 No lentic habitat within the study area	Unlikely Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Macquarie Perch *Macquaria australasica* E EPBC	Previously recorded, particularly in the upstream reaches, of the Lachlan, Murrumbidge and Murray Rivers.	Absent No lentic habitat within the study area.	Unlikely Study area within known distribution of species.	No 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 *Litoria raniformis* 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 No Black Box/Lignum/Nitre goosefoot swamp, billabongs or rice crops in study area.	Unlikely Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Reptiles				
Pink-tailed Legless Lizard *Aprasia parapulchella* 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 Study area lacking rocky habitat and kangaroo grass	Unlikely Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Striped Legless Lizard *Delmar impar* 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 No perennial native or exotic grasses in development site.	Possible Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Migratory Marine Birds				
Fork-tailed Swift *Apus pacificus* 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 Aerial species with resilience to vegetation variation.	Possible Study area within known or predicted distribution of species.	No 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 *Hirundapus caudacutus* M EPBC	This migratory terrestrial species occurs in Australia from late spring to early autumn and feeds on the wing at height.	Present Aerial species without specific vegetation requirements	Possible Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Black-faced Monarch *Monarcha melanopsis* M EPBC	Vagrant to Australia. Prefers dense rainforest vegetation. Breeds in dense vegetation within Eastern Australia	Absent No dense, rainforest vegetation within study area.	Possible Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Yellow Wagtail *Motacilla flava* 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 Study area highly disturbed.	Unlikely Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Satin Fly-catcher *Myiagra cyanoleuca* 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 Trees within study area too scattered to support this species.	Unlikely Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Rufus Fantail *Rhipidura rufifrons* 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 Lack of dense understorey in study area.	Unlikely Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Migratory Wetland Species				
Common Sandpiper *Actitis hypoleucos* 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 No coastal or rocky habitat in study area	Unlikely Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Sharp-tailed Sandpiper *Caldris acuminata* 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 No estuarine wetland habitat in study area.	Unlikely Study area within known distribution of species.	No 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 *Calidris melanotos* M EPBC	The population is generally widespread but scattered in NSW. Breeding occurs in Russia and North America.	Absent No coastal or wetland habitat in study area.	Unlikely Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
Latham's Snipe *Gallinago hardwickii* 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 Freshwater wetland with suitable riparian vegetation for supporting invertebrates.	Possible Study area within known distribution of species.	No Wetland areas would not be impacted by development footprint
Common Greenshank *Tringa nebularia* M EPBC	Does not breed in Australia but occurs in all types of wetlands within distribution area, usually in large numbers.	Present Wetland habitat within study area.	Possible Study area within known distribution of species.	No 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

- Superb Parrot (*Polytelis swainsonii*) **-** Vulnerable
- Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable

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.

APPENDIX H PERSONNEL

Personnel involved in the report are:

Name	Title	Qualifications	Roles
Mitch Palmer	Senior Ecologist (Technical Lead)	• BAM Accredited Assessor • B.Science (Geology and Geography)	Review and approval of BDAR
Julie Gooding	Environmental Consultant - Ecologist	• BAM Accredited Assessor • B. Science (Biology)	Field Work including PCT identification, vegetation mapping, vegetation integrity plots and threatened flora surveys. Author of BDAR Version 1.2
Jess Murphy	Environmental Consultant - Ecologist	• B. Science • Master Environmental Science and Management •	Field Work including threatened Fauna surveys.
Erin Davies	Environmental Consultant - Graduate	• B. Science (Land and Heritage Management) • Master. Environmental Science	Assisting with Field Work
Jessie Whieldon	Environmental Consultant - Graduate	• B. Applied Science • M. Wildlife Management	Assisting with Field Work
Michelle Patrick	Environmental Consultant - Ecologist	• BAM Accredited Assessor • Masters of Environment	Field work for substation and intersections Author for BDAR Version 2.1
Taylor Hume	Environmental Consultant – Graduate/GIS Consultant	• Bachelor of Science (Hon)	Updating BDAR maps
Bridgette Poulton	Environmental Consultant	• Master of Environmental Science	Field Work including threatened Fauna surveys
Emma Matthews	Environmental Consultant - Graduate	• Bachelor of Science (Hons)	Field Work including threatened Fauna surveys
Beth Noel	Senior Environmental Consultant (Ecology)	• Master of Wildlife Management • B App. Sc. (Honours, Geology)	BDAR update and BAM calculatons
Dimity Bambrick	Environmental Consultant	• Bachelor of Science (Zoology) (Ecology & Conservation)	Updating BDAR maps

APPENDIX I BAM CALCULATOR CREDIT REPORT

BAM Credit Summary Report

Proposal Details

Assessment Id
00011762/BAAS19078/18/00011763

Proposal Name
Jindera Solar Farm

BAM data last updated *
04/06/2020

Assessor Name
Michelle T Patrick

Report Created
17/06/2020

BAM Data version *
27

Assessor Number
BAAS19078

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
2

Assessment Type
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	8.6	0.25	High Sensitivity to Potential Gain	2.00	TRUE	95
4	277_Roadside	42.4	4.3	0.25	High Sensitivity to Potential Gain	2.00	TRUE	91
5	277_Creekline	40.0	0.5	0.25	High Sensitivity to Potential Gain	2.00	TRUE	10

6	277_Substation_Woodland	24.3	1.6	0.25	High Sensitivity to Potential Gain	2.00	TRUE	20
7	277_Substation_Grassland	3.9	3.1	0.25	High Sensitivity to Potential Gain	2.00	TRUE	0
							Subtotal	**216**
River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion								
2	9_Woodland	29.8	1.6	0.25	High Sensitivity to Potential Gain	1.75		21
3	9_Grassland	24.7	1.1	0.25	High Sensitivity to Potential Gain	1.75		12
							Subtotal	**33**
							Total	**249**

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	42.4	1.38	0.25	2	False	29
277_Creekline	40.0	0.49	0.25	2	False	10
277_Substation_Woodland	24.3	1.04	0.25	2	False	13
					Subtotal	**52**
Cullen parvum / Small Scurf-pea (Flora)						
9_Woodland	29.8	1.57	0.25	2	False	23

9_Grassland	24.7	1.1	0.25	2	False	14
277_Roadside	42.4	1.38	0.25	2	False	29
277_Creekline	40.0	0.49	0.25	2	False	10
277_Substation_Woodland	24.3	1.62	0.25	2	False	20
					Subtotal	**96**
Litoria raniformis / Southern Bell Frog (Fauna)						
277_Creekline	40.0	0	0.25	2	False	0
					Subtotal	**0**
Petaurus norfolcensis / Squirrel Glider (Fauna)						
277_Grazed	22.2	4.35	0.25	2	False	48
277_Creekline	40.0	0.32	0.25	2	False	6
277_Roadside	42.4	0.18	0.25	2	False	4
277_Substation_Woodland	24.3	1.17	0.25	2	False	14
					Subtotal	**72**
Swainsona recta / Small Purple-pea (Flora)						
277_Roadside	42.4	1.38	0.25	2	False	29
277_Substation_Woodland	24.3	1.62	0.25	2	False	20
					Subtotal	**49**

Swainsona sericea / Silky Swainson-pea (Flora)						
277_Roadside	42.4	1.38	0.25	2	False	29
277_Substation_Woodland	24.3	1.62	0.25	2	False	20
					Subtotal	**49**

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00011762/BAAS19078/18/00012235	Jindera SolarFarm	04/06/2020
Assessor Name	Report Created	BAM Data version *
	17/06/2020	27
Assessor Number	BAM Case Status	Date Finalised
BAAS18074	Open	To be finalised
Assessment Revision	Assessment Type	
0	Paddock Trees	

* 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.

Paddock Trees Credit Requirement

Class	Contains hollows	Number of trees	Ecosystem credits
277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion			
3	False	7.0	5
3	True	4.0	4
2	False	2.0	1
3	False	13.0	10
3	True	6.0	6
3	False	1.0	1
			27
			27

APPENDIX J LAND CATEGORY ASSESSMENT

February 20 2020

Andrew Fisher
Senior Team Leader Planning,
Department of Planning, Industry and Environment

South-west Branch

Dear Andrew,

Re: 17-323 Jindera Solar Farm

NGH has been engaged to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed Jindera Solar Farm, located in the Greater Hume Local Government Area (LGA), approximately 4 km north of Jindera, and 13 km north of Albury. The development site 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, and Lot 1 of DP 749584,

Section 6.8(3) of the Biodiversity Conservation Act 2016 determines that the Biodiversity Assessment Method (BAM) is to exclude the assessment of the impacts of clearing of native vegetation on Category 1-exempt land (within the meaning of Part 5A of the Local Land Services Act 2013) with exception to any impacts prescribed by the regulations under section 6.3 .**Category 1-exempt land** is defined under the LLS act as;

- Land cleared of native vegetation as at 1 January 1990 or lawfully cleared after 1 January 2019
- Low Conservation Grasslands (following commencement of the new framework on 25th August 2017
- Land (not being grasslands) containing only low conservation groundcover (following commencement of the new framework on 25th August 2017)
- Native vegetation identified as regrowth in a Property Vegetation Plan under the repealed Native Vegetation Act 2003
- Land biodiversity certified under the *Biodiversity Conservation Act 2016*.

This letter report establishes the methodology, results and conclusions to evaluate the land categorisation for the development site. It is requested that Department of Planning, Industry and Environment (DPIE) review the proposed methodology, endorse it if considered appropriate, and provide comment where required for the land categorisation of the development site and the proposed Jindera Solar Farm.

If you have any questions, please contact me on the number below. I would be pleased to discuss this matter with you further.

Yours sincerely,

Environmental Consultant (Ecology)
NGH Pty Ltd
Accredited Assessor BAAS19078
Author: Taylor Hume
Reviewed by Mitch Palmer

Attachment 1

Methodology

An initial desktop assessment and subsequent field assessments were undertaken over the development site to determine the ecological constraints and native vegetation communities on site. Assessment of the development site as Category 1-Exempt and Category 2- Regulated Land was undertaken using the following data sources:

- Aerial imagery of historical land use (Sourced from Google Earth and Spatial Services unit Department of Finance, Services and Innovation);
- 2017 Land Use Dataset (Australian Land Use and Management (ALUM) Classification Version 7 (OEH, 2017);
- NSW Woody vegetation extent and FPC 2011 (OEH, 2015);
- Sensitive regulated and vulnerable regulated lands on the Native Vegetation Regulatory Map portal (Figure 1).
- Relevant vegetation mapping layers available from the SEED portal.

The potential of land legally cleared at or since 1 Jan 1990 (woody vegetation only) and/or land significantly disturbed or modified since 1990 (non woody vegetation) was assessed. Where there was any doubt, or where data was conflicting, the precautionary principle was applied, and deferred to Category 2 – Regulated Land. Historical images for 1990, 2005 and 2014 were evaluated to determine current and historic land-use (Figure 3 to Figure 8).

Results

The analysis of the above sources identified in conjunction with aerial imagery that areas of land within the proposed development site for Jindera Solar Farm have been used continuously for cropping and grazing prior to and post 1990. Although smaller areas of past cropping are clearly evident, the vast majority of the development site is identified as having modified pastures in the relevant land use layers, however, conclusive evidence within the supporting historical imagery could not determine the significance of groundcover modification and therefore a precautionary approach was applied. The only exception to this is recent areas of cropping evident during the field surveys (for example most of the open paddocks have been used for cropping, hay production or grazing). The following table (Table 1) demonstrates how the above-mentioned layers were used in determining land category:

Table 1 – Summary of date sources and interpretation

Data Sources	Category 1 – Exempt Land	Category 2– Regulated Land	Excluded Land
Aerial Imagery Jindera Locality • 1990 • 2003 • 2014	• Clear evidence of cropping • Clear evidence of significant groundcover modification	• Woody vegetation present at 1990 in conjunction with woody vegetation extent layer	N/A
2013 **Land** Use Dataset	Land use identified as; • Grazing modified pastures (excluding woody vegetation) where clear evidence of significant groundcover modification has occurred post 1990	Land use identified as; • Managed resource protection • Grazing native vegetation	N/A

	• Cropping • Manufacturing and industrial • Residential and farm infrastructure	• Grazing modified pastures • Cropping • Residential and farm infrastructure • Utilities	
NSW Woody vegetation extent	• Areas of woody vegetation regrowth that has occurred post 1990 following previous clearing events	• Woody vegetation present as at 1990 in conjunction with historic aerial imagery	N/A
Native regulatory map • Sensitive regulated land • Vulnerable regulated land • Excluded land	N/A	• All areas identified as vulnerable regulated land • All areas identified as sensitive regulated land (there were no areas identified as sensitive regulated land)	N/A

Another determining feature of constant agricultural use is a lack of woody vegetation regrowth in the majority of areas, as represented in the aerial images. The 2011 Woody Vegetation extent data does however demonstrate scattered patches and isolated paddock trees in the development site that has been mapped as Category 2 Regulated Land. In areas where it is not 100% conclusive whether the grassland areas have been previously cropped or significantly modified, a precautionary approach has been applied and mapped as Category 2 – Regulated Land.

The Land Category Map identifies the areas of Vulnerable Regulated Land occurring within the development site, as Sensitive Regulated Land does not occur on site, and therefore has been mapped as Category 2 – Regulated land. Refer to Figure 2 Development site and land categorisation (Source ESRI)

PCTs in various condition states within the development site that were recorded during the field surveys undertaken thus far include;

Woodland areas;

- 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 (roadside vegetation).
- PCT 277 - Blakely's Red Gum – Yellow Box Grassy Woodland of the NSW South Western Slopes Bioregion
- PCT 9 – River Red Gum – wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion.

Three wetland areas area in the east of the development site;

- PCT 360 – Gilgai wetland mosaic in the southern NSW South Western Slopes Bioregion.

Conclusion

Based on the above data sources, there is evidence to suggest that 26 of the 27 lots within the development site has been under regular rotational cropping, hay production or grazing since 1990. Lot 138 DP 753342 is primarily native vegetation (Figure 2).

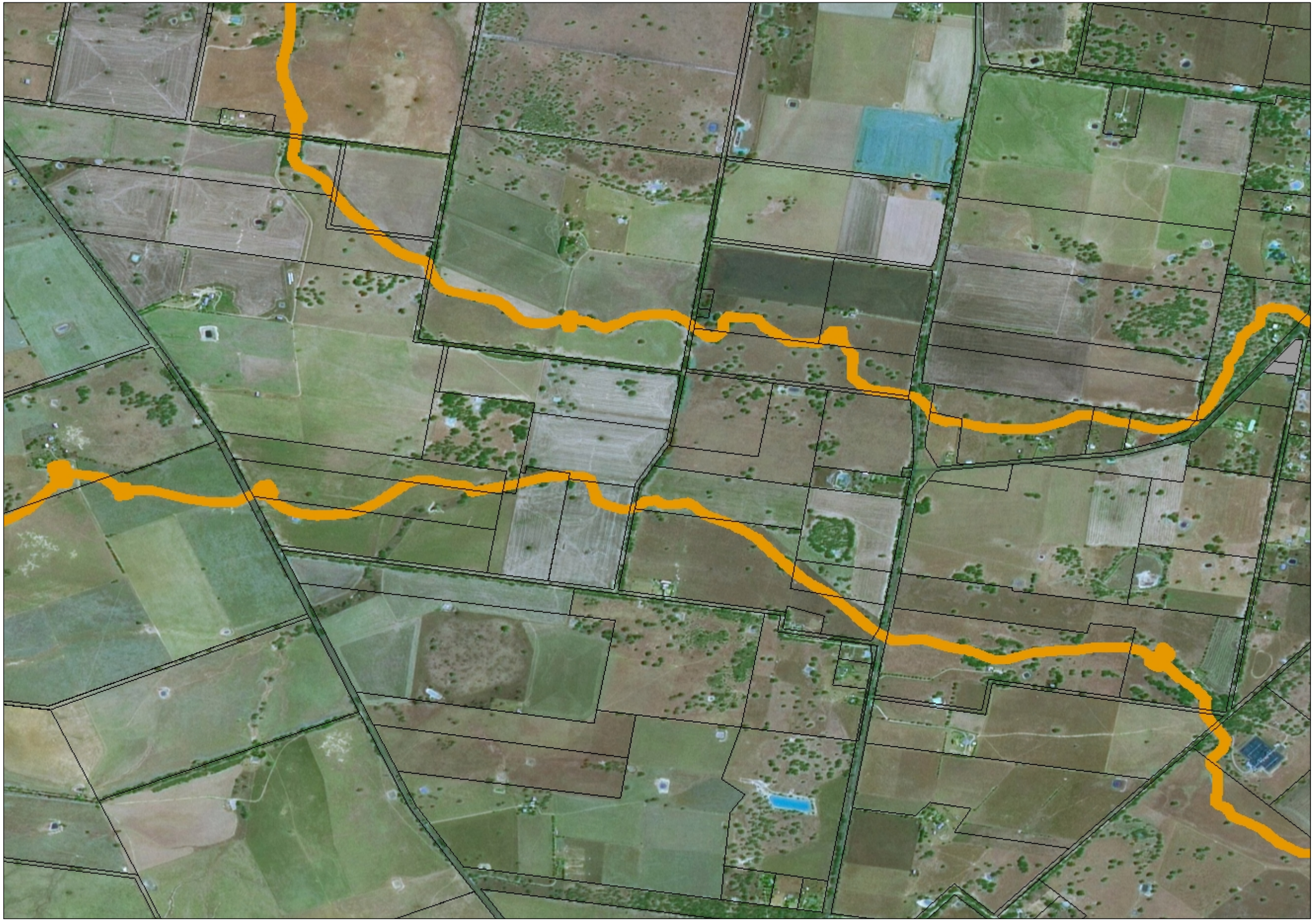
The 2013 Land Use data presented in Figure 9 supports primary land use within the identified areas within these lots as cropping or modified pastures, with smaller areas of grazing native vegetation. There is evidence of revegetation or native regeneration along riparian areas identified as category 2 regulated land within the development site shown to have occurred between 2005 and 2014 (Figure 6; Figure 88).

The Land Use Map (Figure 9) shows the majority of the site to be ‘Cropping’, with ‘Grazing modified pastures’ to the to the east of the development site. These areas are considered to meet the definition of Category 1-Exempt Land. Woody vegetation and areas identified as ‘Grazing native vegetation’ have been included as Category 2 - Regulated land. Where in doubt, or where data sources are conflicting, a precautionary approach has been implemented to areas deemed inconclusive in terms of determining historical land use.

A draft map of areas considered to be Category 1 Exempt Land and Category 2 Regulated Land and has been produced and shown in Figure 2 Development site and land categorisation (Source ESRI) Figure 8 Aerial Imagery 2014 with Land categorisation (Source: Dept. Spatial Services delivery).

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NSW GOVERNMENT

Legend

Cadastre

Native Vegetation Regulatory Map (in force)

- Land Excluded from the LLS Act
- Category 2 – Regulated Land (Vulnerable)
- Category 2 – Regulated Land (Sensitive)

Comments

0 0.28 0.6 1.12
kilometres

Figure 1 Local Land Services- Sensitive and Vulnerable Lands

Map created: 22-Aug-2018

The information in this map is correct to the best of our knowledge. No warranty or guarantee is provided and no liability is accepted for any loss or damage resulting from any person relying upon or using the information contained in the map.

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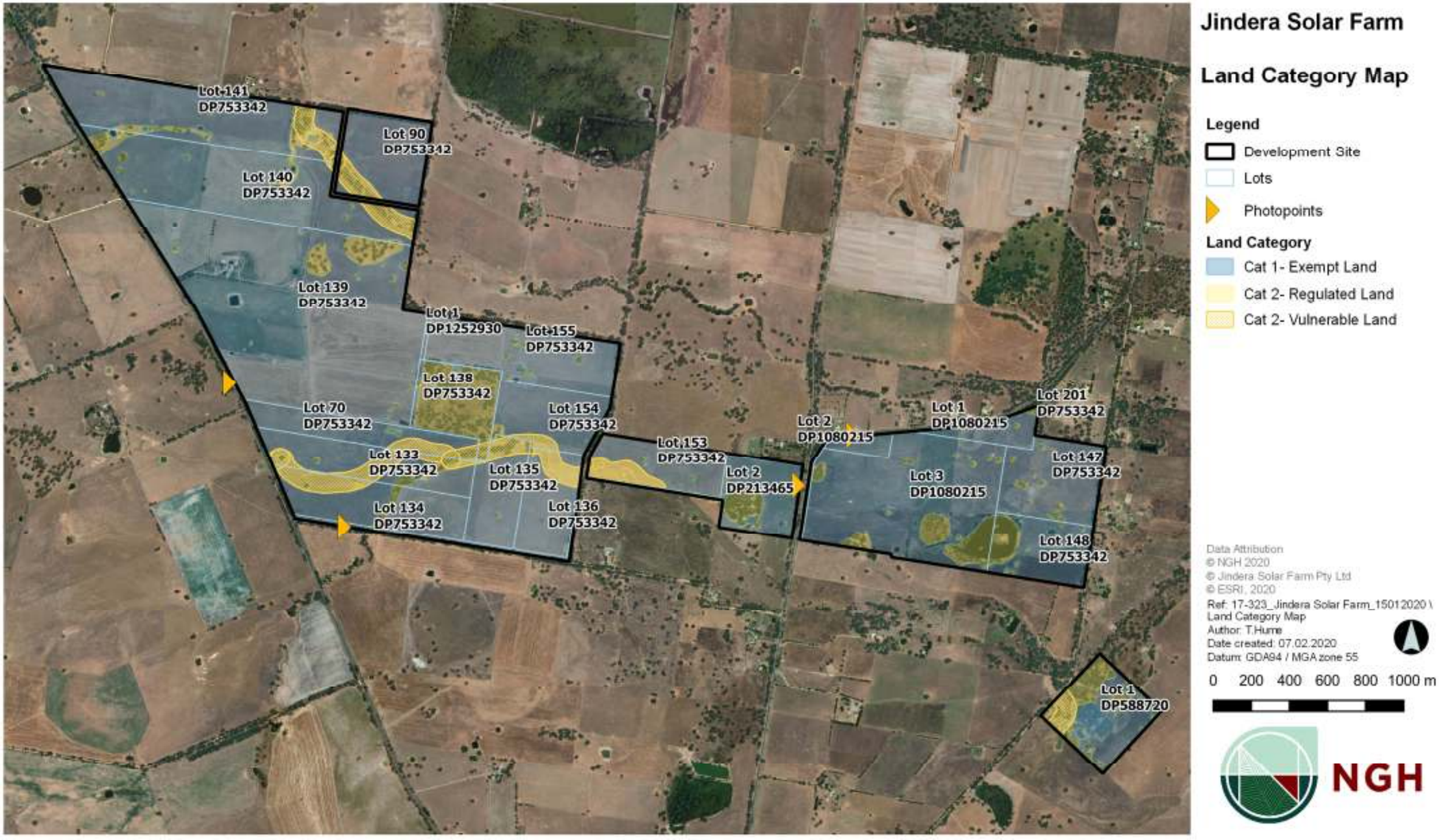


Figure 2 Development site and land categorisation (Source ESRI)



Figure 3 Aerial Imagery 1990 (Source: Dept. Spatial Services delivery)



Figure 4 Aerial Imagery 1990 with Land categorisation (Source: Dept. Spatial Services delivery)



Figure 5 Aerial Imagery 2003 (Source: Dept. Spatial Services delivery)



Figure 6 Aerial Imagery 2003 with Land categorisation (Source: Dept. Spatial Services delivery)



Figure 7 Aerial Imagery 2014 (Source: Dept. Spatial Services delivery)



Figure 8 Aerial Imagery 2014 with Land categorisation (Source: Dept. Spatial Services delivery)



Figure 9 Land use (Source ESRI)

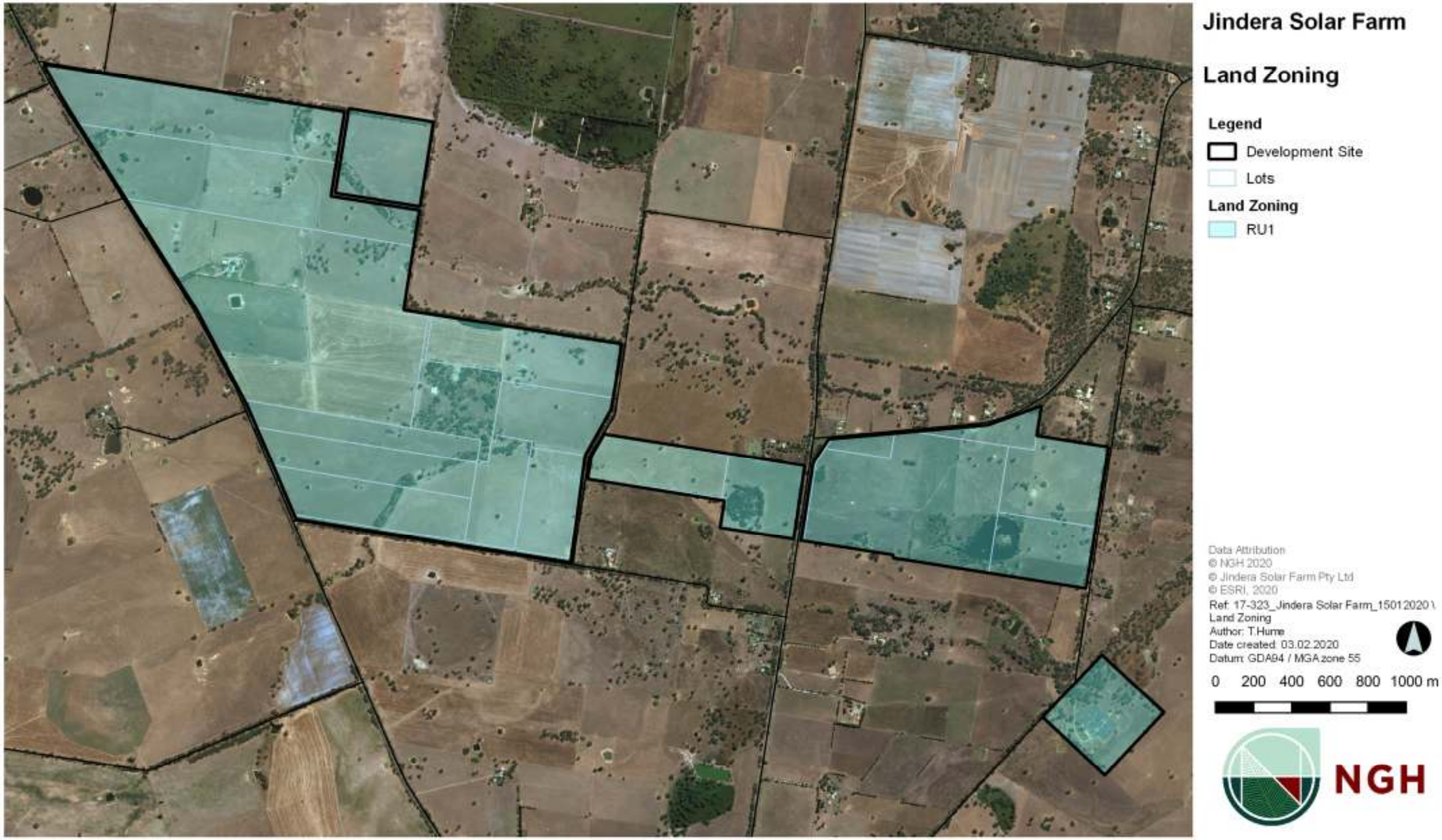


Figure 10 Land Zoning (Source ESRI)

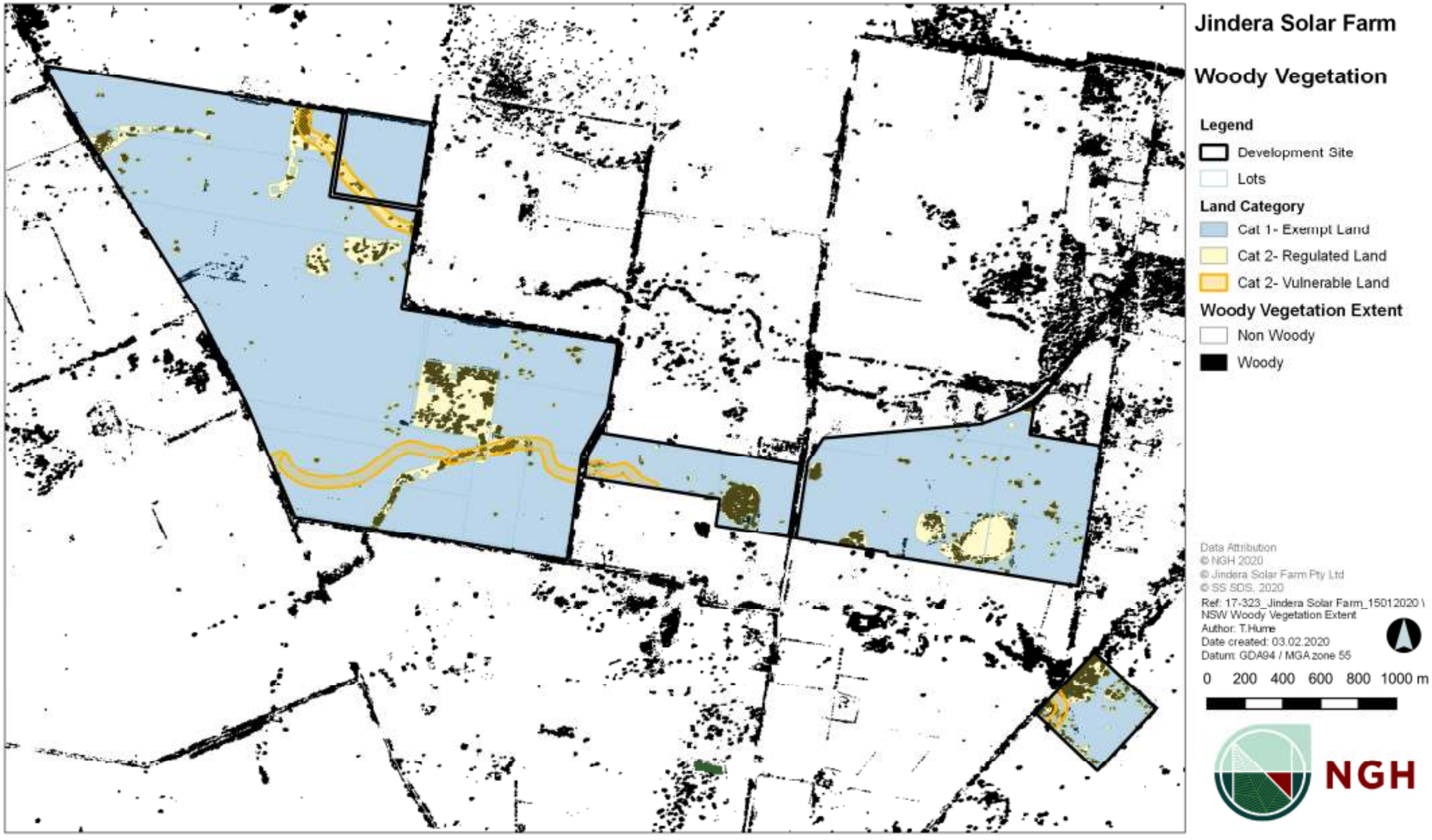


Figure 11 NSW Woody vegetation extent 2011

Table 2 – Photographs showing current land use

Photo Points	Summary	Image
Photo point 1 **Walla Walla Jindera Road, south-east**	Evidence of grazing and hay production	
Photo point 2 **Urana Road, east**	Currently grazed	
Photo point 3 **Urana Road, south-east**	First paddock is grazing and paddocks to the south east were used for hay production.	

Photo Points	Summary	Image
Photo point 4 **Klinberg Road, north**	Grazed paddocks	
Photo point 5 **Glenellen Road, south**	Aerial imagery shows the paddocks in this area are mainly hay production or grazing.	