BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Dunedoo 66MW Photovoltaic Solar Farm

September 2020

Project Number: 17-362

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ACRONYMS AND ABBREVIATIONS

ASL	Above sea level
AWS	Automatic weather station
BAM	Biodiversity Assessment Method
BAM-C	BAM Calculator
BC Act	Biodiversity Conservation Act 2016
BCD	Biodiversity Conservation Division
BDAR	Biodiversity Development Assessment Report
BS Act	Biosecurity Act 2015
BOM	Australian Bureau of Meteorology
BOS	Biodiversity Offset Scheme
Cwth	Commonwealth
DECCW	Refer to BCD
DoAWE	Department of Agriculture, Water and the Environment, formally DoEE
DPIE	(NSW) Department of Planning, Industry and Environment
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
ESD	Ecologically Sustainable Development
FM Act	*Fisheries Management Act 1994* (NSW)
ha	hectares
Heritage Act	*Heritage Act 1977* (NSW)
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007* (NSW)
KFH	Key Fish Habitat
km	kilometres
LEP	Local Environment Plan
m	Metres
MNES	Matters of National environmental significance under the *EPBC Act* (c.f.)
NPW Act	*National Parks And Wildlife Act 1974* (NSW)
NSW	New South Wales
OEH	Formally Office of Environment and Heritage, now BCD
REF	Review of Environmental Factors
SEPP	*State Environmental Planning Policy* (NSW)
SEWPAC	(Cwth) Department of Sustainability, Environment, Water, Population and Communities
sp/spp	Species/multiple species
TEC	Threatened Ecological Community

EXECUTIVE SUMMARY

NGH has prepared this BDAR on behalf of IbVogt for the Dunedoo Solar Farm in Dunedoo, NSW. The purpose of this BDAR was to address the requirements of the BAM, developed for Major Projects, and to address the biodiversity matters raised in the SEARs. In this BDAR, biodiversity impacts have been assessed through:

- Comprehensive mapping and assessment completed in accordance with the BAM;
- The identification of two threatened species 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 up to 14 Ecosystem Credits within the Development Site for impacts to Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (PCT 281);
- The generation of 1 Ecosystem Credits within the Development Site for impacts to Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion (PCT 201);
- The generation of up to 5 Ecosystem Credits within the Development Site for impacts to River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion (PCT 78).

The retirement of these credits will be carried out in accordance with the NSW Biodiversity Offsets Policy for Major Proposals, and will be achieved by either;

(a) Retiring credits under the Biodiversity Offsets Scheme
(b) making payments into the Biodiversity Conservation Fund
(c) funding a biodiversity action

1 INTRODUCTION

The Dunedoo Solar Farm proposal 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 Dunedoo Solar Plant ('the proposal') according to the NSW Biodiversity Assessment Methodology (BAM) as required by the Secretary's Environmental Assessment Requirements (SEARs) for the proposal.

1.1 THE PROPOSAL

The Proposal involves the construction of a ground-mounted photovoltaic solar array which would generate around 66 MW (DC) of renewable energy. The Development Site would occupy up to 112 ha of the 330 ha Subject Land. The Proposal would include a new overhead TL to connect the solar farm into the Essential Energy transmission network via the existing Dunedoo substation, located approximately 2 km to the south of the solar array site.

The proposal infrastructure includes:

- approximately 173,000 pv solar arrays mounted on single axis tracking systems;
- electrical cables and conduits;
- inverter/transformer units, containerised, distributed across the site;
- battery storage units, containerised, distributed across the site;
- on site substation containing transformer, associated switchgear and control and lightening protection masts;
- communications tower (21.2m high), adjacent to the substation;
- site office, compounds, parking, access tracks and perimeter fencing;
- operations and maintenance buildings with associated car parking;
- two access points via Allweather road;
- internal access tracks;
- lighting, CCTV system, security fencing;
- vegetative screening;
- a 66kV overhead Transmission Line (approximately 2.1km long) connecting the Project's substation to the existing Essential Energy Dunedoo substation.

The layout of the infrastructure components is shown in Figure 6-1 and Figure 6-2 and the components are described below. The plans and specifications of the components are subject to detailed design and product selection which is shown in APPENDIX I.

The overhead 66 kV powerline would be made up of 22 m (maximum) tapered steel poles.

The 2m x 1m solar panels would be arranged in single rows mounted on single axis trackers with a maximum height not exceeding 3m above the natural ground level.

In total, the construction phase of the proposal is expected to take approximately 9 months. Dunedoo solar farm is expected to have approximately a 30-year operating life, at which point the solar farm would either:

- be decommissioned, removing all above ground infrastructure and returning the site to its existing land capability; or
- continue operation (which could involve reconditioning) if the lease agreement is renewed. Reconditioning would involve replacing components that were originally installed with new components that reflect technology that is available at that time.

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 79.35 ha;
- **Development Site** – The area of land that is subject to a proposed development inclusive of potential direct, indirect and prescribed impacts. The Development Site is approximately 113.37 ha;
- **Subject Land** – The areas of the Development Site to which the BAM has been applied;
- **Buffer Area** – All land within 1500 m of the outside edge of the boundary of the Development Footprint.

1.2 THE DEVELOPMENT SITE

1.2.1 Site location

The Dunedoo Solar Plant proposal site is located approximately 2km north of Dunedoo, within the Warrumbungle Shire Local Government Area (LGA).

The Dunedoo proposal comprises about 112 ha of freehold land, identified Lot 137/DP754309, Lot 140/ DP754309, Lot 80/DP754309, Lot 1/DP854326, Lot 119/754291, Lot 201/754291, Lot 200/754291, Lot 181/754291, Lot 182/754291. The site is accessed by Allweather Road to the South and by Digilah East Rd to the East. It also includes powerline easement lots Lot 11 DP130889, Lot 7012 DP93290, all substation lots Lots 181-186 and 196-201 DP754291, Talbragar River Reserve (reference number 56146), and Lot 1 DP1260716.

1.2.2 Site description

The site comprises of several large flat paddocks which that have been largely cleared for cropping and mixed farming purposes. Cleared areas are commonly cropped with improved pasture species such as Lucerne, Forage Oats and sub-tropical grasses and legumes that have been fertilised accordingly. Remnant vegetation is heavily modified throughout the site and generally derived from a community of Yellow box alluvial woodland and Fuzzy box Woodland. The remnant areas have been highly disturbed and lack native understory due to grazing and pasture improvement practices. The Talbragar River is a perennial stream that runs to the South of the proposal site, just to the North of the Dunedoo township.

The land immediately surrounding the proposal site includes cropping and grazing land, Crown land, Essential Energy substation and Dunedoo township, south of the Talbragar River.

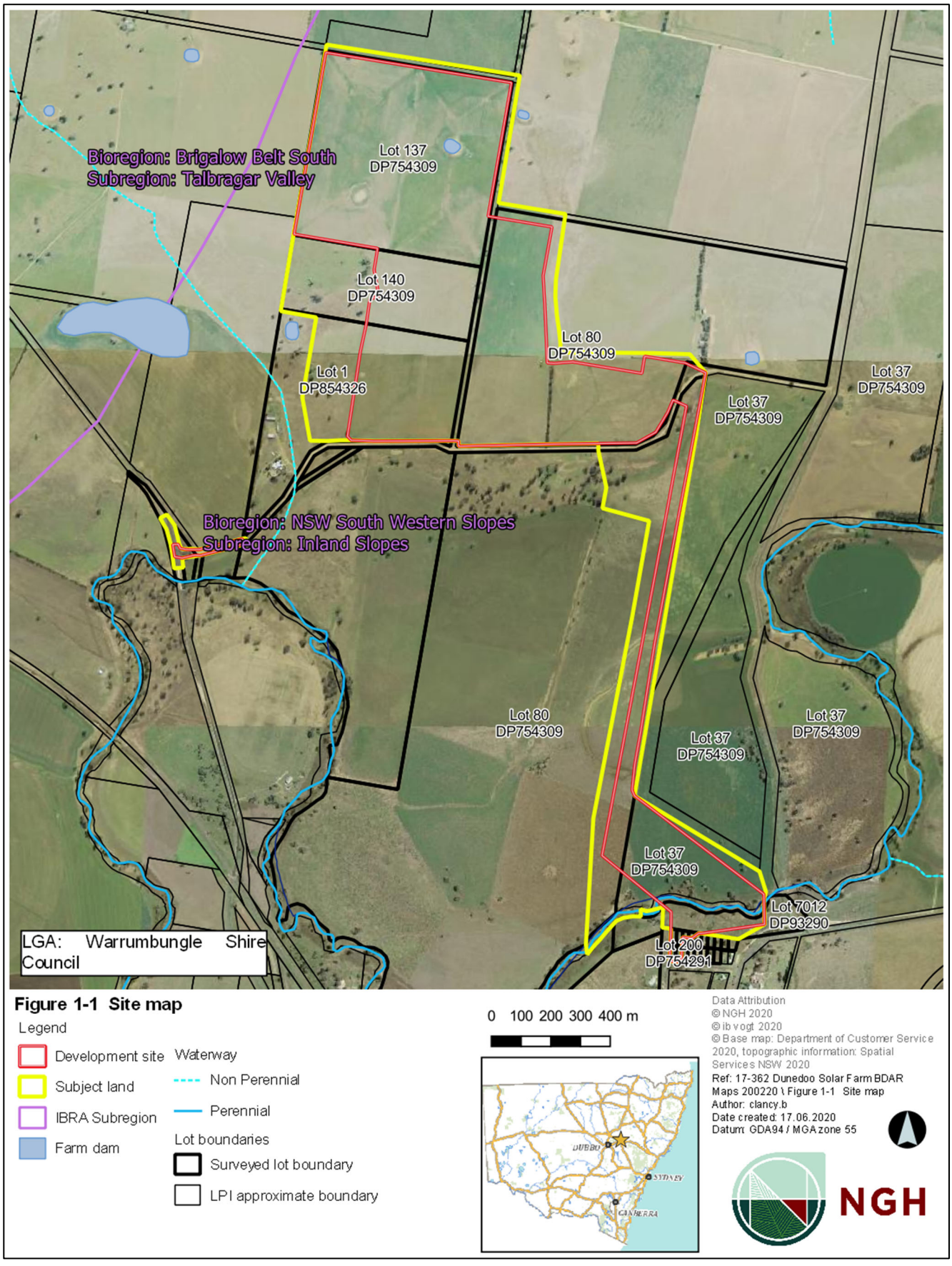

Figure 1-1 Site Map

1.3 STUDY AIMS

This BDAR has been prepared by NGH Pty Ltd (NGH) on behalf of IbVogt.

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.

Table 1-1 SEARs Requirement

Secretary's Environmental Assessment Requirement	Where addressed
1. Biodiversity impacts related to the proposed Dunedoo Solar Farm are to be assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). 2. The BDAR must include information in the form detailed in the Biodiversity Conservation Act 2016 (s 6.12), Biodiversity Conservation Regulation 2017 (s 6.8) and Biodiversity Assessment Method including details of the measures proposed to address the offset obligation as follows; • The total number and classes of biodiversity credits required to be retired for the development/project; • The number and classes of like-for-like biodiversity credits proposed to be retired; • The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules; • Any proposal to fund a biodiversity conservation action; • Any proposal to conduct ecological rehabilitation (if a mining project); • Any proposal to make a payment to the Biodiversity Conservation Fund (Fund). 3. If requesting the application of the variation rules, the BDAR must contain details of what reasonable steps have been taken to attempt to obtain the required like-for like biodiversity credits. 4. 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 Biodiversity Conservation Act 2016	**Whole Report.**

No specific considerations for any threatened species, populations or communities were specified in the SEARs or by the Biodiversity Conservation Division (BCD).

1.4 SOURCE OF INFORMATION USED IN THE ASSESSMENT

The following information sources were used in the preparation of this report:

- Aerial Maps and Proposal layers provided by IbVogt.
- Commonwealth Department of Environment and Energy (DoEE) Species Profiles and Threats database (SPRAT) http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.
- Commonwealth Department of Environment and Energy Protected Matters Search Tool Accessed online at http://environment.gov.au/epbc/protected-matters-search-tool
- Australias IBRA Bioregions and subbioregions. 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.

- Ecological Australia (ELA) (2008), Editing Mitchell Landscapes. Version 3. http://data.environment.nsw.gov.au/dataset/mitchell-landscapes-version-3e8403)
- 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/.
- 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 SUBREGION

Bioregions are large, geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features and plant and animal communities. The proposal is located within the NSW South Western Slopes Bioregion and the Inland Slopes subregion (DoEE 2002) (Figure 1-1).

These bioregions were entered into the BAM Calculator (BAM-C) for the proposal.

2.2 NSW LANDSCAPE REGIONS AND AREA

One Mitchell Landscape occurs within the proposal, *Talbragar - Upper Macquarie Terrace Sands and Gravels*. This Mitchell landscape has a total of approximately 87,270 ha within NSW and has a percentage cleared estimate of 93%. A description of the general characteristics of this landscape are provided below;

'Sandy Quaternary alluvial sediments on the floodplains and terraces of the Talbragar River, general elevation 350 to 500m, local relief 30 to 40m. Red-brown and red-yellow earthy sands with some yellow texture-contrast soils on the valley margins. River red gum (*Eucalyptus camaldulensis*) along the channels, Yellow box (*Eucalyptus melliodora*) and Rough-barked apple (*Angophora floribunda*) with White cypress pine (*Callitris glaucophylla*) on the plain'.

This Mitchell Landscape was selected within the BAM-C for the proposal.

2.3 NATIVE VEGETATION

Using GIS, a 1500m buffer from the outer edge of the Development Site was established. As the natural vegetation that occurs within the proposal site is woodland and grassland derived from woodland, native vegetation mapping used over-storey as a surrogate for native vegetation cover (Figure 3-1 and Figure 3-2) Total cover within the buffer was than estimated and assigned a class in relation to benchmark of the Plant Community Type (PCT) present. Approximately 297 ha of native vegetation occurs was mapped within 10-30% class in regards to benchmark.

2.4 CLEARED AREAS

Cleared areas within the proposal are primarily used for cropping and grazing. These areas have been frequently cultivated, fertilised and are limited in terms of native fauna habitat but may provide suitable foraging habitat for raptors, parrots and macropods. However, all of areas contain a component of derived native flora species, generally with low diversity and low cover but in some instances contain a high native flora cover. Therefore, all areas within the Development Site have been assigned a PCT and differentiated into vegetation zones based on condition or identified as Category 1 Exempt Land (see Section 3.2 and Appendix A).

Figure 2-1 Sub-tropical grass such as Consol lovegrass, Premier digit and Bambatsi panic paddock that also contains a low diversity and cover of native flora

Figure 2-2 Lucerne paddock containing low diversity and cover of native flora

2.5 RIVERS AND STREAMS

One named watercourse, Talbragar River (7th order stream) occurs to the south of the Development Site. The Talbragar River flows to the West-Southwest and into the Macquarie River, reaching the confluence with the Macquarie River near Dubbo.

2.6 WETLANDS

No wetlands occur within or adjacent to the Development Site. The closest nationally Important Wetland downstream from the Development Site is the Macquarie Marshes located over 200km to the Northwest.

Three (3) man-made dams occur within the Development Site for stock. Habitat at these dams is limited and lack fringing vegetation and/or aquatic vegetation.

2.7 CONNECTIVITY FEATURES

The landscape within the Development Site has been heavily cleared and lacks significant connectivity. However, remnant vegetation does occur in small isolated patches within the farmed landscape. The main source of connectivity throughout the broader region surrounding the proposal occurs along the watercourse to the South of the Development Site, Talbragar River, which supplies permanent to semi-permanent water, and contains a predominately native understorey and lined with sparsely distributed *Eucalyptus* and *Casuarina* species.

2.8 AREAS OF GEOLOGICAL SIGNIFICANCE

No karsts, caves, crevices or cliffs or other areas of geological significance occur within the proposal.

2.9 SITE CONTEXT COMPONENTS

A BAM assessment was completed for this proposal. The proposal ID for the assessment is 00009114/BAAS17051/18/00009115 Revision 4 for the Development Site and Revision 5/Revision 6 for Development Footprint options. The assessment type that was selected is 'Major Project'. This section summarises the values entered into the Landscape values section of the BAM calculator.

2.9.1 Method applied

The proposal conforms to the definition of a *site-based development* under the BAM. The site-based development assessment methodology has therefore been used in this BAM assessment.

2.9.2 Percent Native Vegetation Cover

The Percent Native Vegetation Cover within the 1500m buffer surrounding the Development Site was calculated to be 7.75%. This number was entered into the BAM calculator for the proposal. A summary of the calculations is as follows

- The total area of the buffer, including the Development Footprint, is 2,040 ha.
- The total area of native vegetation mapped within the buffer, including the Development Site, is 158.23 ha.
- Current native vegetation cover is therefore 7.75% (rounded to 8%)

2.9.3 Patch Size

For each vegetation zone, the assessor must determine the patch size area within which the vegetation zone is located. The patch size area is assigned to the vegetation zone as a class, being <5ha, 5–24ha, 25–100ha or ≥100ha. Patch size within the vegetation zones mapped onsite fall within the 5-24ha and 25-100ha size classes.

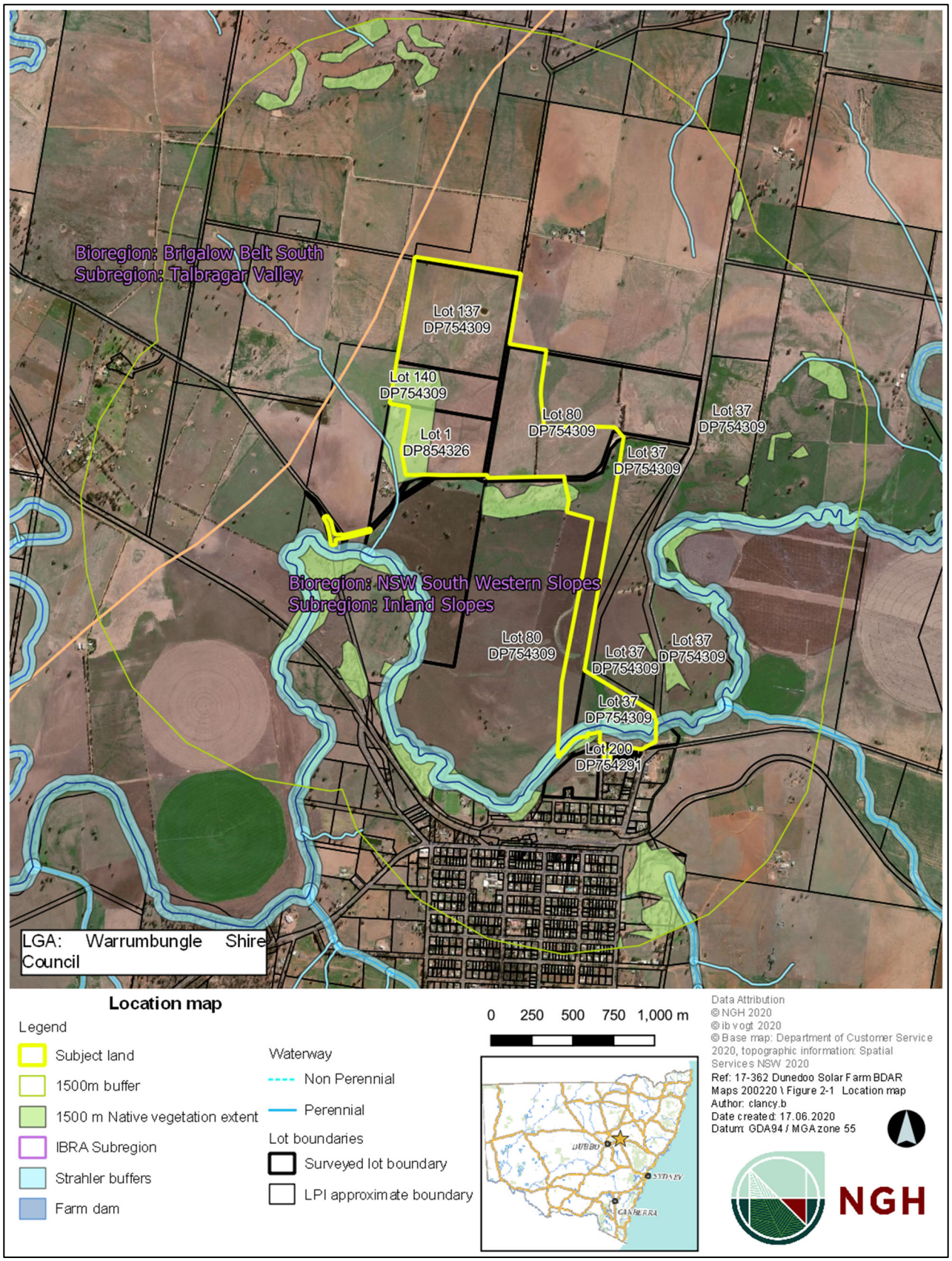

Figure 2-3 Location map

3 NATIVE VEGETATION

3.1 NATIVE VEGETATION EXTENT

Approximately 8.4 ha of native vegetation occur within the Development Site (Figure 3-1 and Figure 3-2).

- 2.18 ha PCT 281 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
- 1.86 ha PCT 201 Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
- 4.36 ha PCT 78 River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion

Eight paddock trees occur within the Development Site, derived from PCT 78 - River Red Gum riparian tall woodland / open forest. 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 *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 surrounded by land that has been cleared of native vegetation since January 1990.

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

The Development Footprint is approximately 79.35 ha of which the vast majority occurs as exotic dominated grassland or cropped areas in poor condition with varying abundances of native perennial groundcover, with native species generally confined to localised occurrences of species, at a ground cover of less than 15%.

Small woodland areas outside of the Development Site but within the proposal site are also in poor to moderate condition with an intact canopy but highly modified groundcover highly influenced by exotic flora and heavy grazing regime.

The riparian area to the south of the Development Site has a small area that will be impacted with the transmission line construction. Riparian vegetation is in moderate condition and contains large *E. camaldulensis* that contains small to large hollows. Midstorey is largely absent and groundcover predominantly native but influenced by exotic flora species.

3.2 LAND CATEGORY ASSESSMENT

As stated within BC Act s6.8(3), the biodiversity assessment is to exclude the assessment of any clearing of native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of the *Local Land Services Act 2013* (LLS Act). This excludes any impacts prescribed by the regulations under section 6.3.

Additionally, in accordance with section 2.3.1.1 of the BAM, biodiversity values that do not need to be assessed include: *(d) biodiversity values associated with the assessment of the impacts of any clearing of native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of the LLS Act), other than the additional biodiversity impacts in accordance with clause 6.1 of the BC regulation*.

Boundaries delineating Category 1-exempt and Category 2-regulated land on the Native Vegetation Regulatory (NVR) map are not yet publicly available. Therefore, during the transitional period (until the entire NVR map is released), accredited assessors may establish those boundaries and associated categorisation for the consent authority to consider by approximating the method used to make the NVR map under the provisions of the BC Act and the LLS Act. This is done by using the same methodology inclusive of, but not limited to:

- 2013 and 2017 Landuse mapping. *A land use layer contributes to identifying land for inclusion in category 1 in the NVR map. Chapter 4 of the NVR map method statement describes the process for identifying and mapping existing and historical agricultural land use since 1 January 1990. Mapping existing and historical land use focuses on identifying patterns or evidence of agricultural land uses according to high-resolution aerial or satellite imagery and classifying land under a national land use classification system.*
- Woody vegetation extent layer 2017. *Contributes to identifying areas for inclusion in category 2 in the NVR map (including individual trees).*
- Aerial imagery post 1990.
- Sensitive regulated land and vulnerable regulated land layer.

To meet the Category 1-exempt land requirement, land must be:

- Legally cleared at or since 1 January 1990 (Woody vegetation only).
- Significantly disturbed or modified since 1990 (Non-woody vegetation).

Approximately 105 ha of the Development Site occurs as cleared agricultural land used for rotational cropping and grazing (Figure 3-1 and Figure 3-2). Evidence of cropped areas occurs and is dominated by Lucerne *Medicago sativa* or was fallowed. Additionally, areas of improved pasture contain species such as Consol Lovegrass *Eragrostis curvula complex*, Premier Digit *Digitaria eriantha,* Bambatsi Panic *Panicum coloratum* and Biserulla *Biserrulla pelecinus*.

Based on the above data sources, there is evidence to suggest the Development Site within lot 137/DP754309, lot 140/DP754309, lot 1 DP854326, lot 80/DP754309, lot 37/DP754309 and lot 11/DP130889 has been under regular cropping, grazing, and pasture improvement since 1989.

The 2017 Land Use Dataset supports the primary land use for the proposal area for cropping. The 2017 Land Use map shows two sections of the site to be '2.1.0 Grazing Native Vegetation'. Woody vegetation and native regrowth/vegetation in the Development Site are considered to meet the definition of Category 2 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.

Areas identified as Category 1-exempt land have been excluded from the BAM assessment, except where prescribed impacts are relevant and discussed in Section 7.3. Where in doubt, or where data sources were conflicting, a precautionary approach has been implemented for areas deemed inconclusive in terms of determining historical land use. The land category assessment can be found in Appendix A

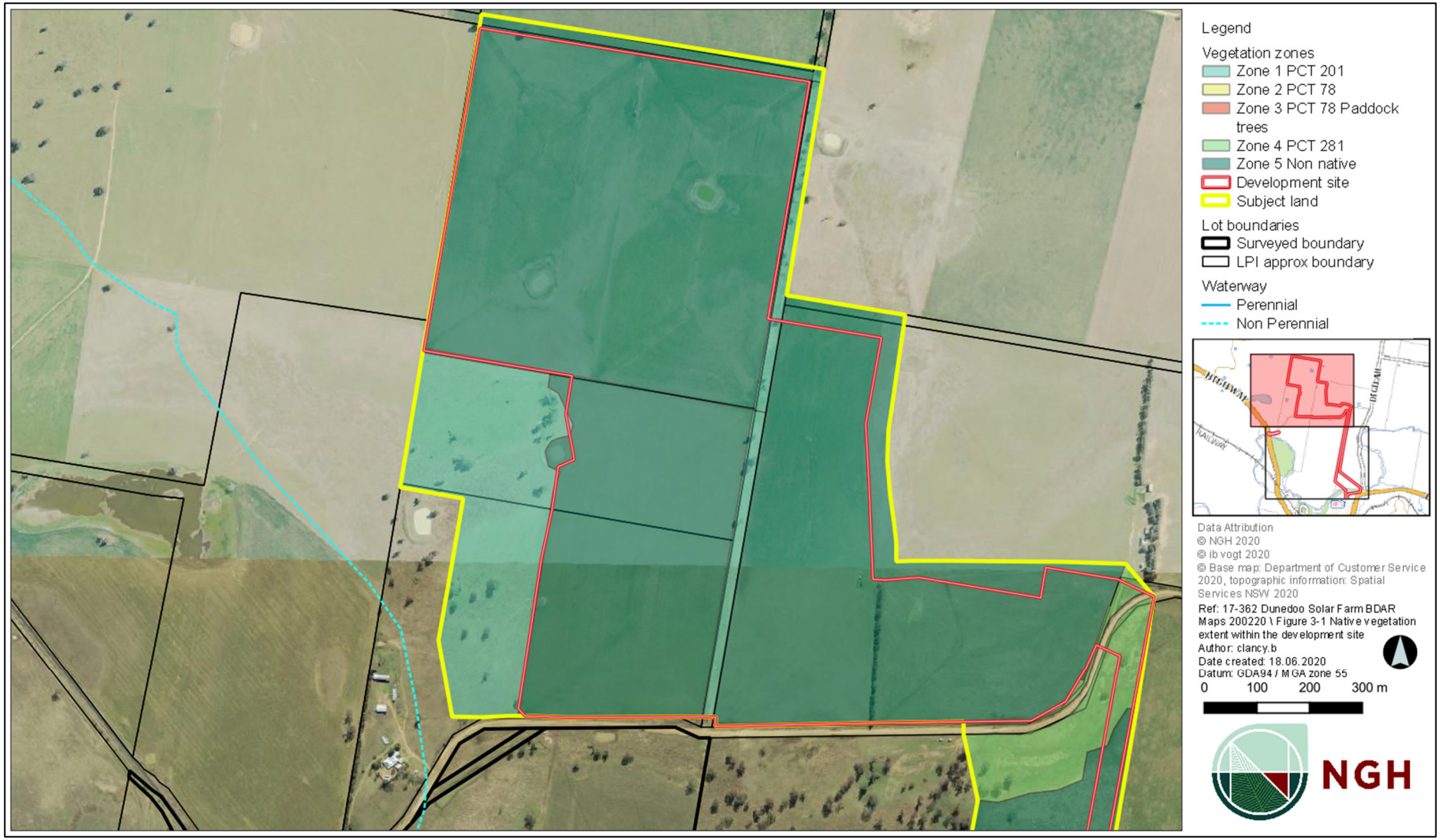

Figure 3-1 Native vegetation extent within the Development Site – North

Figure 3-2 Native vegetation extent within the Development Site – South

3.3 PLANT COMMUNITY TYPES (PCTS)

3.3.1 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 study area. Two relevant existing vegetation maps were assessed;

- Central West and Lachlan Catchments Vegetation Mapping by the Department of Environment and Conservation (2017);
- SEED Mapping – Sharing and Enabling Environmental Data (2017) for the Central West and Lachlan Region

Field surveys and personnel

Survey Date	Survey Personnel	Survey
5th – 7th December 2017	Aleksei Atkin – Senior Ecologist (BAAS17093 Mitch Palmer – Technical Lead – Ecology (BAAS17051)	• Diurnal Fauna Survey • Nocturnal Fauna Survey • Targeted Nocturnal Fauna Survey • Targeted Amphibian and Reptile Survey • Flora Survey
9th – 10th August 2018	Aleksei Atkin – Senior Ecologist (BAAS17093 Mitch Palmer – Technical Lead – Ecology (BAAS17051)	• Diurnal Fauna Survey • Dusk Fauna Survey • Nocturnal Fauna Survey • Targeted Nocturnal Fauna Survey
25th – 26th September 2018	Mitch Palmer – Technical Lead – Ecology (BAAS17051) Brendon True – Ecologist (BAAS18155)	• Diurnal Survey • Dusk Survey • Flora Survey
27th – 28th April 2020	Mitch Palmer – Technical Lead – Ecology (BAAS17051) Brendon True – Ecologist (BAAS18155)	• Paddock Trees • Flora Survey

Floristic surveys

Flora surveys were undertaken in Summer 2017, Winter and Spring 2018, and Autumn 2020. The Development Site was initially surveyed by car and foot on the 5th – 7th December 2017 by one (1) Senior Ecologist and one (1) Fauna Ecologist from NGH to determine the PCTs and habitat on the Development Site. Subsequent flora and fauna surveys were undertaken over 6 days between 2018 and 2020 to complete vegetation integrity plots, paddock tree counts, and targeted species surveys. PCTs were identified using native species present, landforms and physiography and its location in the IBRA subregion. The Subject Land was then stratified into areas of similar condition class to determine vegetation zones for each PCT. Vegetation integrity plots (20mx50m) were established in each vegetation zone. In total, 20 plots were undertaken throughout the proposal site. Data was collected on the composition, structure and function of the vegetation and collected utilising the methodology outlined within the BAM.

3.3.2 Limitations

A thorough search of the Development Site was undertaken were possible to do so in accordance with the BAM, and relevant threatened flora and fauna guidelines. However, there is potential for some flora species not to be recorded during the survey due to the timing of the survey (outside optimal survey periods) and the prevailing dry conditions. In particular, inconspicuous or geophytic species, which typically flower outside of the completed surveyed periods may not have been recorded.

Regardless, a precautionary approach has been taken as to the likelihood of the presence of suitable habitat. Therefore, flora and fauna species unlikely to be detected during the time of the survey are considered to be assessed adequately. Details of these surveys are included in Section 4.2.4 below.

3.3.3 PCTs identified on the Development Site

Three (3) Plant Community Types (PCTs) were identified in the Development Site:

- PCT 281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion;
- PCT 201: Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion; and
- PCT 78: River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion.

A description of each of these PCTs follows in **Error! Reference source not found.** to **Error! Reference source not found.**

Table 3-1 Rough-Barked Apple - red gum - Yellow Box woodland

Rough-Barked Apple - red gum - Yellow Box woodland		
Vegetation formation	Grassy Woodlands	
Vegetation class	Western Slopes Grassy Woodlands	
Vegetation type	PCT ID	281
	Common Community Name	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Approximate extent within the Development Site		2.18 ha in moderate condition
Species relied upon for PCT identification	Species name	Relative abundance
	Eucalyptus melliodora	15%
	Eucalyptus camaldulensis	10%
	Angophora floribunda	5%

Rough-Barked Apple - red gum - Yellow Box woodland		
	Eucalyptus blakelyi	1%
	Austrostipa aristiglumis	10%
	Boerhavia dominii	1-2%
	Mentha satureioides	1-2%
	Chloris truncata	5-10%
	Anthosachne scabra	1-2%
	Echinochloa colona	1-2%
Justification of evidence used to identify the PCT	Eight (8) plots were undertaken within this PCT. Four (4) plots were undertaken within the low condition vegetation, Two (2) within the exotic dominated vegetation, one (1) within moderate condition vegetation and one (1) within good condition vegetation. Condition classes were determined through comparison of species composition and cover between plots. All plots within patches that lacked canopy were assigned as lower condition grasslands, however variation within the grasslands exists, with some paddocks having a high exotic component, some containing a roughly equal proportion of exotic and native, and some paddocks showing a high native component. As such, the grassland communities have been divided in to exotic, low and moderate condition classes. Where native overstory exists, this community has been assigned the good condition class. Vegetation within the community is highly disturbed and modified. Vegetation potentially could be placed within 3 PCTs • PCT 281 - Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion • PCT 74 Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion • PCT 437 - Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion Vegetation within proposal site has a canopy species that strongly resembles characteristics of PCT 281 with the dominance of *E. melliodora*, *A. floribunda* and red gums such as *E. blakeyii,* and *E. camaldulensis*. Mid storey is absent and groundcover is similar between the two PCTs however, is dominated by *Austrostipa aristiglumis* and in patches *Tribulus micrococcus* which is more characteristic of PCT 437. However, PCT determination was made based on the canopy species present within small remnant patches of woodland within the Development Site and the broader locality surrounding the proposal site. Additionally, common groundcover species such as *Boerhavia dominii, Galium leptogonium, Mentha satureioides, Austrostipa scabra, Anthosachne scabra* and *Chloris truncata* are present. It was also investigated that areas of low condition derived grassland where canopy species is absent and dominated by *Austrostipa aristiglumis* with the presence of *Marsilea drummondii*, *Chloris truncata* and *Solanum esuriale* may fit PCT 45 Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion. However although groundcover species are important diagnostic components of this PCT, it was determined that the dominance of Chloris truncata and Austrostipa aristiglumis is more of a result of the past disturbance of the groundcover through historical land use than that of a natural grassland and in conjunction with the sparse remnant patches of *E. melliodora, A. floribunda* and *E. camaldulensis* within the proposal site and broader locality, these areas are more likely to be cleared low condition derived areas of PCT 281.
TEC Status	White Box Yellow Box Blakely's Red Gum Woodland
Estimate of percent	67% cleared

Rough-Barked Apple - red gum - Yellow Box woodland	
cleared within NSW	

Examples	 *Figure 3-3 Example of PCT 281 good condition containing native overstory*  *Figure 3-4 Example of PCT 281 moderate condition low diversity and but high cover of native flora*

Rough-Barked Apple - red gum - Yellow Box woodland

Figure 3-5 Example of PCT 281 low condition with a similar abundance and cover of native and exotic flora

Figure 3-6 Example of PCT 281 exotic condition with high abundance and cover of exotic flora

Table 3-2 Fuzzy Box Woodland

Fuzzy Box Woodland		
Vegetation formation	Grassy Woodlands	
Vegetation class	Western Slopes Grassy Woodlands	
Vegetation type	PCT ID	201
	Common Community Name	Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Approximate extent within the Development Site		1.86 ha in moderate condition
Species relied upon for PCT identification	Species name	Relative abundance
	Eucalyptus microcarpa	10-15%
	Eucalyptus conica	5-10%
	Chloris truncata	5-10%
	Rytidosperma fulva	2-3%
	Rytidosperma setacea	1-2%
	Sclerolaena muricata	5-10%
	Austrostipa scabra	1-2%
	Pratia concolor	2-5%
	Bothriochloa macra	2-3%
Justification of evidence used to identify the PCT	Ten plots were undertaken within this PCT. Three (3) within good condition and seven (7) within low condition. Condition classes were determined based on the presence of canopy species and native groundcover, with good condition patches being mapped where both native canopy and groundcover exist, and low condition vegetation being mapped where predominantly exotic groundcover occurs with no native overstory. The majority of this community occurs as a cropped, exotic dominated grassland. This vegetation community is highly modified. Potential PCTs include: • Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion • Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions Floristics features of canopy species (Eucalyptus species) was difficult to locate however very small amounts of immature fruits closely resembled both *E. microcarpa* and *E. conica*. Groundcover species consisted of *Chloris truncata*, *Sida corrugata*, *Rytidosperma* sp, *Austrostipa scabra* and *Sclerolaena muricata*. With the likelihood that both *E. microcarpa* and *E. conica* are present, it was determined that the PCT relates closer to Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion although in a highly modified condition.	

Fuzzy Box Woodland	
TEC Status	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions.
Estimate of percent cleared within NSW	94% cleared
Examples	 *Figure 3-7 Example of PCT 201 Good condition*  *Figure 3-8 Example of PCT 201 low condition*

Table 3-3 River Red Gum riparian tall woodland / open forest

River Red Gum riparian tall woodland / open forest		
Vegetation formation	Forested Wetlands	
Vegetation class	Inland Riverine Forests	
Vegetation type	PCT ID	78
	Common Community Name	River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Approximate extent within the Development Site		4.24 ha in good condition 0.12 ha as paddock trees
Species relied upon for PCT identification	Species name	Relative abundance
	Eucalyptus camaldulensis	Dominant – 15-20%
	Casuarina cunninghamiana	5%
	Cynodon dactylon	Dominant – 20%
	Austrostipa verticillata	5%
	Austrostipa ramosissima	5%
	Boerhavia dominii	2-5%
	Carex appressa	2-5%
	Marsilea drummondii	Dominant – 20%
	Urtica incisa	0.5-1%
Justification of evidence used to identify the PCT	Two (2) plots were undertaken within this PCT. The proposal site lies within the most northern end of the NSW South Western Slopes IBRA region however in very close proximity to the boundary and mapped Brigalow Belt South IBRA region to which this PCT predominately inhibits (within 1-2 km). It is therefore likely that this PCT encroaches along river systems and tributaries into the NSW South Western Slopes IBRA region and is more likely to occur at the proposal site than similar PCT more common within the southern and Riverina and lower slopes regions of the NSW South Western Slopes. Vegetation is clearly dominated by *E. camaldulensis* and sporadic *Casuarina cunninghamiana* with a modified groundcover dominated by *Cynodon dactylon* and *Marsilea drummondii*, with other common species within this PCT including *Austrostipa verticillata*, *Austrostipa ramosissima, Urtica incisa* and *Boerhavia dominii*. Exotic flora including *Lycium ferrosissimum, Lolium perenne, Tragopogon porrifolius* and *Xanthium sp* were also abundant	
TEC Status	Not a TEC	
Estimate of percent	60% Cleared	

River Red Gum riparian tall woodland / open forest	
cleared within NSW	
Examples	 *Figure 3-9 PCT 78 in good condition along the Talbragar River and intersection with the potential transmission line*  *Figure 3-10 PCT 78 along the Talbragar River*

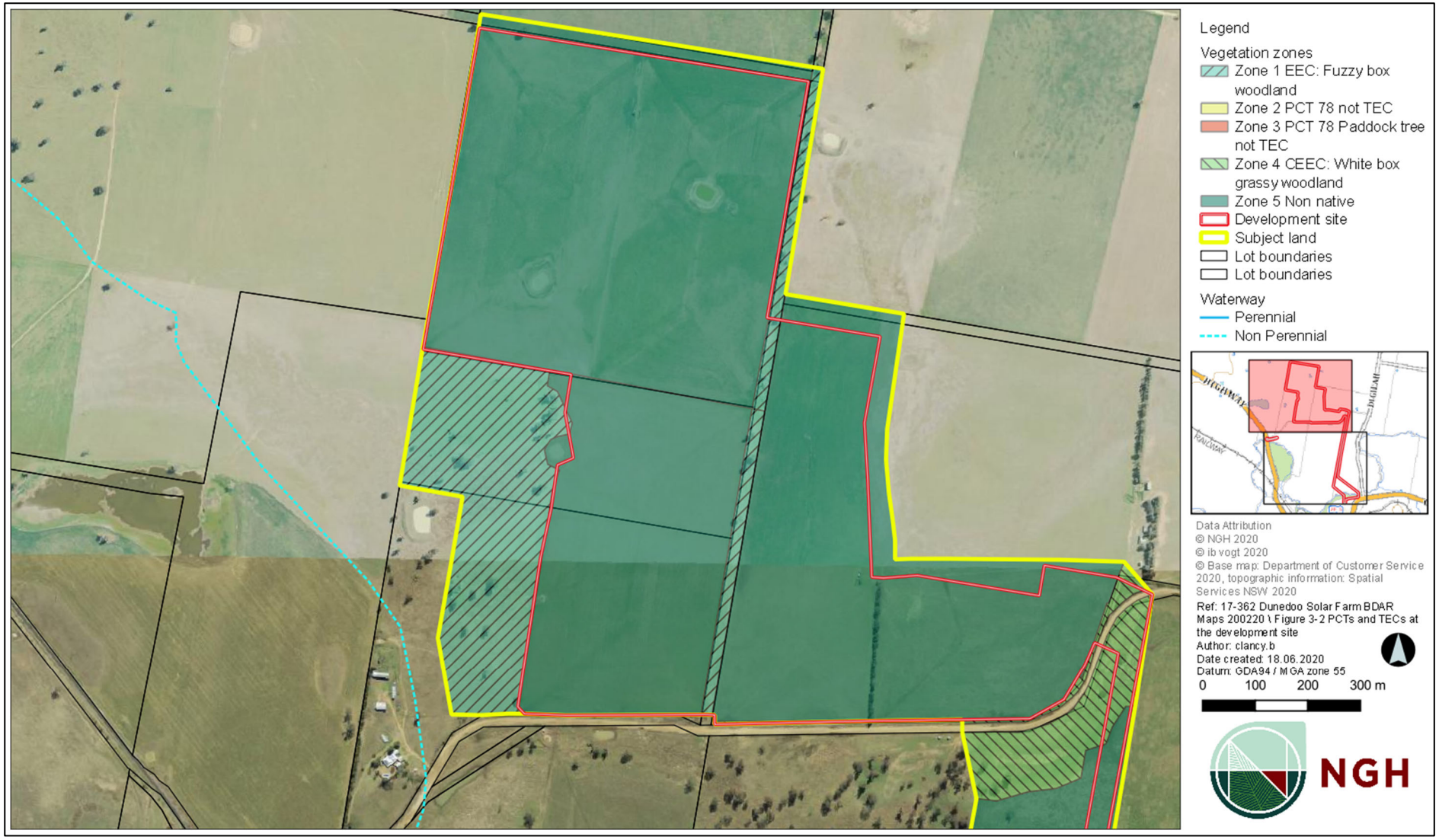

Figure 3-11 PCTs and TECs at the Development Site – North

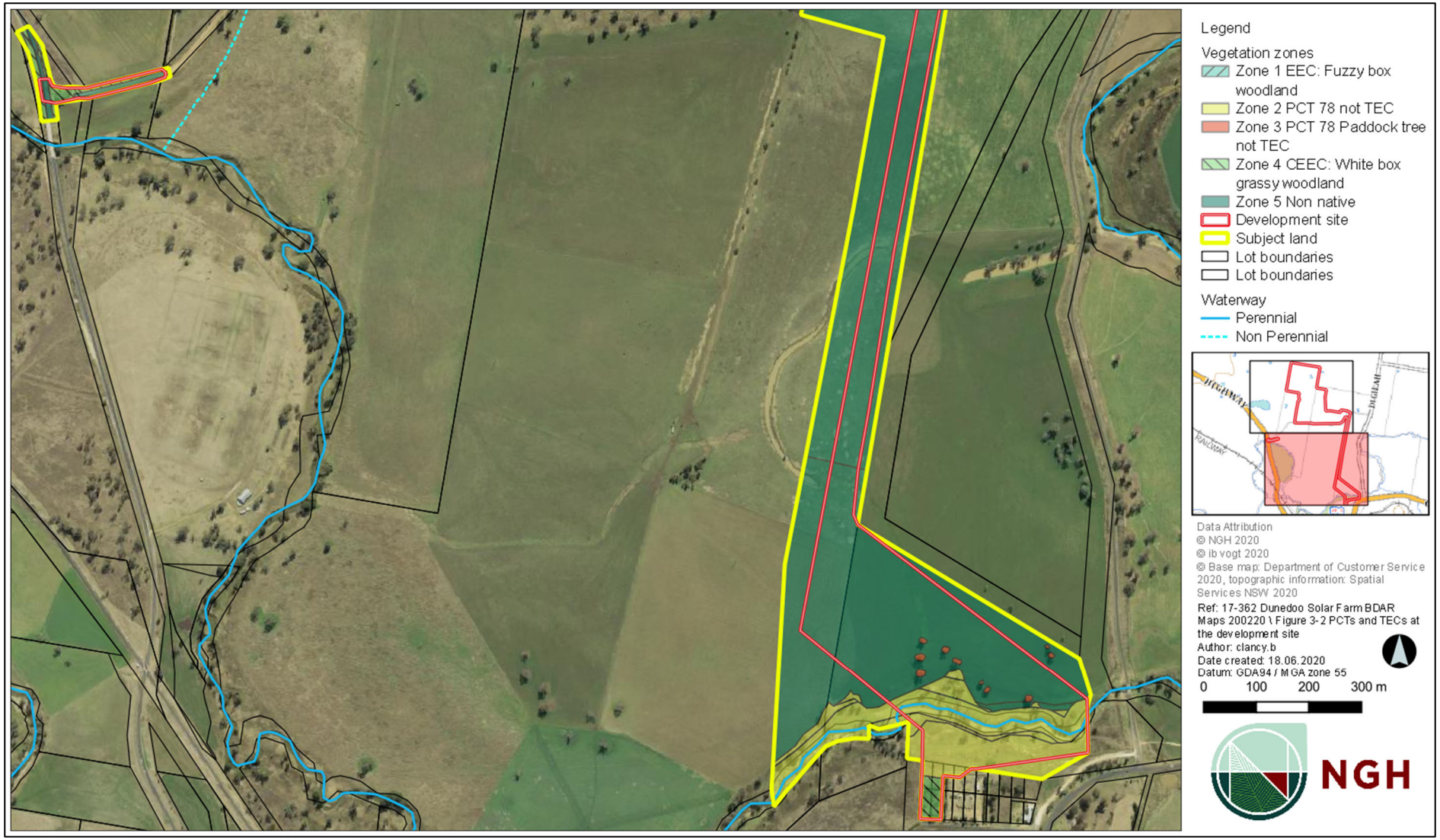

Figure 3-12 PCTs and TECs at the Development Site – South

3.4 THREATENED ECOLOGICAL COMMUNITIES

PCTs associated with two (2) TECs listed under the BC Act occur within the Development Site.

- White Box, Yellow Box, Blakely's Red Gum Grassy Woodland (BC Act and EPBC Act), and
- Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions (BC Act).

Small areas of moderate condition PCT 281 (2.18 ha) is considered to form part of the White Box Yellow Box Blakely's Red Gum Woodland and occur within the Development Site. Additionally, a small area of PCT 201 (1.86 ha) is considered to be consistent with Fuzzy Box Woodland TEC and occurs within the Development Site. All vegetation zones associated with PCTs 201 and 281 within the Development Footprint are considered to constitute TECs within the calculator.

3.5 VEGETATION INTEGRITY ASSESSMENT

3.5.1 Vegetation zones and survey effort

Three (3) PCT's were identified in the Development Site. Each of these PCTS were stratified into zones with a similar broad condition state. These zones were defined based on the overstorey condition, understorey condition and management practices. In total, four (4) native vegetation zones were identified with 7 vegetation integrity plots undertaken. One (1) non-native vegetation zone has also been included.

Table 3-4 Vegetation zones at the Development Site

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (# plots)	Plot Numbers	Patch size (ha)
1	201	Moderate	1.86	3	DS15, DS16, DS19	20
2	78	Good	4.23	2	DS1, RRG2	50
3	78	Paddock Tree	-	-	-	-
4	281	Moderate	2.18	2	DS5, DS4	20
5		Non-Native	104.76	11	DS2, DS3, DS8, DS9, DS10, DS11, DS12, DS13, DS14, DS17, DS18	-

3.5.2 Paddock Trees

There were eight (8) paddock trees were observed within the Development Site. Each paddock tree was assigned the PCT from which it is most likely derived. Threatened species that would use the paddock trees are assumed to be the same threatened species predicted by the BAM Calculator to utilise the PCTs and zones identified within the Development Site (Table 3-5). All paddock trees were mapped in the field using a handheld GIS Tablet and were visually assessed from the ground to determine whether any hollows were present. The Diameter at Breast Height (DBH) of the tree was assessed and assigned a paddock tree class relevant to the large tree benchmark for the associated PCT as per the BAM-C. However, it is not anticipated at this stage of the design that these paddocks trees will be required to be removed. Therefore, although targeted fauna surveys of paddock trees were included in the field surveys, where required in accordance with the BAM, the BAM-C Paddock tree module has not been utilised at this time.

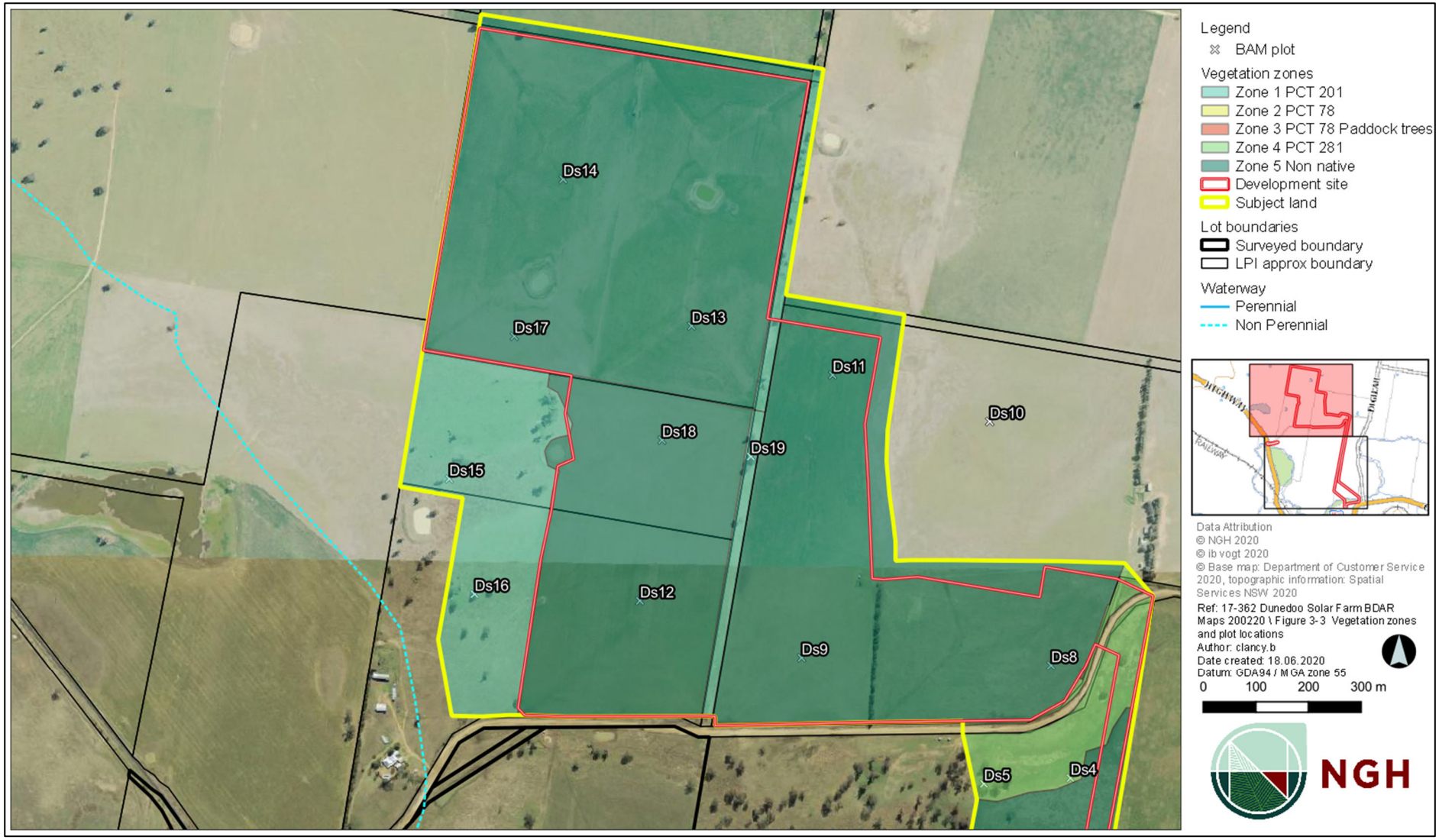

Figure 3-13 Vegetation zones at the Development Site – North

Figure 3-14 Vegetation zones at the Development Site – South

3.5.3 Vegetation integrity assessment results

The vegetation zones that would be impacted by the proposal, as entered into the BAM calculator, their condition class, number of plots undertaken within them and their current integrity score, as determined by the BAM calculator, are provided in Table 3-5.

Table 3-5 Current vegetation integrity scores for each vegetation zone within the Development Site

Zone ID	PCT/Zone	Composition score	Structure score	Function score	Vegetation Integrity Score
1	201	65.7	60.6	25.6	46.7
2	78	57.9	54.8	32.6	46.9
3	78	-	-	-	Paddock Tree
4	281	67.1	78.6	20.1	47.3
5	-	-	-	-	Non-native

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 predicted by the BAM-C

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Fauna			
Magpie Goose *Anseranas semipalmata*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Regent Honeyeater *Anthochaera phrygia*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Critically Endangered	Critically Endangered
Dusky Woodswallow *Artamus cyanopterus cyanopterus*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Gang-gang Cockatoo *Callocephalon fimbriatum*	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Glossy Black-Cockatoo *Calyptorhynchus lathami*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Vulnerable	Not Listed

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Little Pied Bat *Chalinolobus picatus*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Speckled Warbler *Chthonicola sagittata*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Spotted Harrier *Circus assimilis*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Brown Treecreeper (eastern subspecies) *Climacteris picumnus victoriae*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Varied Sittella *Daphoenositta chrysoptera*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Spotted-tailed Quoll *Dasyurus maculatus*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Vulnerable	Endangered

Common Name	Associated PCT	NSW Listing Status	National Listing Status
	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion		
Black-necked Stork *Ephippiorhynchus asiaticus*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Endangered	Not Listed
Little Lorikeet *Glossopsitta pusilla*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Painted Honeyeater *Grantiella picta*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Vulnerable
Brolga ***Grus rubicunda***	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
White-bellied Sea-Eagle *Haliaeetus leucogaster*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Black-breasted Buzzard *Hamirostra melanosternon*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Little Eagle *Hieraaetus morphnoides*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Vulnerable	Not Listed

Common Name	Associated PCT	NSW Listing Status	National Listing Status
	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion		
Swift Parrot ***Lathamus discolor***	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Endangered	Critically Endangered
Major Mitchell's Cockatoo *Lophochroa leadbeateri*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Vulnerable	Not Listed
Square-tailed Kite *Lophoictinia isura*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Hooded Robin (south-eastern form) *Melanodryas cucullata cucullat*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Black-chinned Honeyeater (eastern subspecies) ***Melithreptus gularis gularis***	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Turquoise Parrot *Neophema pulchella*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Barking Owl *Ninox connivens*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Powerful Owl *Ninox strenua*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Corben's Long-eared Bat *Nyctophilus corbeni*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Vulnerable	Vulnerable
Scarlet Robin *Petroica boodang*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Flame Robin *Petroica phoenice*	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Koala *Phascolarctos cinereus*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Vulnerable
Superb Parrot *Polytelis swainsonii*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Vulnerable
Grey-crowned Babbler *Pomatostomus temporalis temporalis*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Grey-headed Flying-fox *Pteropus poliocephalus*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Vulnerable
Australian Painted Snipe *Rostratula australis*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Endangered	Endangered
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Diamond Firetail *Stagonopleura guttata*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Freckled Duck *Stictonetta naevosa*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Masked Owl *Tyto novae-hollandiae*	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion 201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion 281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed
Rosenberg's Goanna *Varanus rosenbergi*	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Vulnerable	Not Listed

4.1.1 Species excluded from the assessment

One species, Barking Owl *Ninox connivens*, has a patch size limitation which requires patches of 50 ha, which are larger than those within the Subject Lands and locality. However, a precautionary approach has been taken, and the species has been retained within the list of species requiring assessment as a result of proximate records to the Development Site.

The BAM calculator states that geographic restrictions exist for Rosenberg's Goanna *Varanus rosenbergi*, as detailed in Table 4-1 above. The site does not occur within the area identified within the geographic restriction for the species, thus the species has been excluded from further assessment. No other ecosystem species have been excluded from assessment.

4.2 SPECIES CREDIT SPECIES

4.2.1 Species credit species to be assessed

The BAM Calculator predicted the following species credit species to occur at the Development Site. These species are assessed in Table 4-2 below.

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	Minimum patch size	Included or Excluded	Reason for exclusion
Fauna							
Barking Owl ***Ninox connivens***	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage. Preferentially hunts small arboreal mammals such as Squirrel Gliders and Common Ringtail Possums, but will hunt birds, invertebrates and terrestrial mammals such as rodents and rabbits. Known in subregion.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Fragmented (11%-30%)	Included	
Black-breasted Buzzard ***Hamirostra melanosternon***	Lives in a range of inland habitats, especially along timbered watercourses which is the preferred breeding habitat. Breeds from August to October near water in a tall tree. Hunts over grasslands and sparsely timbered woodlands. Not a powerful hunter, despite its size, mostly taking reptiles, small mammals, birds, including nestlings, and carrion. Also specialises in feeding on large eggs. Predicted in subregion.	Moderate Sensitivity to Potential Gain	Vulnerable	Not Listed	Relictual (with 10% or less habitat retained)	Included	
Booroolong Frog ***Litoria booroolongensis***	Along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults on or near	High Sensitivity to Potential Gain	Endangered	Endangered	Relictual (with 10% or less habitat retained)	Included	

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Minimum patch size	Included or Excluded	Reason for exclusion
	cobble banks and other rock structures within stream margins. Known in subregion.						
Brush-tailed *Phascogale Phascogale tapoatafa*	Dry sclerophyll open forest with sparse groundcover. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. Females have exclusive territories of ~20–40 ha, while males have overlapping ones often >100 ha. Nests and shelters in hollow bearing trees. Predicted in subregion.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Relictual (with 10% or less habitat retained)	Included	
Brush-tailed Rock-wallaby *Petrogale penicillata*	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. Highly territorial and have strong site fidelity with an average home range size of about 15 ha. Known in subregion.	Very High Sensitivity to Potential Gain	Endangered	Vulnerable	Fragmented (11%-30%)	Excluded	No suitable rocky habitat
Bush Stone-curlew *Burhinus grallarius*	Open forests and woodlands with a sparse, grassy ground layer and fallen timber. Known in subregion.	High Sensitivity to Potential Gain	Endangered	Not Listed	Fragmented (11%-30%)	Included	
Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*	Roosts in caves, mines, stormwater tunnels, buildings, and other man-made structures. Maternity caves have very specific temperature and humidity regimes. Hunt in forested areas, catching moths and other flying insects	Very High Sensitivity to Potential Gain	Vulnerable	Not Listed	Relictual (with 10% or less habitat retained)	Excluded	No suitable breeding habitat

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Minimum patch size	Included or Excluded	Reason for exclusion
	above the tree tops. Known in subregion.						
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. Hollow bearing trees are favoured nesting sites, but nests opportunistically. Known in subregion.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Fragmented (11%-30%)	Included	
Gang-gang Cockatoo *Callocephalon fimbriatum*	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. Favours old growth forest and woodland attributes for nesting and roosting. Known in subregion.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Fragmented (11%-30%)	Included	
Glossy Black-Cockatoo *Calyptorhynchus lathami*	Coastal woodlands and drier forest areas, open inland woodlands or timbered watercourses where casuarinas/ sheoaks are common. Prefer rugged country, where extensive clearing has not taken place. Brigalow scrub or hilly rocky country with casuarina species are preferred habitat in inland NSW. Known in western third of subregion.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Relictual (with 10% or less habitat retained)	Included	

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Minimum patch size	Included or Excluded	Reason for exclusion
Grey-headed Flying-fox ***Pteropus poliocephalus***	Range of vegetation communities including rainforest, open forest, and closed and open woodland. Roost sites usually near water, including lakes, rivers, and coastlines. Known in subregion.	High Sensitivity to Potential Gain	Vulnerable	Vulnerable	Relictual (with 10% or less habitat retained)	Excluded	No breeding camps within site
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 Sensitivity to Potential Gain	Vulnerable	Vulnerable	Relictual (with 10% or less habitat retained)	Included	
Large-eared Pied Bat ***Chalinolobus dwyeri***	Roosts in caves, crevices in cliffs, old mine workings and in the disused nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Known in subregion.	Very High Sensitivity to Potential Gain	Vulnerable	Vulnerable	Fragmented (11%-30%)	Included	
Little Eagle ***Hieraaetus morphnoides***	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. Known in subregion.	Moderate Sensitivity to Potential Gain	Vulnerable	Not Listed	Fragmented (11%-30%)	Included	

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Minimum patch size	Included or Excluded	Reason for exclusion
Major Mitchell's Cockatoo ***Lophochroa leadbeateri***	Wide range of treed and treeless habitats, always within easy reach of water. Known in subregion.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Relictual (with 10% or less habitat retained)	Included	
Masked Owl ***Tyto novaehollandiae***	Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Known in subregion, identified on site.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Fragmented (11%-30%)	Included – known from site	
Pale-headed Snake ***Hoplocephalus bitorquatus***	Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. In drier environments, it appears to favour habitats close to riparian areas. The species shelters during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. The main prey is tree frogs although lizards and small mammals are also taken.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Fragmented (11%-30%)	Included	
Pink-tailed Legless Lizard ***Aprasia parapulchella***	Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (*Themeda australis*). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Known in subregion.	High Sensitivity to Potential Gain	Vulnerable	Vulnerable	Relictual (with 10% or less habitat retained)	Excluded	No rocky area present within site

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Minimum patch size	Included or Excluded	Reason for exclusion
Powerful Owl ***Ninox strenua***	Requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation. Pairs of Powerful Owls demonstrate high fidelity to a large territory. In good habitats a mere 400 ha can support a pair; where hollow trees and prey have been depleted the owls need up to 4000 ha. Powerful Owls nest in large tree hollows, in large eucalypts that are at least 150 years old. Known in subregion.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Fragmented (11%-30%)	Included	
Regent Honeyeater ***Anthochaera phrygia***	Temperate woodlands and open forests of the inland slopes of south-east Australia, in particular dry open forest, woodland, Box-Ironbark woodland, and riparian forests of River Sheoak. Known in subregion.	High Sensitivity to Potential Gain	Critically Endangered	Critically Endangered	Relictual (with 10% or less habitat retained)	Excluded	Site not within Mapped Important Habitat
Square-tailed Kite ***Lophoictinia isura***	Timbered habitats including dry woodlands and open forests, particularly timbered watercourses. Known in subregion. Known in subregion.	Moderate Sensitivity to Potential Gain	Vulnerable	Not Listed	Fragmented (11%-30%)	Included	
Squirrel Glider ***Petaurus norfolcensis***	Survey year round but sites with bi-pinnate acacia, autumn winter flowering trees and shrubs such as *Eucalyptus robusta* and *Banksia sp* (*integrafolia* etc) should be subject to a more retracted survey period of between March-August. Relies on large old trees with hollows for	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Relictual (with 10% or less habitat retained)	Included	

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Minimum patch size	Included or Excluded	Reason for exclusion
	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).						
Superb Parrot ***Polytelis swainsonii***	Box-Gum, Box-Cypress, and Boree Woodlands and River Red Gum Forests. They nest in hollows of large trees in tall open forest or woodland. Known in subregion.	High Sensitivity to Potential Gain	Vulnerable	Vulnerable	Relictual (with 10% or less habitat retained)	Included	
Swift Parrot ***Lathamus discolor***	On the coast and southwest slopes in areas with abundant flowering eucalypts or lerp. Feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, and White Box. Known in subregion.	Moderate Sensitivity to Potential Gain	Endangered	Critically Endangered	Relictual (with 10% or less habitat retained)	Excluded	Site not within Mapped Important Habitat
White-bellied Sea-Eagle ***Haliaeetus leucogaster***	Large areas of open water including larger rivers, swamps, lakes, and the sea. Coastal dunes, tidal flats, grassland, heathland, woodland, and forest. Breeding habitat mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Subregion presence information not available.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Relictual (with 10% or less habitat retained)	Included	
Flora							
Ausfeld's Wattle ***Acacia ausfeldii***	Associated species include *Eucalyptus albens*, *E. blakelyi* and *Callitris spp.*, with an understorey dominated by	High	Vulnerable	Not listed	N/A	Included	

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Minimum patch size	Included or Excluded	Reason for exclusion
	Cassinia spp. and grasses. Known in subregion.						
Spear-grass Austrostipa wakoolica	Floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils. Habitats include edges of lignum swamp with box and mallee, creek banks in grey, silty clay, mallee and lignum sandy-loam flat, open cypress forest on low sandy range, and low, rocky rises. Known to occur south of Narranderra, west of Cowra within subregion.	Moderate	Endangered	Endangered	N/A	Excluded	Occurs west of Cowra. Site is approximately 250 km north-northeast of Cowra.
Bluegrass Dichanthium setosum	Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. Often collected from nutrient-enriched and water-enriched grazed open grassy woodlands on the northern tablelands. It is unclear is disturbance is beneficial or detrimental for the species. Known in subregion.	High Sensitivity to Potential Gain	Vulnerable	Vulnerable	N/A	Included	
Pine Donkey-orchid *Diuris tricolor*	Usually recorded from disturbed habitats. Understorey often grassy with herbaceous plants such as *Bulbine* species. Grows in sclerophyll forest among grass, often with Cypress pine. Found in sandy soils, either on flats or small rises. Known in subregion.	Moderate	Vulnerable	Not listed	N/A	Included	

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Minimum patch size	Included or Excluded	Reason for exclusion
Scant Pomaderris ***Pomaderris queenslandica***	Found in moist eucalypt forest or sheltered woodlands with a shrubby understorey, and occasionally along creeks. Know in subregion.	High Sensitivity to Potential Gain	Endangered	Not Listed	N/A	Included	
Tarengo Leek Orchid ***Prasophyllum petilum***	Grows in open sites within Natural Temperate Grassland. Also grows in grassy woodland in association with River Tussock *Poa labillardieri*, Black Gum *Eucalyptus aggregata* and tea-trees *Leptospermum spp*. and within the grassy groundlayer dominated by Kanagroo Grass under Box-Gum Woodland. Apparently highly susceptible to grazing, being retained only at little-grazed travelling stock reserves and in cemeteries. Known in subregion east of Binalong, south and east of Boorowa.	Moderate Sensitivity to Potential Gain	Endangered	Endangered	N/A	Excluded	Site is not east of Binalong or south of Boorowa
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.	N/A	Not listed	Endangered	N/A	Included	
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	N/A	Included	
Euphrasia arguta	Eucalypt forest with a mixed grass and shrub understorey. Known in subregion. Predicted in subregion.	High	Not listed	Critically Endangered	N/A	Included	

4.2.2 Inclusions and exclusions based on habitat features

The following species credit species have been excluded from further assessment based on the habitat features present at the Development Site. Table 4-3 below details habitat features required.

Table 4-3 Species credit species excluded based on habitat features or dristrubution

Species credit species	Habitats present	Reason for exclusion
Spear-grass *Austrostipa wakoolica*	Occurs west of Cowra	Site is approximately 250 km north-northeast of Cowra.
Brush-tailed Rock-wallaby *Petrogale penicillata*	Habitat constraint is listed as land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines.	None of these features occur within 1 km of site.
Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding	None of these features occur within site.
Grey-headed Flying-fox *Pteropus poliocephalus*	Breeding camps	No breeding camps occur within site.
Large-eared Pied Bat *Chalinolobus dwyeri*	Cliffs - Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.	None of these features occur within 2 km site.
Pink-tailed Legless Lizard *Aprasia parapulchella*	Rocky Areas - Or within 50m of rocky areas	No rocky areas within site.
Regent Honeyeater *Anthochaera phrygia*	Mapped Important Areas	Site does not occur within mapped important area.
Swift Parrot *Lathamus discolor*	Mapped Important Areas	Site does not occur within mapped important area.
Tarengo Leek Orchid *Prasophyllum petilum*	Known in subregion east of Binalong, south and east of Boorowa.	Site does not occur east of Binalong, south and east of Booroowa.

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).

No species credit species have been excluded from assessment based on habitat quality. Non-native vegetation or Category 1 exempt land has been excluded from assessment under the BAM, and all remaining vegetation is considered to constitute potential habitat for species credit species.

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. All species have been surveyed for within the correct survey window, utilising appropriate methodologies. The results are summarised in **Error! Reference source not found.**. Details of the survey methodologies and results are provided for each surveyed species are provided below. Targeted survey locations are mapped on Figure 4-1.

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 weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count
Fauna				
Bush Stone-curlew *Burhinus grallarius*	2	Surveyed Dec 2017 Surveyed September 2018	No	0
Gang-gang Cockatoo *Callocephalon fimbriatum*	2	Surveyed Dec 2017 Surveyed September 2018	No	0
Glossy Black Cockatoo *Calyptorhynchus lathami*	2	Surveyed August 2018	No	0
Eastern Pygmy-possum *Cercartetus nanus*	2	Surveyed Dec 2017 Surveyed September 2018	No	0
White-bellied Sea Eagle *Haliaeetus leucogaster*	2	Surveyed Dec 2017	No	0
Black-breasted Buzzard *Hamirostra melanosternon*	1.5	Surveyed Dec 2017	No	0
Little Eagle *Hieraaetus morphnoides*	1.5	Surveyed August 2018	No	0
Pale-headed Snake	2	Surveyed Dec 2017	No	0
Booroolong Frog *Littoria booroolongensis*	2	Surveyed Dec 2017	No	0
Major Mitchell's Cockatoo *Lophochroa leadbeateri*	2	Surveyed Dec 2017	No	0
Square-tailed Kite *Lophoictinia isura*	1	Surveyed Dec 2017	No	0
Barking Owl *Ninox connivens*	2	Surveyed Dec 2017	No	0

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count
Powerful Owl *Ninox strenua*	2	Surveyed August 2018	No	0
Squirrel Glider *Petaurus norfolcensis*	2	Surveyed Dec 2017	No	0
Brush Tailed Phascogale *Phascogale tapoatafa*	2	Surveyed Dec 2017	No	0
Koala *Phascolarctos cinereus*	2	Surveyed Dec 2017	No	0
Superb Parrot *Polytelis swainsonii*	2	Surveyed September 2018	No	0
Masked Owl *Tyto novaehollandiae* (Breeding)	2	Detected on site Dec 2017 Not detected During August 2018 Survey	No	0
Flora				
Ausfeld's Wattle *Acacia ausfeldii*	2	Surveyed December 2017 Surveyed September 2018	No	0
Bluegrass *Dichanthium setosum*	2	Surveyed December 2017 Surveyed September 2018	No	0
Pine Donkey-orchid *Diuris tricolor*	1.5	Surveyed September 2018	No	0
Euphrasia arguta	3	Surveyed December 2017 Surveyed September 2018	No	0
Scant Pomaderris *Pomaderris queenslandica*		Surveyed December 2017 Surveyed September 2018	No	0
Small Purple-pea *Swainsona recta*	1	Surveyed December 2017 Surveyed September 2018	No	0
Silky Swainson-pea *Swainsona sericea*	2	Surveyed December 2017 Surveyed September 2018	No	0

4.2.5 Weather

Weather conditions recorded for these dates from the Bureau of Meteorology (BOM) at the Dunedoo Weather Station (**ID:** 064009)are presented in Table 4-5.

Table 4-5 Weather Summary

Survey Date	Maximum temperature (°C)	Minimum temperature (°C)	Rainfall (mm) on survey date, preceding 14 days	Survey
5th – 7th December 2017	32.4	12.4	0.0, 44.8	• Diurnal Fauna Survey • Nocturnal Fauna Survey • Targeted Nocturnal Fauna Survey • Targeted Amphibian and Reptile Survey • Flora Survey
9th – 10th August 2018	18.7	-0.9	0.0, 8.9	• Diurnal Fauna Survey • Dusk Fauna Survey • Nocturnal Fauna Survey • Targeted Nocturnal Fauna Survey
25th – 26th September 2018	20.0	6.0	1.0, 0	• Diurnal Survey • Dusk Survey • Flora Survey
27th – 28th April 2020	26.0	13.6	0.1, 0	• Flora Survey

4.2.6 Candidate species survey and results

Diurnal avifauna (Gang-Gang Cockatoo, Major Mitchell Cockatoo, Superb Parrot, Little Eagle, White Bellied Sea Eagle, Square-tailed Kite, Glossy Black Cockatoo)

SURVEY EFFORT

A woodland bird census was completed on the mornings of the 6th and 7th of December 2017, the 10th of August 2018 and the 26th of September 2018. Additionally, surveys were conducted at dusk on the 9th of August 2018 and the 25th of September 2018. A total approximate survey effort of these surveys was a total of six person hours. There were 12 20-minute 2 ha area searches for birds were carried out, as well as opportunistic surveys throughout the site visit including traversing the site by car and on foot. Incidental recordings of all species were mapped. Paddock trees and remnant trees within and adjacent to the Development Site were surveyed for evidence of stick nests used by raptors., and for evidence of use of hollows by parrots.

SURVEY RESULTS

No threatened bird species were seen during surveys. One EPBC Act listed marine species, Dollarbird *Eurystomus orientalis*, was recorded four (4) times within and adjacent to the Development Site, within remnant vegetation at the south of the Development Site, adjacent to the Transgrid sub-station. Up to four birds were identified during each sighting of the species, and the individuals appeared to be utilising hollows within the River Red-gum *Eucalyptus camaldulensis* along the Talbragar River, adjacent to the Development Site.

Surveys were undertaken within suitable time periods for the detection of breeding the Glossy Black Cockatoo (March– August), Little Eagle (Aug – Oct), and Superb Parrot (Sept – Nov). None of these species were detected within the Development Site.

No other threatened birds were observed during the surveys. One large stick nest was identified outside the Development Site, which was attended by Ravens. This may provide suitable raptor breeding habitat in the future. A full list of bird species detected are shown in Appendix B

Nocturnal avifauna (Brush-stone Curlew, Barking Owl, Powerful Owl, & Masked Owl)

SURVEY EFFORT

A targeted spotlight survey was completed on the evenings of 5th and 6th December 2017 for a total of approximately 7 person hours. A 100 watt spotlight was used for both vehicle-based and foot surveys of remnant vegetation. This involved visual searches of trees for prey species such as arboreal mammals, and call playback for all three species was conducted. Vehicle-based searches were undertaken for approximately 1 person hours, and foot surveys for 6 person hours.

Call playback with a megaphone was undertaken at three sites, shown in Figure 4-1 and Figure 4-2 within remnant vegetation within the north-west of the Development Site, within retained trees in the centre of the Development Site and within remnant vegetation along the Talbragar River, followed by a period of listening for responses.

A targeted survey of breeding species credit owls including Barking Owl, Powerful Owl and Masked Owl was conducted by two ecologists on the 8th and 9th of August, 2018. Call playback and spotlighting was undertaken at the same sites as the December 2017 survey.

SURVEY RESULTS

Two Masked Owls were heard calling in response to the call playback, adjacent to the north-western portion of the Development Site. One bird flew in to a tree at the northern end of vegetation zone 4, while another bird was heard calling off site, to the north west of the Development Site. The survey did not detect any Barking Owl or Powerful Owl.

Although the Masked Owl was detected during the December survey, the survey occurred outside the survey period for determination of Masked Owl and Powerful Owl breeding within the Development Site (May – August). A second survey was conducted over two nights in August 2018, which replicated the call playback sites and spotlighting surveys conducted in December. The Masked Owl was not detected during the August surveys, which indicates that the species is not utilising the Development Site as breeding habitat, and thus Species Credits for the species are not generated.

Mammals

Koala

SURVEY EFFORT

A targeted search was completed on the 5th and 6th of December, 2017, with mature feed trees occurring within the Development Site searched for signs of Koalas (scats and scratches), in addition to observation of trees for individuals, for approximately two person hours. A formal SAT survey was not undertaken, however radial searches around the base of important trees was undertaken opportunistically, in addition to inspection for signs of presence such as scratches or urine stains.

A targeted spotlight survey was completed on the evenings of 5th and 6th December 2017 for a total of approximately 7 person hours, and on the 9th and 10th of August 2018 for a total of approximately 8 person hours. A 100 watt spotlight was used for both vehicle-based and foot surveys of remnant vegetation. This involved visual searches of trees for Koala, and call- playback surveys. Vehicle-based searches were undertaken for approximately 1 person hours, and foot surveys for 6 person hours in December, and foot surveys were conducted for 8 person hours in August.

SURVEY RESULTS

No Koalas were seen during the survey, and no incidental evidence of presence was found.

Nocturnal Mammals (Eastern Pygmy-possum, Squirrel Glider, Brush tailed Phascogale)

SURVEY EFFORT

A targeted spotlight survey was completed on the evenings of 5th and 6th December 2017 for a total of approximately 7 person hours, and on the 9th and 10th of August 2018 for a total of approximately 8 person hours. A 100 watt spotlight was used for both vehicle-based and foot surveys of remnant vegetation. This involved visual searches of trees for arboreal mammals and call surveys for Squirrel Glider during foot surveys. Vehicle-based searches were undertaken for approximately 1 person hours, and foot surveys for 6 person hours in December, and foot surveys were conducted for 8 person hours in August.

SURVEY RESULTS

No nocturnal mammals, including Eastern Pygmy-possums, Squirrel Gliders or Brush tailed Phascogales were seen during the survey.

Amphibians (Booroolong Frog)

SURVEY EFFORT

A targeted amphibian and reptile survey was completed on the nights of 5th and 6th December 2017 for a total of approximately four person hours. Weather conditions recorded for these days at the nearest weather station included 0.0 mm of rainfall, however 26.4 mm of rain had fallen on the 3rd of December, the month's highest rainfall. Point call surveys including call playback with a megaphone was used at three (two) farm dams within the Development Site, and at two points along the Talbragar River. At the time of survey, there was standing water in these dams.

SURVEY RESULTS

No Booroolong Frogs were seen or heard during the survey. Three frog species were recorded calling during the surveys, including Spotted Marsh Frog *Limnodynastes tasmaniensis*, Striped Marsh Frog *Limnodynastes peronii*, and Emerald-spotted Tree Frog *Litoria peronii*. The majority of these species were identified within the Talbragar River.

Reptiles (Pale-headed snake)

SURVEY EFFORT

A targeted frog and reptile survey was completed on the nights of 5th and 6th December 2017 for a total of approximately four person hours. Weather conditions recorded for these days at the nearest weather station included 0.0 mm of rainfall, however 26.4 mm of rain had fallen on the 3rd of December, the month's highest

rainfall. Point call surveys including call playback with a megaphone was used at three (two) farm dams within the Development Site, and at two points along the Talbragar River. At the time of survey, there was standing water in these dams.

SURVEY RESULTS

No Pale-headed Snakes were seen during the survey. Three frog species were recorded calling during the surveys, including one arboreal species which could act as a prey source for the Pale-headed Snake, the Emerald-spotted Tree Frog *Litoria peronii*.

Threatened Flora

Ausfeld's Wattle *Acacia ausfeldii*

SURVEY EFFORT

A targeted survey was completed on the morning of 7th of December 2017 for a total of approximately 1 person hour, and on the 25th of September 2018 for approximately 2 person hours. Parallel transects were walked by a botanist and assistant at a ten-metre spacing within areas of vegetation containing suitable habitat for the species.

SURVEY RESULTS

No Ausfeld's Wattle *Acacia ausfeldii* were detected during the survey. It is not considered to occur within the Development Site.

Bluegrass *Dichanthium setosum*

SURVEY EFFORT

A targeted survey was completed on the morning of 7th of December 2017 for a total of approximately 1 person hour, and on the 25th of September 2018 for approximately 2 person hours. Parallel transects were walked by a botanist and assistant at a ten-metre spacing within areas of vegetation containing suitable habitat for the species.

SURVEY RESULTS

No Bluegrass *Dichanthium setosum* were detected during the survey. It is not considered to occur within the Development Site.

Pine Donkey-orchid *Diuris tricolor*

SURVEY EFFORT

A targeted survey was completed on the 25th of September 2018 for approximately 2 person hours. Parallel transects were walked by a botanist and assistant at a ten-metre spacing within areas of vegetation containing suitable habitat for the species.

SURVEY RESULTS

No Pine Donkey-orchids *Diuris tricolor* were detected during the survey. It is not considered to occur within the Development Site.

Euphrasia arguta

A targeted survey was completed on the morning of 7th of December 2017 for a total of approximately 1 person hour, and on the 25th of September 2018 for approximately 2 person hours. Parallel transects were walked by a botanist and assistant at a ten-metre spacing within areas of vegetation containing suitable habitat for the species.

SURVEY RESULTS

No *Euphrasia arguta* were detected during the survey. It is not considered to occur within the Development Site.

Scant Pomaderris *Pomaderris queenslandica*

A targeted survey was completed on the morning of 7th of December 2017 for a total of approximately 1 person hour, and on the 25th of September 2018 for approximately 2 person hours. Parallel transects were walked by a botanist and assistant at a ten-metre spacing within areas of vegetation containing suitable habitat for the species

SURVEY RESULTS

No Scant Pomaderris *Pomaderris queenslandica* were detected during the survey. It is not considered to occur within the Development Site.

Small Purple-pea *Swainsona recta*

A targeted survey was completed on the 25th of September 2018 for approximately 2 person hours. Parallel transects were walked by a botanist and assistant at a ten-metre spacing within areas of vegetation containing suitable habitat for the species.

SURVEY RESULTS

No Small Purple-pea *Swainsona recta* were detected during the survey. It is not considered to occur within the Development Site.

Silky Swainson-pea *Swainsona sericea*

SURVEY EFFORT

A targeted survey was completed on the morning of 7th of December 2017 for a total of approximately 1 person hour, and on the 25th of September 2018 for approximately 2 person hours. Parallel transects were walked by a botanist and assistant at a ten-metre spacing within areas of vegetation containing suitable habitat for the species.

SURVEY RESULTS

No Silky Swainson-pea *Swainsona sericea* were detected during the survey. It is not considered to occur within the Development Site.

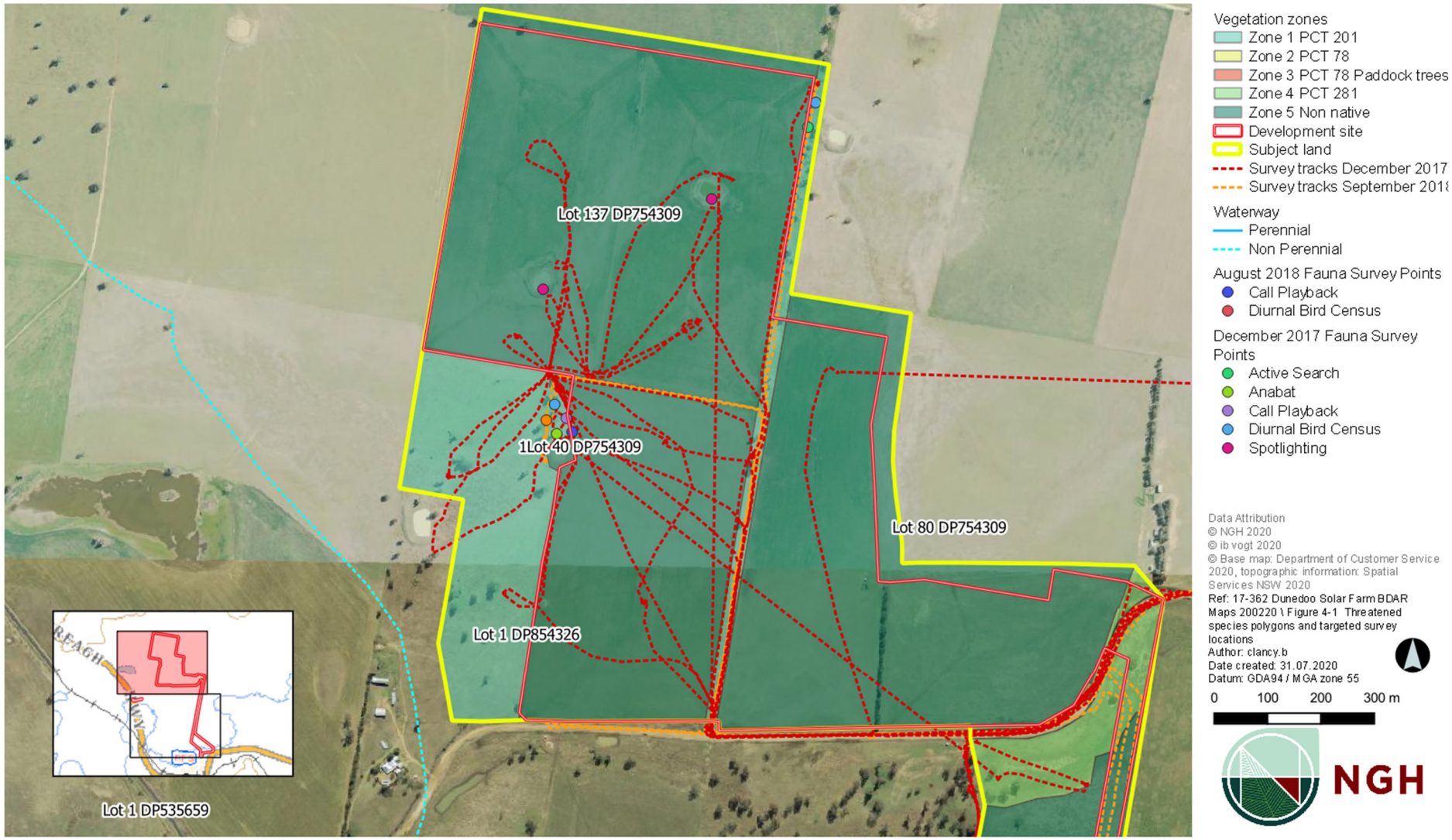

Figure 4-1 Survey effort and targeted survey locations – North

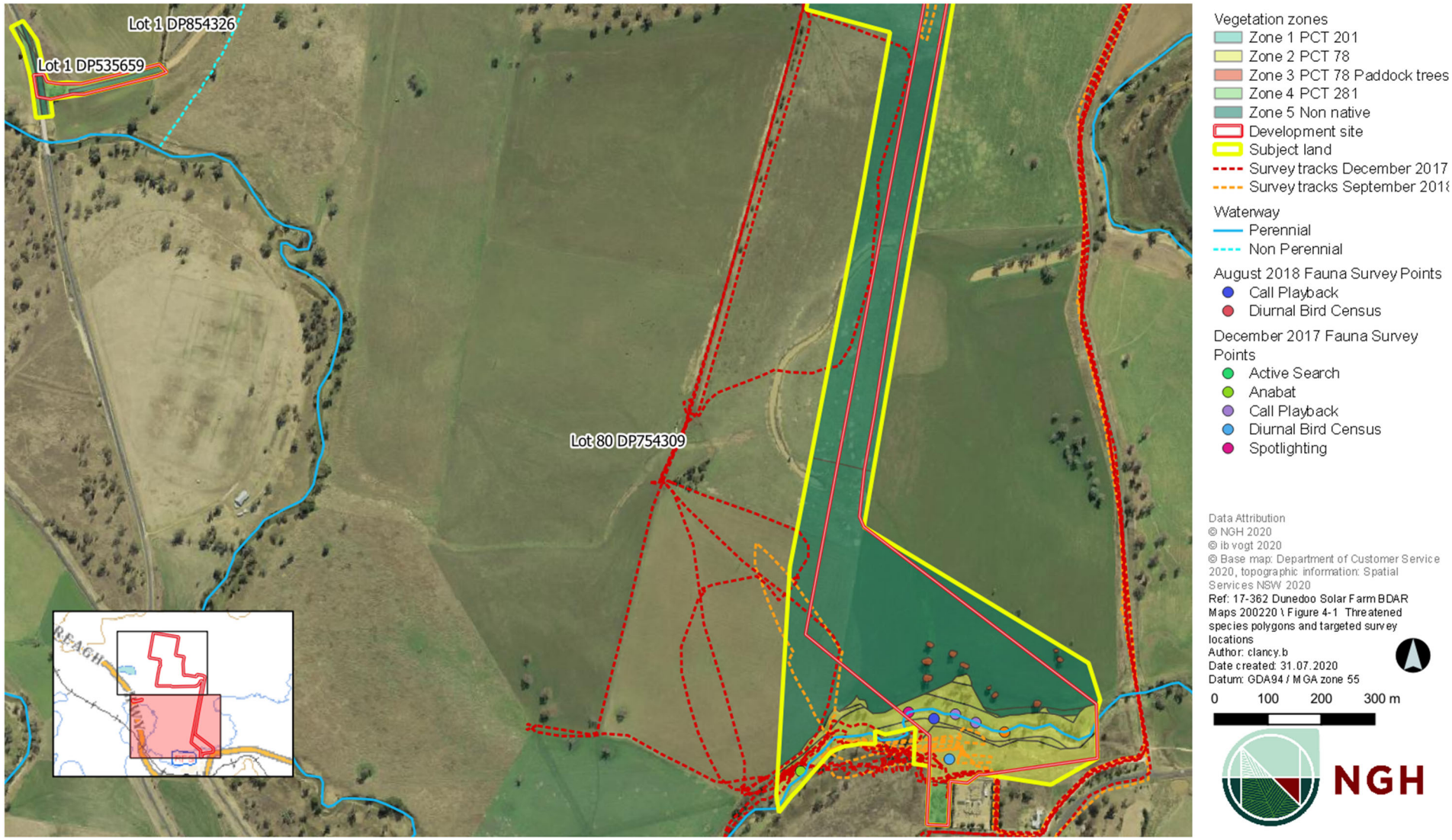

Figure 4-2 Survey effort and targeted survey locations – South

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

There are several agricultural buildings on the Subject Land, including a large open shed on the southwest corner of the Development Site. This shed could provide potential roosting habitat for Eastern Bentwing-bat and other threatened bats that roost in buildings. These buildings do not occur within the Development Site.

Planted vegetation not representing a plant community type was present in one patch within the Subject Land, but not within the Development Site. The vegetation will not be removed or impacted as a result of the proposal. The 0.69 ha patch comprises planted *Eucalypt* species.

No hollows are yet present in any of these trees. These trees could provide foraging habitat for threatened bird and mammal species. Threatened species that may use this habitat for foraging are;

- Eastern Pygmy Possum
- Squirrel Glider
- Brush-tailed Phascogale
- Eastern Bentwing Bat
- Barking Owl
- Masked Owl
- Little Eagle
- Gang-gang Cockatoo
- Glossy Black Cockatoo
- Major Mitchell's Cockatoo
- Superb Parrot

As this vegetation is not being impacted, it does not require further assessment within the BAM Calculator.

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

The Talbreagar River intersects the southern portion of the Development Site, within the Transmission Line easement. The river is heavily eroded and has been subject to extensive previous clearing, however contains occasional sedges and grasses. This creek and surrounding vegetation could provide habitat for:

- Boorolong Frog (*Litoria booroolongensis*)
- Pale-headed Snake (*Hoplocephalus bitorquatus*)

The Booroolong Frog and Pale-headed Snake were not detected during the site surveys.

Unnamed farm dams occur within the northwestern portion of the Development Site. These dams would be filled by the proposal. The impacts proposed to the two dams are not anticipated to have any broader impacts for environments that sustain and interact with the rivers, streams and wetlands either on or offsite.

An assessment of threatened species and ecological communities under the *Fisheries Management Act 1994* (FM Act) that may use the habitats of the Talbragar River was undertaken. No threatened species were considered to occur within the Development Site. Talbragar River, as a tributary of the Macquarie River has potential to fall within the Darling River Endangered Ecological Community, listed under the FM Act. However, as the site is upstream of Burrendong Dam, the portion of the river does not fall within the Endangered Ecological Community. No construction activities would occur within the creek line. No impacts would occur to water flow paths or volumes within the creek line.

5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC protected matters report was undertaken on 11 October 2017 (10km 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 **Error! Reference source not found.**). Relevant to Biodiversity these include:

- Wetlands of International Importance;
- Threatened Ecological Communities;
- Threatened species;
- Migratory species;

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

5.1 WETLANDS OF INTERNATIONAL IMPORTANCE

Five wetlands of international importance were returned from the protected matters report. The nearest of these (within 200 km of the Development Site) are the Macquarie Marshes and Hunter estuary wetlands. All other wetlands returned from the search are over 700 km away. The Macquarie Marshes occurs approximately 220 km north-west of the Development Site. It is fed by the Macquarie River. While the Talbragar River is a tributary of the Macquarie River, it is separated by Burrendock Dam, and impacts to Wetlands of International Importance are considered unlikely.

5.2 THREATENED ECOLOGICAL COMMUNITIES

Five threatened ecological communities were returned from the protected matters report. One of these, *White Box-Yellow Box-Blakely's Red Gum Grass Woodland and Derived Native Grassland*, listed as critically endangered, has been assessed within the Development Site. An assessment of whether the vegetation community within the Development Site met the condition threshold for each of the EPBC listed communities was undertaken.

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived native grassland

2.18 ha of remnant Blakely's Red Gum and Yellow Bow Woodland occurs within the Development Site. This woodland was considered to form part of the listed national ecological community due to the presence of mature trees and naturally regenerating Blakley's Red Gum. An assessment of condition threshold is shown in Figure 3-3. It concludes that 0.58 ha occurs within the Development Footprint and would be impacted on by the proposal.

5.3 THREATENED SPECIES

Thirty-nine threatened species were identified in the PMST report. Of these, 10 are considered likely to occur in the Development Site. Bold entries can be considered to have been targeted during onsite surveys:

- Swift Parrot;
- **Superb Parrot;**
- Painted Honeyeater;
- Regent Honeyeater;
- **Koala;**
- **Grey-headed Flying-fox;**
- **Booroolong Frog;**

- ***Dichanthium setosum;***
- ***Swainsona recta.***

No EPBC listed threatened species were identified within the Development Site during surveys. Based on the comprehensive mammal and bird surveys undertaken and evaluation of habitat, no other listed MNES are considered likely to occur in the Development Site regularly or rely on the habitats present.

5.4 MIGRATORY SPECIES

Twelve listed migratory species were identified in the PMST report. Of these, five could potentially occur in the Development Site based on an assessment of habitat and distribution.

- Common Sandpiper;
- Fork-tailed Swift;
- White-throated Needletail;
- Yellow Wagtail;
- Satin Flycatcher;

One EPBC Act listed Marine species, Dollarbird *Eurystomus orientalis* was identified in proximity to the Development Site. The individuals were utilising hollows in trees outside of the proposal footprint. Based on the bird surveys undertaken and evaluation of habitat, none of these species are considered likely to occur in the Development Site regularly or rely on the habitats present.

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 site selection process for Dunedoo Solar Farm, a number of alternative locations were considered. IbVogt has 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 site was selected because it provides the optimal combination of:

- Low environmental constraints (predominantly cleared cropping land)
- Level terrain for cost effective construction
- High quality solar resource
- Compatible land use zoning of the land
- Low flood risk
- Road access
- On-site or good access to the transmission network
- High levels of available capacity on the grid transmission system.
- Land availability.

The Development Footprint is of a scale that allows for flexibility in the design, allowing ecological and other constraints to be avoided.

6.1.2 Proposal components – consideration of alternate modes or technologies

The LRET and REAP outline the commitment by both Australia and NSW to reduce GHG emissions and 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.

Photovoltaic 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. In terms of its impacts on biodiversity, PV solar has minimal construction footprint, mounts being either pile driven or on small footings. The largest footprint components are the perimeter tracks and inverter and switch station footings. The layout can be flexible to minimising impacts on site constraints.

6.1.3 Proposal planning phase – detailed design

A Preliminary Constraints Analysis (PCA) was conducted by NGH Environmental (2017), which informed the proposed site layout design.

Vegetation constituting the highest ecological constraints, such as forming components of TECs and providing threatened flora and fauna habitat, were avoided and minimised as far as practical by:

- Refining the layout to avoid vegetation clearing whenever possible, reducing the clearing footprint of the project
- Locating ancillary facilities in areas with minimal biodiversity values

- Making provisions for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the Development Site.

A detailed analysis of vegetation mapping was undertaken to determine the areas of vegetation zones constituting the highest quality. These areas of vegetation zones have been avoided, and thus avoided the generation of an offset credit requirement for the majority of the proposal. Evidence of avoidance can be seen in the easternmost paddocks being excluded from the footprint, due to their higher native understory component.

The final site layout and location has not been able to completely avoid all areas of biodiversity value. The preferred option for the connection of the transmission line was directly into the existing 132kv transmission line in the South. The only other option was to connect to the TransGrid substation directly across the south of the Development Site. This option would require removal of native vegetation that could not be avoided.

The final design footprint is detailed in Appendix I.

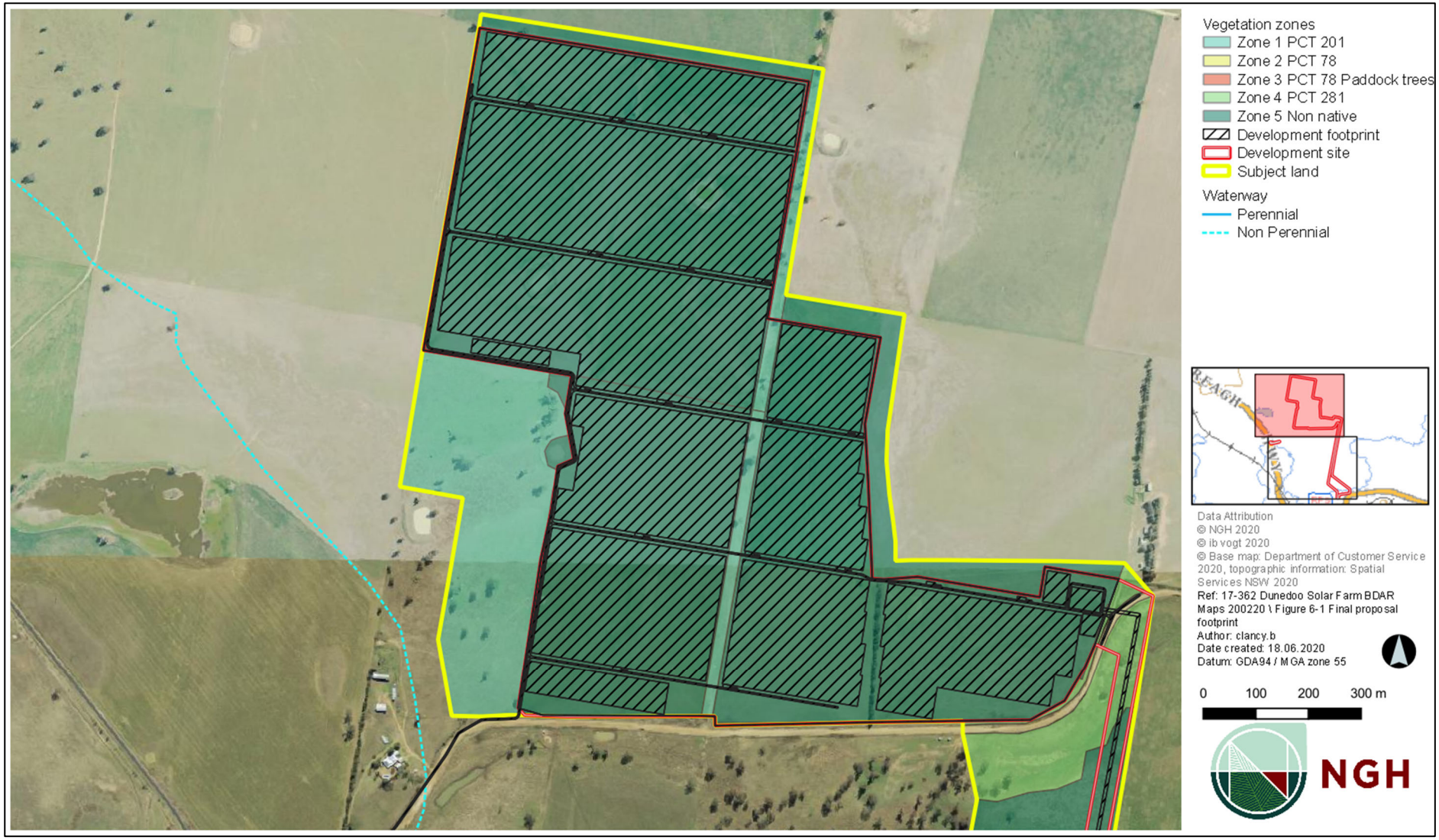

Figure 6-1 Final project footprint – North

Figure 6-2 Final project footprint – South

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.

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Table 7-1 Potential impacts to 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
Direct impacts					
Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks)	Up to 0.91 ha	Regular	Construction	• White Box, Yellow Box, Blakely's Red Gum Grassy Woodland. • Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions. • Dollarbird	• 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	Up to 0.91 ha	Regular	Construction, Operation	• White Box, Yellow Box, Blakely's Red Gum Grassy Woodland. • Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions. • Dollarbird	• Direct loss of native fauna • Decline in local fauna populations
Injury or death of fauna	Up to 0.91 ha	Regular	Construction	Dollarbird	• Direct loss of native fauna • Decline in local fauna populations
Removal of habitat features e.g. HBTs	Up to 0.91 ha including 1 HBT to be impacted	Regular	Construction	Dollarbird	• Direct loss of native fauna habitat • Injury and mortality of fauna during clearing of habitat features

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
Shading by solar infrastructure	Up to 0.91 ha	Regular	Operational Phase: Long-term	• White Box, Yellow Box, Blakely's Red Gum Grassy Woodland. • Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	• Modification of native fauna habitat • Potential loss of ground cover resulting in unstable ground surfaces and sedimentation of adjacent waterways.
Existence of permanent solar infrastructure	Up to 0.91 ha	Regular	Operational Phase: long-term	• White Box, Yellow Box, Blakely's Red Gum Grassy Woodland. • Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	• Modification of habitat beneath array (entirely 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

The changes in vegetation integrity scores as a result of clearing are documented for each vegetation zone in **Error! Reference source not found.** below.

Table 7-2 Current and future vegetation integrity scores for each vegetation zone within the Development Site

Zone ID	PCT/Zone	EEC and/or threatened species habitat?	Area Impacted (ha)		Area Zone (ha)	Current vegetation Integrity Score	Future vegetation Integrity Score
			Option 1	Option 2			
1	201	EEC	0.06	0.06	1.86	46.7	0
2	78	No	0.26	0.21	4.23	46.9	0
4	281	EEC	0.58	0.58	2.18	47.3	0

The future vegetation integrity scores have been considered precautionarily, and account for complete removal of the vegetation within the footprint.

7.1.2 Loss of species credit species habitat or individuals

No Species Credit Species are considered impacted by the proposal, thus do not generate a credit requirement.

7.1.3 Loss of hollow-bearing trees

23 Hollowing bearing trees (HBTs) were recorded within the Development Site. One of these hollow bearing trees occur within the Development Footprint and would be removed by the proposal. The tree, a River Red Gum *Eucalyptus camaldulensis* contains one small and one medium hollow.

7.2 INDIRECT IMPACTS

Indirect impacts of the proposal include soil and water contamination, creation of barriers to fauna movement, or the generation of excessive dust, light or noise. Table 7-3 below details the type, frequency, intensity, duration and consequence of the direct and indirect impacts of the proposal. Indirect impact zones are mapped on Figure 7-1 and Figure 7-2.

Table 7-3 Potential impacts to 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	• White Box, Yellow Box, Blakely's Red Gum Grassy Woodland. • Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions.	• Direct loss of native flora and fauna habitat • Injury and mortality of fauna during clearing of fauna habitat and habitat trees • Disturbance to stags, fallen timber, and bush rock • Increased edge effects
Reduced viability of adjacent habitat due to edge effects	Unknown	Constant	Operational Phase: Long-term	• White Box, Yellow Box, Blakely's Red Gum Grassy Woodland. • Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions.	• Direct loss of native flora and fauna habitat • Injury and mortality of fauna during clearing of fauna habitat and habitat trees • Disturbance to stags, fallen timber, and bush rock • Increased edge effects
Reduced viability of adjacent habitat due to noise, dust or light spill	Unknown	Rare	Operational Phase: Short-term	• White Box, Yellow Box, Blakely's Red Gum Grassy Woodland. • Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions.	• May alter fauna activities and/or movements • Loss of foraging or breeding habitat • Inhibit the function of plant species, soils and dams
Transport of weeds and pathogens from the site to adjacent vegetation	Unknown	Irregular	Construction & Operational Phase: Long-term	• White Box, Yellow Box, Blakely's Red Gum Grassy Woodland. • Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions.	• Degradation of White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Fuzzy Box Woodland. • Weed encroachment.

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)					
Increased risk of starvation, exposure and loss of shade or shelter	Unknown	Rare	Construction & Operational Phase: Long-term	• White Box, Yellow Box, Blakely's Red Gum Grassy Woodland. • Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions.	• Loss of foraging habitat.
Loss of breeding habitats	1 HBT	Constant	Construction & Operational Phase: Long-term	• White Box, Yellow Box, Blakely's Red Gum Grassy Woodland. • Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions.	• Loss of potential breeding habitat.
Earthworks and mobilisation of sediments	Unknown	Regular	Construction	• White Box, Yellow Box, Blakely's Red Gum Grassy Woodland. • Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions.	• Erosion and sedimentation and/or pollution of soils, dams and downstream habitats.
Cumulative loss of native vegetation, habitat and competition for remaining resources from other developments including rural land clearing	Up to 0.91 ha 1 HBT to be impacted	Constant	Construction & Operational Phase: Long-term	• White Box, Yellow Box, Blakely's Red Gum Grassy Woodland. • Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions.	• Loss of foraging and potential breeding habitat

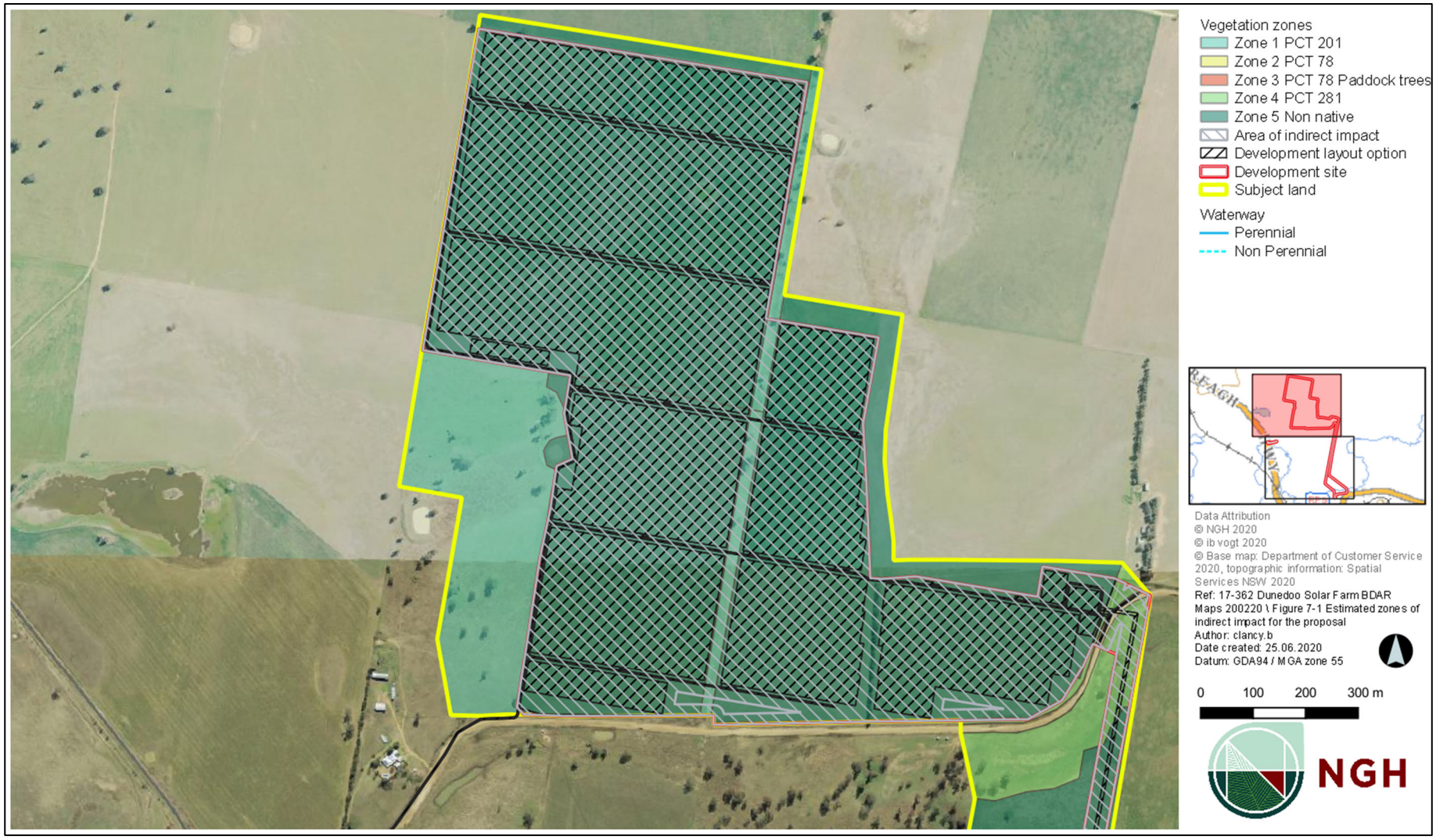

Figure 7-1 Estimated zones of indirect impact for the proposal - North

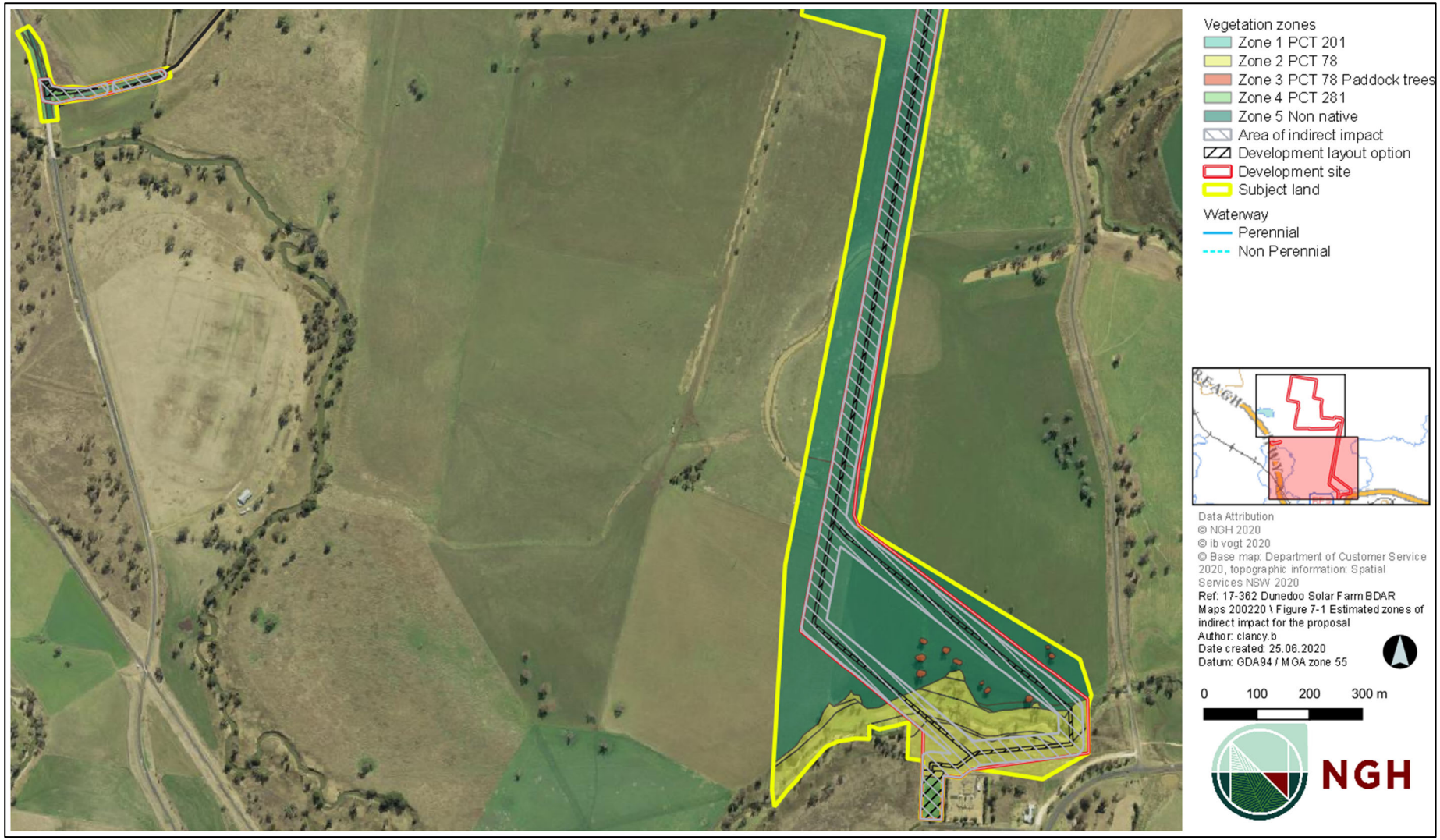

Figure 7-2 Estimated zones of indirect impact for the proposal - South

7.3 PRESCRIBED IMPACTS

The BC Regulation (clause 6.1) identifies actions that are prescribed as impacts to be assessed under the Biodiversity Offsets Scheme (BOS). The following prescribed impacts are relevant to the proposal:

- Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of these species across their range
- Impacts of 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 human made structures or non-native vegetation
- 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

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 connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

The remnant vegetation along the western edge of the Development Site, immediately to the south of the Development Site, and the canopy trees occurring in a north-south line in the centre of the Development Site have been avoided entirely, such that no tree removal will be required for the construction of the solar farm. Further, the proposed transmission easement has avoided the removal of canopy trees where possible by being designed in previously cleared areas. The only location where the proposal intersects with canopy trees is within the riparian corridor of the Talbragar River, and tree removal in this area will be minimal. As a result of the avoidance of these areas of vegetation, connectivity to be maintained across the landscape.

River Red Gum riparian vegetation along Talbragar River, Fuzzy Box woodland along the western side of the Development Site and Rough-Barked Apple - red gum - Yellow Box woodland to the south of the site provide corridors of habitat connectivity for mobile fauna species. The Development Footprint intersects with this habitat in the 40 m wide easement for the transmission line across the Talbragar River. There would also be some short-term, indirect disturbance associated with construction and long-term disturbance would occur as the permanent removal of 1 hollow-bearing tree. Fauna utilising this corridor for movement such as the Masked Owl would be considered unlikely to be impacted as a result of the proposed clearing, due to the already fragmented and degraded nature of the vegetation. The proposal is not considered likely to exacerbate this impact such that threatened species would not continue to utilise the habitat as a movement corridor.

7.3.2 Impacts of development on the movement of threatened species that maintains their life cycle

The remnant vegetation along the western edge of the Development Site, immediately to the south of the Development Site, and the canopy trees occurring in a north-south line in the centre of the Development Site have been avoided entirely, such that no tree removal will be required for the construction of the solar farm. Further, the proposed transmission easement has avoided the removal of canopy trees where possible by being designed in previously cleared areas. The only location where the proposal intersects with canopy trees is within the riparian corridor of the Talbragar River, and tree removal in this area will be minimal. As a result of the avoidance of these areas of vegetation, connectivity to be maintained across the landscape.

The Masked Owl is a highly mobile species with a large home range. Individuals were detected during the initial surveys in December, but not during the breeding period in August, indicating that the individuals on site breed in a location outside of the Development Site. The proposal would remove one hollow-bearing tree, which contains hollows large enough to support the species' breeding. These impacts would occur within the riparian corridor, where an approximate 40 m corridor will be cleared in order to connect the transmission line to the substation. The species and others would continue to utilise the Development Site and surrounding habitats as movement corridors.

7.3.3 Impacts of development on the habitat of threatened species or ecological communities associated with human made structures

No impacts to threatened species whose habitat is associated with human made structures (such as microchiropteran bats utilising bridges) are considered to occur. Targeted surveys did not detect threatened amphibians within human made dams, and no bridges or culverts would be impacted as a result of the works.

7.3.4 Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities

While two dams will be filled in as a result of the proposal, impacts to the Talbragar River and any other aquatic fauna habitat have been avoided. The transmission line will be constructed over the river, meaning that there will be no impact to water quality as a result of the works. The dams to be filled in are not considered to be important to the nearby areas of threatened ecological community. The proposal is not considered to impact on water quality, water bodies and hydrological processes that sustain threatened species and ecological communities.

No threatened flora or fauna dependent on water bodies were detected within the Development Site. The Talbragar River does not form part of any threatened ecological communities, and no threatened species listed under the fisheries management act are considered likely to occur

Construction of the proposal would not directly affect surface water quality. Indirectly, the proposed works would involve a range of activities that would disturb soils and potentially lead to sediment laden runoff, affecting local water ways during rainfall events. These potential impacts are unlikely to significantly impact water quality. The use of fuels and other chemicals on site pose a risk of surface water contamination in the event of a spill. Chemicals used onsite would include fuels, lubricants and herbicides, none of which are considered difficult to manage.

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). There would be a low risk of contamination in the event of a chemical spill (fuels, lubricants, herbicides etc.) as storage and emergency handling protocols would be implemented.

The proposal is not likely to impact the bioregional persistence of any threatened flora, fauna or ecological communities with the implementation of the recommended mitigation measures.

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

As construction work within the vegetated areas of the site has been avoided as far as is practical, the risk of vehicle strike to threatened fauna is considered low. Additionally, comprehensive surveys have been conducted to determine the presence of threatened fauna, which were not identified on site. Vehicle

movements will occur during the construction process, however the volume and duration of the vehicles on site is not considered high. As such, the overall risk of vehicle strike to threatened species and components of communities is considered low. Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation

Impacts from vehicle strikes have largely been avoided by not proposing construction within the majority of vegetated areas. Where works do occur in or in proximity to vegetation, mitigation measures will be implemented to enforce a site speed. With the recommended mitigation measures, it is therefore not likely that vehicles associated with the proposal will have a substantive impact on this species.

7.4 IMPACTS TO BIODIVERSITY VALUES THAT ARE UNCERTAIN

The majority of the Development Footprint will consist of solar panels. The impacts of shading and diversion of rainfall runoff from the panels themselves is largely unknown. This aspect is discussed in more detail under section 7.5 below in relation to potential impacts on the composition and cover abundance of groundcover.

For the purpose of this BDAR report, the entire Development Footprint is assumed to be removed however, as the indicative layout shows, substantial peripheral areas are likely to be unimpacted and it is likely that a number of perennial native species will persist underneath the solar arrays. Certainly, only a minor proportion of the seed bank will be impacted, given the limited excavation proposed.

In this assessment an assumption has been made that all vegetation within the Development Footprint would be removed. This is a 'worst case' and highly conservative approach. There is currently limited ability to vary this assumption without specific scientific data to justify a lesser impact; such as the results of ground cover monitoring beneath the solar array. Therefore, the costs associated with purchasing and retiring ecosystem and species credits or the need for offset areas is currently an 'over estimated result' of the impacts of this solar farm undertaken to address current uncertainty.

7.5 IMPACTS TO MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

7.5.1 Threatened Ecological Communities

One EPBC Act listed community was recorded during the surveys, that of White Box, Yellow Box, Blakely's Red Gum Grassy Woodland (Box-gum Woodland). Approximately, 0.58 ha of this community would be impacted by the construction of the transmission line, in proximity to the substation. An EPBC Assessment of significance was completed for White Box, Yellow Box, Blakely's Red Gum Grassy Woodland (APPENDIX H**Error! Reference source not found.**) and concluded that a significant impact was unlikely based on the basis that:

- The amount of habitat to be removed or disturbed by the proposal is relatively small in the context of the greater area of habitat that would remain;
- No fragmentation or isolation of habitat would occur;
- The proposal would not modify or destroy abiotic factors;
- The proposal would not cause a substantial change in the species composition;
- The proposal would not cause a substantial reduction in the quality of the ecological community.

No referral is considered necessary to DAWE.

7.5.2 Threatened Species

The EPBC Act 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 utilised in Table 7-4 as it applies to the proposal. Impact areas that score five or more using this tool contain habitat critical to the survival of the Koala. The assessment in Table 7-4 resulted in a score of 5 and, as such, habitat within the Development Site is not critical to the survival of the Koala and an assessment of significant impact according to the EPBC Act significant impact criteria is not required.

Table 7-4 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.	✓
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.	✓ Woodland and riparian areas contain several Koala feed tree species including River Red Gum *Eucalyptus camaldulensis*.
	+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.	✓ Some areas that would be impacted are connected to outside bushland that exceeds 1000 ha.
	+1 (medium)	Area is part of a **contiguous landscape** < 1000 ha, but ≥ 500 ha.	
	0	None of the above.	

Attribute	Score	Inland	Applicable to the proposal?
	(low)		
Key existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. 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.	
	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.	
Total	**5**	**Decision: Habitat not critical to the survival of the Koala—referral not required**	

7.5.3 Migratory Species

One (1) EPBC marine listed species was recorded during the surveys; Dollarbirds were recorded at four separate locations within vegetation outside the Development Footprint. It is considered unlikely that the species would utilise any habitats within the Development Footprint.

An assessment of significant impact was completed for the Dollarbird (APPENDIX H) and concluded that a significant impact was unlikely on the basis that the proposal would not:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

An EPBC referral is not considered necessary. No other EPBC Act listed species were detected or considered likely to occur within the Development Site.

7.6 ASSUMPTIONS AND PREDICTIONS

It is possible that some species were not recorded during the survey due to the nature of faunal movements, however all surveys were undertaken within the time periods stipulated as suitable within the OEH BioNet database, and in accordance with the BAM and relevant guidelines. Based on the repetition of surveys over multiple seasons, the assumptions made within the BDAR are considered accurate.

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 (Gibbons and Lindenmayer, 2000). 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 are 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 **Error! Reference source not found.**.

8.1.1 Direct impacts from the clearing of vegetation and habitats

- Time works to avoid critical life cycle events;
- 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;
- Relocate habitat features (fallen timber, hollow logs) from within the Development Site.

8.1.2 Indirect impacts

- 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;
- Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise;
- Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill;
- Adaptive dust monitoring programs to control air quality;
- Temporary fencing to protect significant environmental features such as riparian zones;
- Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas;
- Staff training and site briefing to communicate environmental features to be protected and measures to be implemented;
- Preparation of a vegetation management plan to regulate activity in vegetation and habitat adjacent to the proposed development;
- Erosion and sediment controls;
- Making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the development site.

8.1.3 Prescribed impacts

- Appropriate landscape plantings of local indigenous species to replace loss of planted vegetation;
- Sediment barriers and spill management protocols to control the quality of water runoff from the site into the receiving environment;
- 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 spring to summer • 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	• 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	Construction	Regular	Contractor	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
heavy machinery, is preferable in situations where partial clearing is proposed	• In areas to clear adjacent to areas to be retained, chainsaws would be used rather than heavy machinery to minimise risk of unauthorised disturbance					
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 • 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 • Construction would cease if dust observed being blown from site until control measures were implemented • 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
Hygiene protocols to prevent the spread of weeds or	• A Weed Management procedure would be developed for the proposal to prevent and	Construction, Operation	Regular	Contractor	Moderate	Weed encroachment

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
pathogens between infected areas and uninfected areas	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 • Any occurrences of pathogens such as Myrtle Rust and Phytophthora would be monitored, treated, and reported. • The weed management procedure would be incorporated into the Biodiversity Management Plan.					
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	• Site induction • 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 • 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 • Rehabilitation of disturbed areas	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
Erosion and sediment controls	• An erosion and sediment control plan would be prepared in conjunction with the final design and implemented	Construction	Regular	Contractor	Moderate	Impacts may occur if erosion and sedimentation control plan not implemented.
Making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the Development Site.	• Retained native vegetation would be considered as an offset site	Operation	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 • Spill management procedures would be implemented.	Construction	Regular	Contractor	Moderate	Impacts may occur to waterway if erosion and sedimentation control plan not implemented.
Appropriate landscape plantings of local indigenous species to replace loss of planted vegetation	• Landscape plantings will be comprised of local indigenous species.	Operation	Regular	Client	Moderate	Plants not surviving
Staff training and site briefing to communicate impacts of traffic strikes on native fauna.	• Awareness training during site inductions regarding enforcing site speed limits. • Site speed limits to be enforced to minimise fauna strike.	Construction, Operation	Regular	Contractor	Moderate	Fauna strikes from vehicles

8.2 ADAPTIVE MANAGEMENT STRATEGY

Adaptive management during construction and operation will be receptive to any new and relevant data that may arise through ongoing assessment and monitoring and is key to the successful implementation of the relevant management plans. This will allow ongoing flexibility to manage objectives, allow for relevant feedback and modifications. Construction management plans will contain management plans for flora and fauna, which will have an adaptive management component. This includes measures to monitor predicted impacts of vehicle strikes, thresholds for species mortality, based on relevant literature, which will trigger adaptive management actions, and any measures proposed to mitigate potential impacts.

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, or
- 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, or
- 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

Two threatened ecological community will be impacted on 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 Grassy Woodland, and
- Fuzzy Box Woodland TEC.

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. **Error! Reference source not found.** shows the location of the Box Gum Woodland in context to the Development Site.

a) **the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII**
The Development Site contains approximately 2.18 ha of vegetation which conforms to the listing of Box Gum Woodland. The proposal avoids the highest quality areas of this community in the southern part of the Development Site where large patches of good condition vegetation are present. Avoiding the 0.58 ha patch of Box Gum Woodland to be impacted would require moving proposal into larger more intact patches of remnant vegetation.

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**

Approximately, 0.58 ha of Box Gum Woodland would be directly impacted by the proposal. Indirect impacts are listed in Table 9-1. This vegetation is highly modified and generally lacks native understory due to grazing and pasture improvement practices. The vegetation integrity score for this patch is 47.3.

Zone ID	Zone Description	Patch size	Composition score	Structure score	Function score	Vegetation Integrity Score
4	PCT 281	0.58	67.1	78.6	20.1	**47.3**

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 1000ha, and then 10,000ha, surrounding the proposed Development Footprint

Using GIS and State Vegetation Mapping (VIS_4468 & 4469), it is estimated that 55 ha of Box Gum Woodland occurs within an area of 1000 ha surrounding the proposed Development Footprint, and 1627 ha of Box Gum Woodland occurs within an area of 10 000 ha surrounding the proposed Development Footprint.

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 32,801 ha 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 0.58 ha is proposed to be removed by the development, which is less than 0.002% 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

It is predicted that the proposal could have impacts on,

- surface water flows across the ground due to the presence of solar panels,
- change in light levels reaching the ground due to shading of panels,
- modification to ground moisture levels where solar panels may block or concentrate rain over certain areas.

The proposal could potentially benefit the Box Gum Woodland by removing disturbances caused by farming activities such as application of fertilisers and exclusion of stock.

There is little scientific information on the effects of solar farms on these factors. Until sufficient monitoring of Solar farms is carried out, it is largely unknown whether solar farms are likely to have a detrimental impact on abiotic factors. A 'worst case' assumption would be that alterations to sunlight reaching the ground and changes to surface water flows due to the large surface area of solar panels over the ground, could modify abiotic factors necessary for survival of the community .

A review of the National Recovery Plan for Box Gum Woodland indicates that;

- Altered hydrological regimes may lead to impacts,
- Prolonged shading may lead to impacts and
- Mowing and slashing associated with managing grasslands may lead to impacts

It therefore has to be assumed (without scientific evidence suggesting otherwise) that this proposal may lead to modification and destruction of important abiotic factors for preserving the integrity of Box Gum Woodland onsite.

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 0.58 ha of Box Gum Woodland including moderate condition native canopy and native groundcovers. No introduced fire or flooding regimes would occur and no increase of natural occurrences of these events is anticipated from the development. The harvesting of plants will not occur within the remaining Box-gum woodland.

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

Up to 0.58 ha of Box Gum Woodland would be removed reducing the vegetation quality and integrity of this patch. No further impacts would occur to remaining Box Gum Woodland in the locality.

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. The small isolated patch to be removed would not cause further fragmentation to areas of Box Gum Woodland in the locality.

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

The 0.58 ha of Box-gum woodland to be removed will be offset by 14 Ecosystem Credits that will be used for management of another area of Box Gum Woodland in the same IBRA region.

Conclusion:

The proposal avoids the highest quality areas of this community in the southern part of the Development Site where large patches of good condition vegetation are present. Extensive areas of Box Gum Woodland occur within 1000 ha and 10,000 ha of the Development Site.

9.2.2 Fuzzy Box Woodland TEC

An assessment of the impacts to the *Fuzzy Box Woodland TEC* was undertaken. **Error! Reference source not found.** shows the location of the *Fuzzy Box Woodland TEC* within the Development Site.

a) **the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII**
The Fuzzy Box Woodland within the Development Site (1.86) occurs in a range of conditions, with moderate condition patches containing both native canopy and native groundcovers and low condition patches lacking native overstorey and having exotic groundcovers. The proposal avoids the highest quality areas of this community in the north-western part of the Development Site where large patches of moderate condition vegetation are present. Avoiding the 0.06 ha patch of Fuzzy Box Woodland to be impacted would require moving proposal into larger more intact patches of remnant vegetation.

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**
0.06 ha of Fuzzy Box Woodland would be directly impacted by the proposal. Indirect impacts are listed in Table 9-2. This vegetation is highly modified and generally lacks native understory due to grazing and pasture improvement practices. The vegetation integrity score for this patch is 46.7.

Zone ID	Zone Description	Patch size	Composition score	Structure score	Function score	Vegetation Integrity Score
1	PCT 201	0.06	65.7	60.6	25.6	**46.7**

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 DPIE for the extent of Fuzzy Box 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 0 ha of Fuzzy Box Woodland occurs within an area of 1000 ha surrounding the proposed Development Footprint, and 92 ha of Fuzzy Box Woodland occurs within an area of 10 000 ha surrounding the proposed Development Footprint.

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 3447 ha of Fuzzy Box Woodland occurs within the Lower Slopes IBRA Subregion. Vegetation mapped from aerial imagery is assumed to be in moderate to good condition. Up to 0.06 ha is proposed to be removed by the development, which is less than 0.001% 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**

Using GIS Vegetation Mapping, it is estimated that 41 ha of Fuzzy Box Woodland occurs in two reserves in the Lower Slopes Subregion, and that 595 ha occurs in four reserves in the NSW South Western Slopes Bioregion.

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

It is predicted that the proposal could have impacts on,

- surface water flows across the ground due to the presence of solar panels,
- change in light levels reaching the ground due to shading of panels,
- modification to ground moisture levels where solar panels may block or concentrate rain over certain areas.

The proposal could potentially benefit the Fuzzy Box Woodland by removing disturbances caused by farming activities such as application of fertilisers and exclusion of stock.

There is little scientific information on the effects of solar farms on these factors. Until sufficient monitoring of Solar farms is carried out, it is largely unknown whether solar farms are likely to have a detrimental impact on abiotic factors. A 'worst case' assumption would be that alterations to sunlight reaching the ground and changes to surface water flows due to the large surface area of solar panels over the ground, could modify abiotic factors necessary for survival of the community.

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 0.06 ha of Fuzzy Box Woodland which would permanently remove the characteristic overstory species of *Eucalyptus microcarpa* and *E. conica* in these areas. These areas have an exotic understory and few native groundcover species would be likely to remain. No introduced fire or flooding regimes would occur and no increase of natural occurrences of these events is anticipated from the development. The harvesting of plants will not occur within the remaining Fuzzy Box Woodland.

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

Up to 0.06 ha of Fuzzy Box Woodland would be removed reducing the vegetation quality and integrity of this patch. No further impacts would occur to remaining Fuzzy Box Woodland in the locality.

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

The small fragmented patches of Fuzzy Box Woodland in the Development Site are already isolated within the agricultural landscapes. The small isolated patch to be removed would not cause further fragmentation to areas of Fuzzy Box Woodland in the locality.

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

The proposal will generate 1 Ecosystem Credit impacts to Fuzzy Box Woodland which will contribute to the conservation of higher quality patches of the community in the same IBRA region.

Conclusion:
The proposal would remove 0.06 ha of Fuzzy Box Woodland. The proposal avoids the highest quality areas of this community in the southern part of the Development Site where large patches of good condition vegetation are present. Extensive areas of Fuzzy Box Woodland occur within 10,000 ha of the Development Site.

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 vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an endangered or critically endangered ecological community, or
- 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
- 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 **Error! Reference source not found.** and mapped on **Error! Reference source not found.**.

Table 10-1 PCTs and vegetation zones that require offsets

Zone ID	PCT ID	PCT name	Zone area (ha)		Vegetation integrity score	Ecosystem credits required	
			Option 1	Option 2		Option 1	Option 2
1	201	Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	0.06	0.06	46.7	1	1
2	78	River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	0.26	0.21	46.9	5	4
4	281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	0.58	0.58	47.3	14	14

The full Biodiversity Credit Report generated by the BAM Calculator is provided in APPENDIX D.

10.1.2 Species credits

An offset is required for the threatened species impacted by the development that require species credits. As no species credit species were present on site, the proposal does not generate a species credit offset requirement.

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 IMPACTS NOT REQUIRING AN OFFSET

Impacts to PCTs that do not meet the thresholds identified in Section 10.1.1 do not require offsets. These PCTs and vegetation zones are identified in Table 10-2 and mapped on Figure 10-1.

Table 10-2 PCTs and vegetation zones that do not require offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score
3	78	River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	0	-

10.3 AREAS NOT REQUIRING ASSESSMENT

Identification of areas not requiring assessment in accordance with BAM Section 10.4 i.e. land without native vegetation.

These areas are mapped on Figure 10-1, Figure 10-2, Figure 10-3 and Figure 10-4.

Figure 10-1 Impacts requiring offset, not requiring offset and not requiring assessment – North (Option 1)

Figure 10-2 Impacts requiring offset, not requiring offset and not requiring assessment – South (Option 1)

Figure 10-3 Impacts requiring offset, not requiring offset and not requiring assessment – North (Option 2)

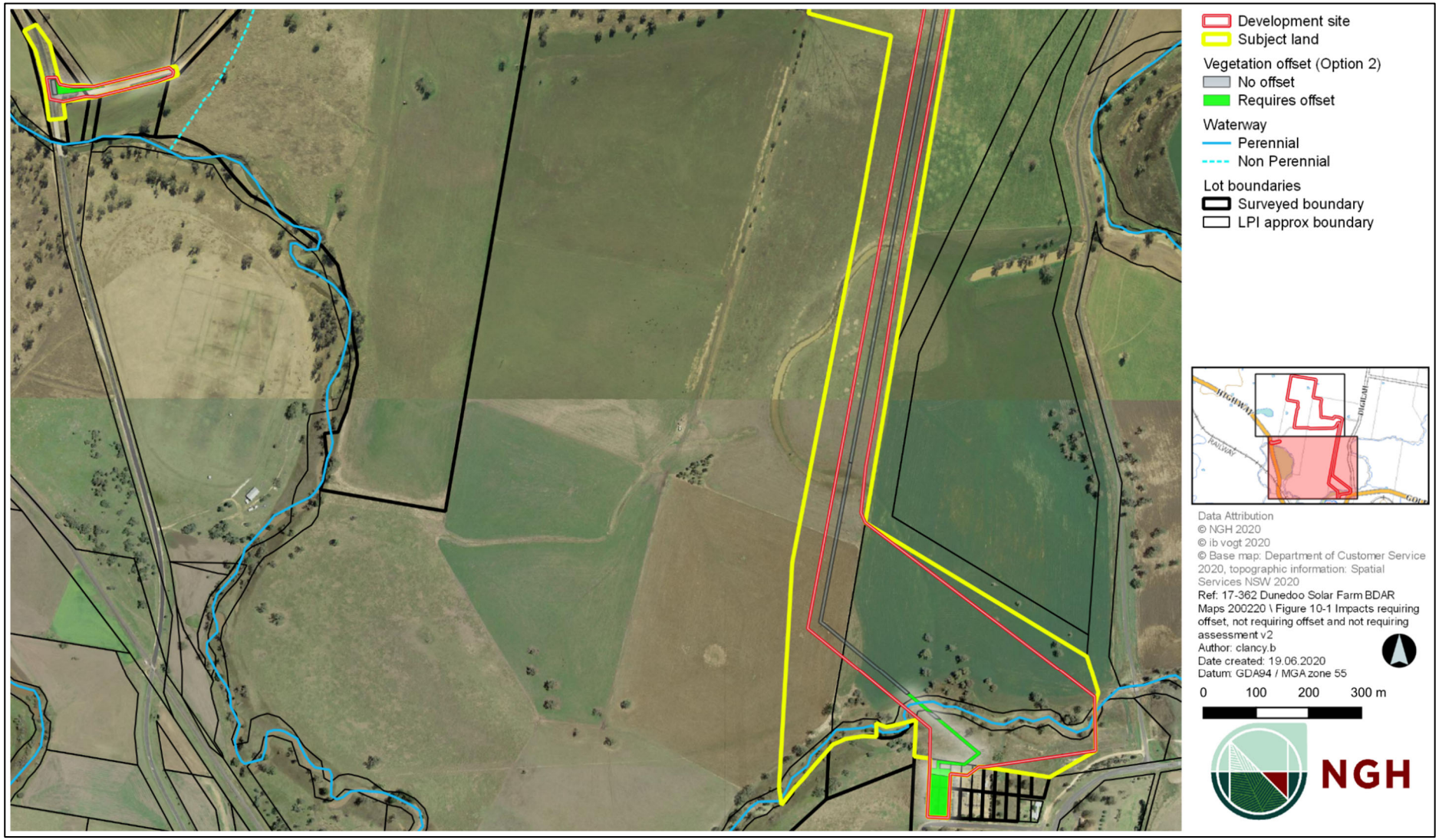

Figure 10-4 Impacts requiring offset, not requiring offset and not requiring assessment – South (Option 2)

11 CONCLUSION

NGH has prepared this BDAR on behalf of IbVogt for the Dunedoo Solar Farm in Dunedoo, NSW. The purpose of this BDAR was to address the requirements of the BAM, developed for Major Projects, and to address the biodiversity matters raised in the SEARs. In this BDAR, biodiversity impacts have been assessed through:

- Comprehensive mapping and assessment completed in accordance with the BAM;
- The identification of two threatened species 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 up to 14 Ecosystem Credits within the Development Site for impacts to Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (PCT 281);
- The generation of 1 Ecosystem Credits within the Development Site for impacts to Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion (PCT 201);
- The generation of up to 5 Ecosystem Credits within the Development Site for impacts to River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion (PCT 78).

The retirement of these credits will be carried out in accordance with the NSW Biodiversity Offsets Policy for Major Proposals, and will be achieved by either;

(d) Retiring credits under the Biodiversity Offsets Scheme
(e) making payments into the Biodiversity Conservation Fund
(f) funding a biodiversity action

12 REFERENCE LIST

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APPENDIX A LAND CATEGORY ASSESSMENT

15 July 2020

David Geering
Senior Conservation Planning Officer
Biodiversity Conservation Division - North West
Department of Planning Industry and Environment
PO Box 2111
Dubbo, NSW, 2640

David.geering@environment.nsw.gov.au

Dear David Geering

Re: 17-362 – Dunedoo Solar Farm

NGH has been engaged by ib vogt to undertake a Biodiversity Development Assessment Report (BDAR) for the proposed Dunedoo 66MW Photovoltaic Solar Farm. The development site is located approximately two kilometres north of Dunedoo, across the following lots within the Warrumbungle Shire Local Government Area;

- Lot 201/DP754291
- Lot 184/DP754291
- Lot 200/DP754291
- Lot 182/DP754291
- Lot 79/DP754309
- Lot 1/DP854326
- Lot 2/DP1075944
- Lot 2/DP854326
- Lot 140/DP754309
- Lot 11/DP130889
- Lot 5/DP130930
- Lot 181/DP754291
- Lot 186/DP754291
- Lot 7012/DP93290
- Lot 183/DP754291
- Lot 1/DP653327
- Lot 1/DP120659
- Lot 1/DP535659
- Lot 2/DP535659
- Lot 80/DP754309
- Lot 37/DP754309
- Lot 185/DP754291
- Lot 137/DP754309

These lots would be refined following confirmation of lot boundaries.

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*). Boundaries mapping Category 1-exempt

land on the Native Vegetation Regulatory Mapping are not yet publicly available. During the transitional period, accredited assessors may establish the categorisation of land for the agency head to consider, following the method utilised to develop the Native Vegetation Regulatory Map.

Category 1-exempt land is defined under the LLS act as;

- Land cleared of native vegetation as at 1 January or lawfully cleared after 1 January 2019
- Low Conservation Grasslands
- Land containing only low conservation groundcover (not being grasslands)
- 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 for the Dunedoo 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,

NGH Pty Ltd

Mitch Palmer
Acting Principal Ecologist
02 4917 3974
NGH Pty Ltd

Attachment 1

Methodology

An initial field assessment was 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 DFSI Spatial Services)
- 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
- State Vegetation Type Map: Central West / Lachlan Region Version 1.3. VIS_ID 4468 (OEH 2019)

Results

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 Dunedoo Locality • 1989 • 1992	• Clear evidence of cropping and grazing. • Clear evidence of significant groundcover modification. • Vegetation screening shown in Figure 6 is exempt land as it is not present in either the 1989 or 1992 aerial imagery.	• Woody vegetation present at 1989, 1992 and current aerial imagery.	N/A
2017 Land Use Dataset	Land use identified as; • Cropping where clear evidence of significant groundcover modification has occurred since 1989.	Land use identified as; • Grazing native vegetation.	N/A
NSW Woody vegetation extent	• Areas of woody vegetation regrowth that has occurred post 1989 following previous clearing events	• Woody vegetation present as at 1989 and 1992 aerial imagery	N/A
Native regulatory map • Sensitive regulated land • Vulnerable regulated land • Excluded land	• No sensitive regulated land, vulnerable regulated land or excluded land is within the proposal area.	N/A	N/A

In summary, the analysis of the above sources identified the following:

- Aerial imagery shows the proposal area has been continuously used for cropping and grazing over the past 30 years, with evidence of cropping and grazing shown in 1989 and 1992 aerial imagery (Figure 2 and Figure 3).
- The 2017 Land Use Dataset reveals the majority of the site as '3.3.0 Cropping' (inclusive of lot 137/DP754309, lot 140/DP754309, lot 1 DP854326, lot 80/DP754309, lot 37/DP754309 and lot 11/DP130889. A portion of lot 37/DP754309 is categorized as '2.1.0 Grazing native vegetation' (Figure 5).
- Field surveys conducted in July 2018 identified evidence of cropping and grazing (Figure 7 and Figure 8) with evidence of tropical grasses such as Consol love grass, Bambasti panic, Premier digit, Biserrula as well as areas of Lucerne.
- NSW Woody Vegetation extent 2011 shows scattered woody vegetation within the proposal area (Figure 4).
- The Native Vegetation Regulatory map does not identify any vulnerable or sensitive regulated land within the proposal area (Figure 6**Error! Reference source not found.**).

Conclusion

Based on the above data sources, there is evidence to suggest the development site within lot 137/DP754309, lot 140/DP754309, lot 1 DP854326, lot 80/DP754309, lot 37/DP754309 and lot 11/DP130889 has been under regular cropping, grazing, and pasture improvement since 1989.

The 2017 Land Use Dataset supports the primary land use for the proposal area for cropping. The 2017 Land Use map shows two sections of the site to be '2.1.0 Grazing Native Vegetation'. Woody vegetation and native regrowth/vegetation in the development site are considered to meet the definition of Category 2 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 land and Category 2 land has been produced as Figure 6

Figures

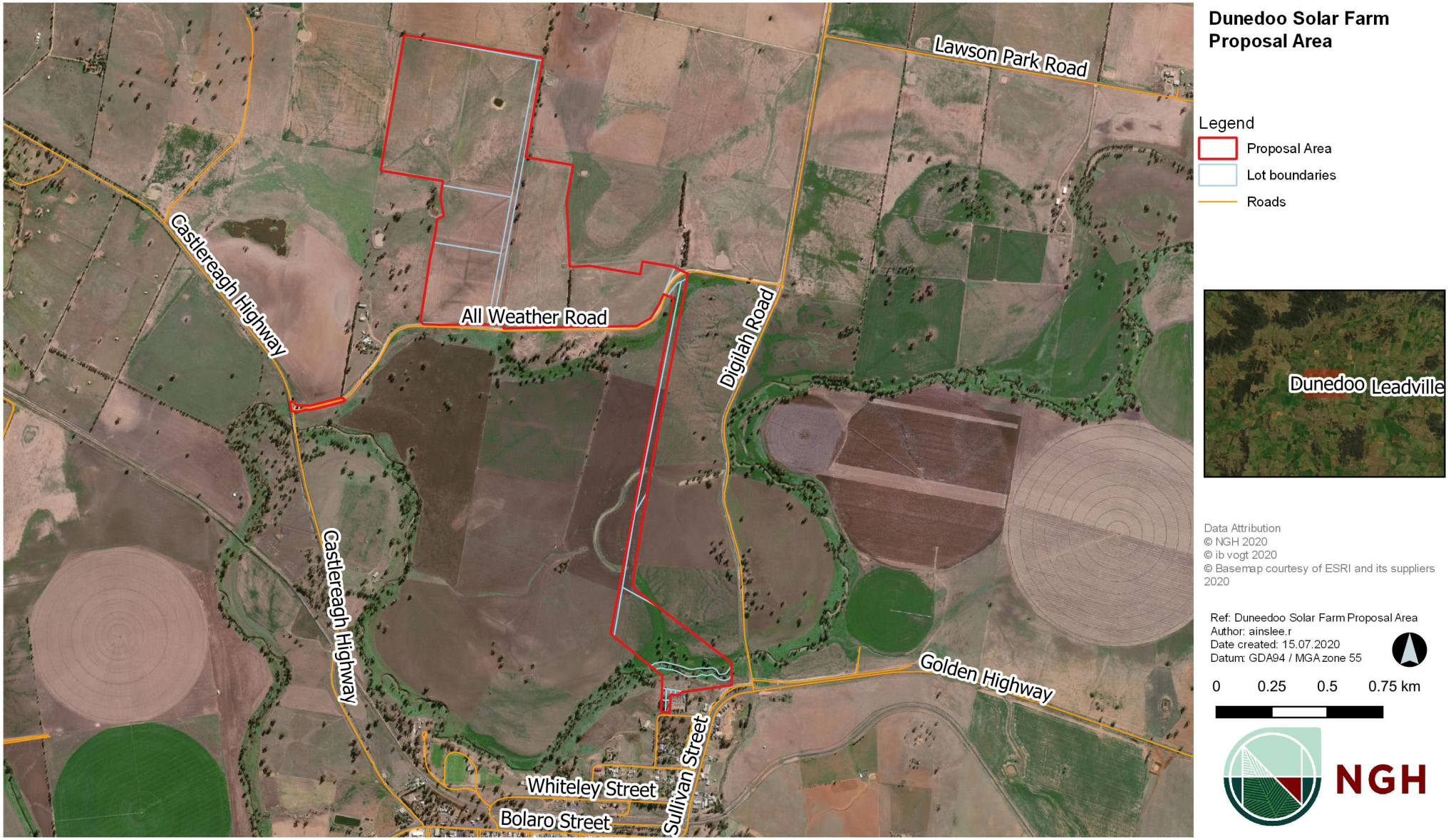

Figure 1 Dunedoo Solar Farm proposal area

Figure 2 1989 Aerial imagery (Department of Spatial Services)

Figure 3 1992 Aerial imagery (Department of Spatial Services)

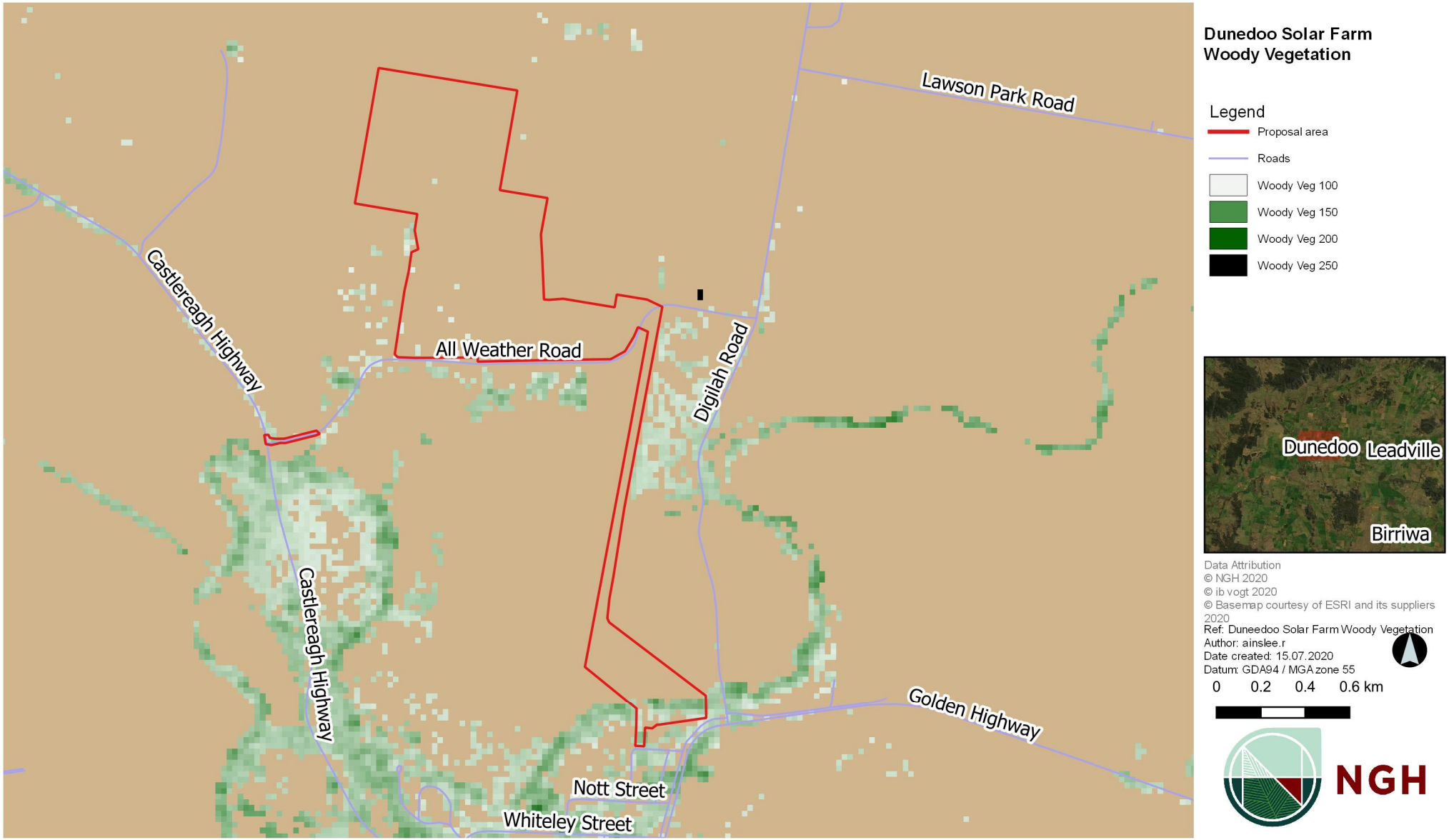

Figure 4 Woody vegetation (OEH, 2011)

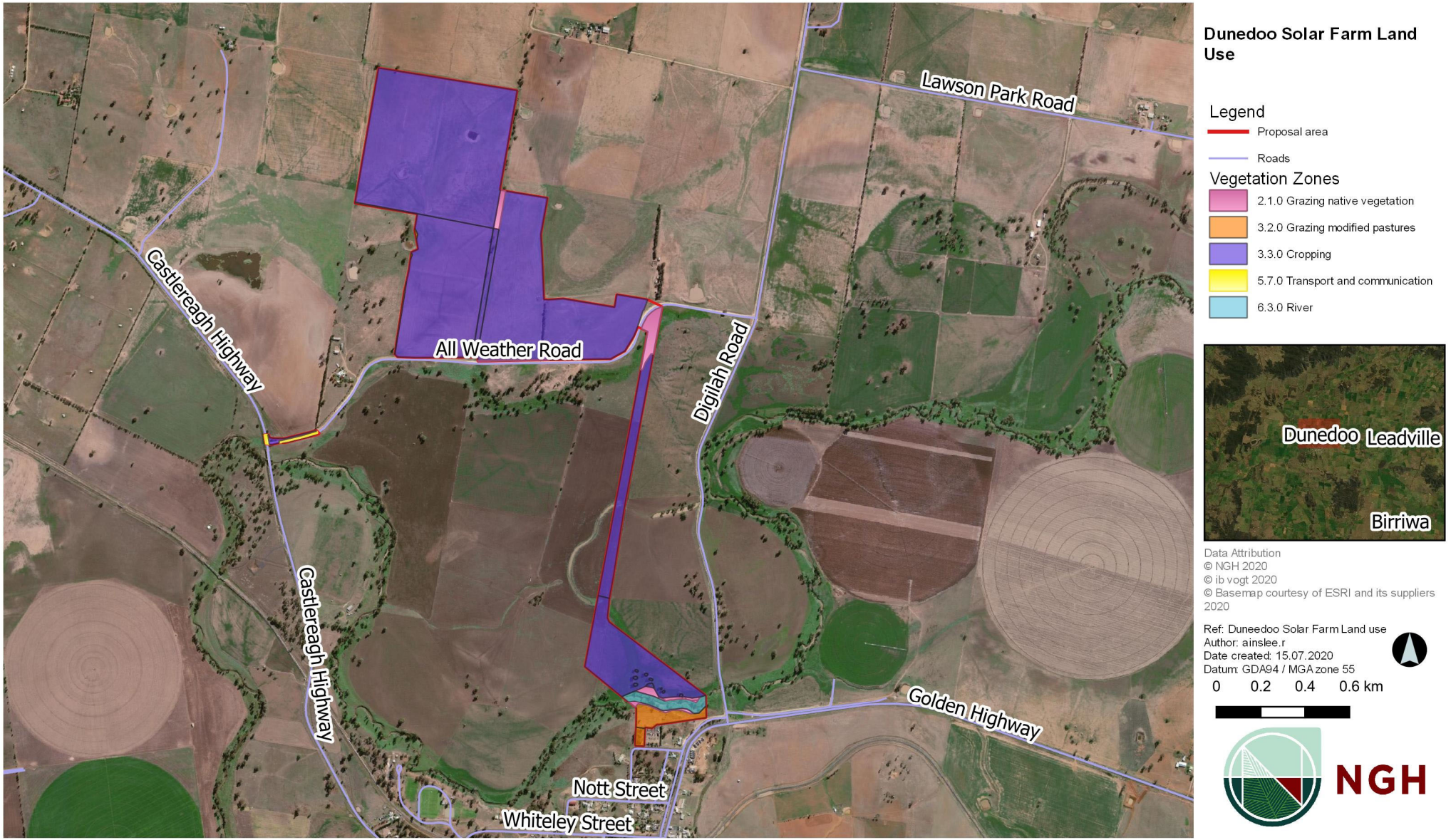

Figure 5 Land use

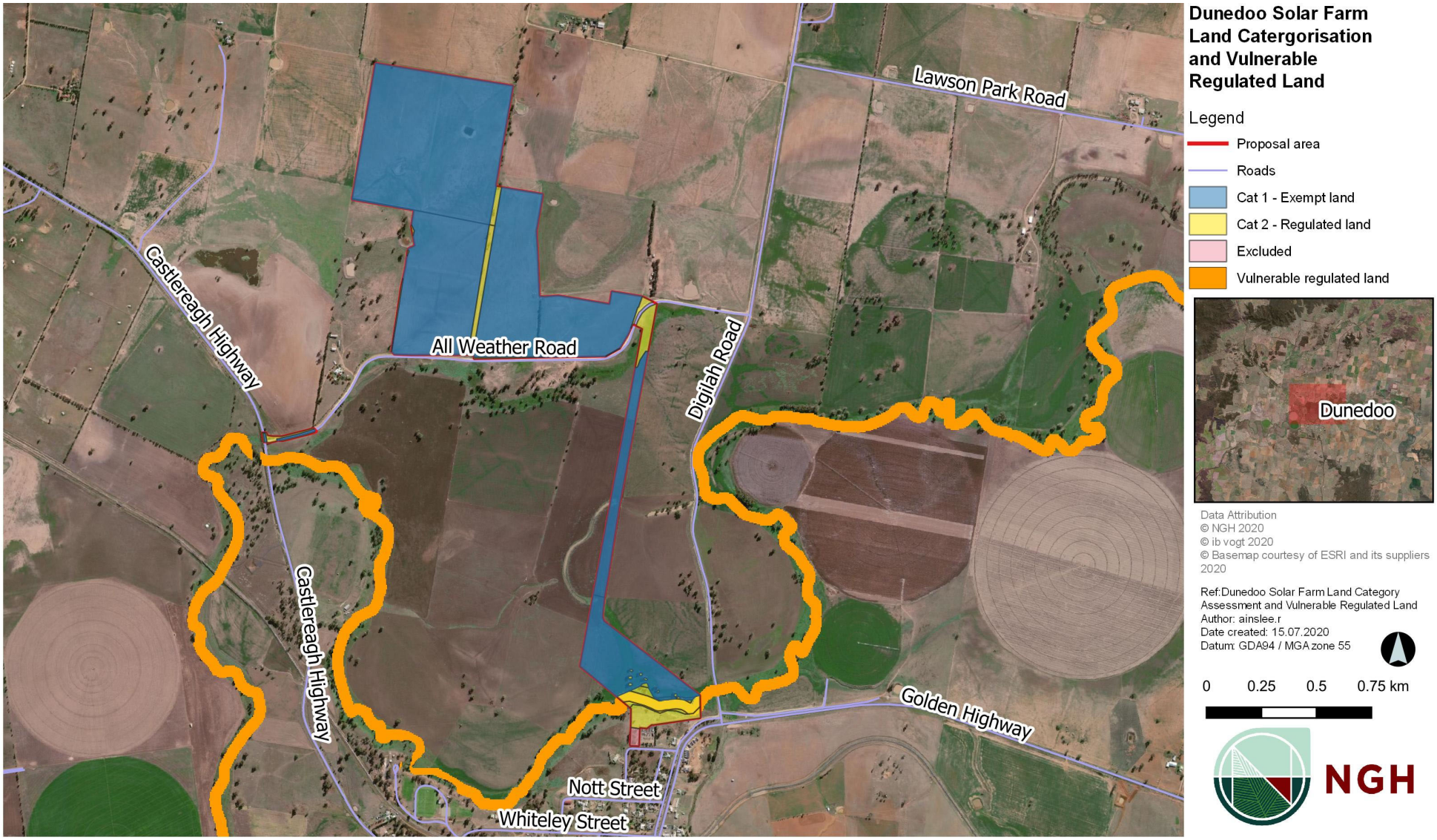

Figure 6 Development site and land categorisation and native vegetation regulatory mapping

Figure 7 Site photo with evidence of grazing/cropping

Figure 8 Site photo of Lucerne paddock

APPENDIX B SURVEY DATA

B.1 PLOT DATA

1.	Scientific Name	Common Name	Family	Plot DS1		Plot RRG2		Plot DS5		Plot DS4		Plot DS15		Plot DS16		Plot DS19	
				C	A	C	A	C	A	C	A	C	A	C	A	C	A
TREES																	
	Angophora floribunda	Rough-barked Apple	Myrtaceae					5									
	Eucalyptus camaldulensis	River Red Gum	Myrtaceae	15	2	25											
	Eucalyptus conica	Fuzzy Box	Myrtaceae											5			
	Eucalyptus melliodora	Yellow Box	Myrtaceae					10									
	Eucalyptus microcarpa	Western Grey Box	Myrtaceae									15		5		15	
SHRUBS																	
*	*Lycium ferocissimum*	African Boxthorn	Solanaceae	5								2	1	0.5	1	5	
	Sclerolaena muricata	Black Rolypoly	Chenopodiaceae									5	20	5		5	
FORBS																	
*	*Acetosella vulgaris*	Sheep Sorrel	Polygonaceae							0.1	5						
	Alternanthera denticulata	Lesser Joyweed	Amaranthaceae			0.1	3										
*	*Alternanthera pungens*	Khaki Weed	Amaranthaceae					0.5	50			0.1	5	1	50		
	Asperula conferta	Common Woodruff	Rubiaceae									0.5	50				
	Boerhavia dominii	Tarvine	Nyctaginaceae	0.2	20			0.5	50	0.2	20	0.1	5				
*	*Brassica spp.*		Brassicaceae	2	50			0.1	5	0.5	5					0.5	3

1.	Scientific Name	Common Name	Family	Plot DS1		Plot RRG2		Plot DS5		Plot DS4		Plot DS15		Plot DS16		Plot DS19	
				C	A	C	A	C	A	C	A	C	A	C	A	C	A
*	*Capsella bursa-pastoris*	Shepherd's Purse										0.5	50	0.5	50		
*	*Carthamus lanatus*	Saffron Thistle	Asteraceae							0.5	10	3	100	0.1	5		
	Chamaesyce drummondii	Caustic Weed	Euphorbiaceae									0.1	2				
	Convolvulus erubescens	Pink Bindweed	Convolvulaceae							0.1	5						
	Convolvulus graminetinus		Convolvulaceae			0.1	2										
*	*Cucumis myriocarpus*	Paddy Melon	Cucurbitaceae														
	Cymbonotus lawsonianus	Bear's Ear	Asteraceae							0.1	1						
	Desmodium varians	Slender Tick-trefoil	Fabaceae (Faboideae)									0.2	2				
	Dichondra repens	Kidney Weed	Convolvulaceae					1	100			2	100				
*	*Echium plantagineum*	Patterson's Curse	Boraginaceae													0.1	1
	Einadia nutans	Climbing Saltbush	Chenopodiaceae									0.1	2	0.5	50		
	Einadia polygonoides	Knotweed Goosefoot	Chenopodiaceae													0.1	1
	Galium leptogonium		Rubiaceae					0.1	50	0.1	1						
	Geranium solanderi	Native Geranium	Geraniaceae	0.2	10	0.1	2	0.2	10								
	Glycine clandestina	Twining glycine	Fabaceae (Faboideae)					0.1	5								
	Goodenia spp.		Goodeniaceae					0.2	10								
	Haloragis heterophylla	Variable Raspwort	Haloragaceae									0.1	3				
*	*Malva parviflora*	Small-flowered Mallow	Malvaceae									0.1	3	0.2	10	40	
*	*Malva spp.*	Mallow	Malvaceae									0.1	2	0.2	5		
*	*Marrubium vulgare*	White Horehound	Lamiaceae					1	10								
*	*Medicago sativa*	Lucerne	Fabaceae (Faboideae)			0.1	2	0.2	2	0.5	3					2	10

1.	Scientific Name	Common Name	Family	Plot DS1		Plot RRG2		Plot DS5		Plot DS4		Plot DS15		Plot DS16		Plot DS19	
				C	A	C	A	C	A	C	A	C	A	C	A	C	A
	Mentha satureioides	Native Pennyroyal	Lamiaceae					1	50			0.5	20				
	Oxalis perennans		Oxalidaceae									0.5	20				
	Oxalis radicosa		Oxalidaceae	2	100	0.1	50	0.1	100	0.5	50						
	Persicaria decipiens	Slender Knotweed	Polygonaceae														
*	*Phyla canescens*	Lippia	Verbenaceae			1				0.5	50						
*	*Plantago lanceolata*	Lamb's Tongues	Plantaginaceae					0.1	2								
*	*Polygonum aviculare*	Wireweed	Polygonaceae											0.2	20		
	Portulaca oleracea	Pigweed	Portulacaceae											0.1	5	0.5	10
	Pratia concolor	Poison Pratia	Lobeliaceae							1	20	2	50				
	Rumex brownii	Swamp Dock	Polygonaceae			0.1	3	0.1	100			0.1	1				
*	*Rumex crispus*	Curled Dock	Polygonaceae			0.1	1										
*	*Schkuhria pinnata var. abrotanoides*	Dwarf Marigold	Asteraceae					0.5	20	0.1	20						
	Sida corrugata	Corrugated Sida	Malvaceae									0.1	2	0.1	2		
*	*Silybum marianum*	Variegated Thistle	Asteraceae					0.1	5			0.1	5			0.1	2
*	*Solanum elaeagnifolium*	Silver-leaved Nightshade	Solanaceae					1	20	0.5	5					0.2	5
	Solanum esuriale	Quena	Solanaceae					1	20	5		0.5	10	0.2	10	0.2	5
*	*Sonchus oleraceus*	Sow Thistle	Asteraceae					0.1	1			0.1	2				
*	*Taraxacum officinale*	Dandelion	Asteraceae					0.1	2	0.1	1						
	Tribulus micrococcus	Spineless Caltrop	Zygophyllaceae							0.1	5						
*	*Tribulus terrestris*	Cat-head	Zygophyllaceae	0.5	10							0.1	10	0.5	20	1	20
*	*Trifolium campestre*	Hop Clover	Fabaceae (Faboideae)									0.5	20				

1.	Scientific Name	Common Name	Family	Plot DS1		Plot RRG2		Plot DS5		Plot DS4		Plot DS15		Plot DS16		Plot DS19	
				C	A	C	A	C	A	C	A	C	A	C	A	C	A
*	*Trifolium glomeratum*	Clustered Clover	Fabaceae (Faboideae)									0.1	5				
	Urtica incisa	Stinging Nettle	Urticaceae	0.2	10												
	Vittadinia cuneata var. hirsuta		Asteraceae									0.2	2	5			
*	*Xanthium occidentale*	Noogoora Burr	Asteraceae			0.1	1										
*	*Xanthium spinosum*	Bathurst Burr	Asteraceae	0.2	20	0.1	1	0.1	1							0.1	2
	Zaleya galericulata	Hogweed	Aizoaceae											0.2	10	0.5	10
GRASS AND GRASS LIKE																	
	Arundinella nepalensis	Reedgrass	Poaceae			0.1	4										
	Austrostipa aristiglumis	Plains Grass	Poaceae					10		20		5					
	Austrostipa verticillata	Slender Bamboo Grass	Poaceae	0.5	10							5					
	Austrostipa ramosissima	Stout Bamboo Grass	Poaceae	5		1											
	Austrostipa scabra	Speargrass						0.1	1					0.2	20	0.2	5
*	*Avena spp.*	Oats	Poaceae	0.5	20					1	50						
	Bothriochloa macra	Red Grass	Poaceae							0.1	10			0.5	20		
*	*Bromus hordeaceus*	Soft Brome	Poaceae					0.1	10								
	Carex appressa	Tall Sedge	Cyperaceae	0.5	5												
	Carex inversa	Knob Sedge	Cyperaceae					5		0.2	10	0.2	10			0.1	5
	Chloris truncata	Windmill Grass	Poaceae							15				10		0.2	5
	Cynodon dactylon	Common Couch	Poaceae	20		10				2	100			2	50	10	
	Cyperus spp.		Cyperaceae			0.1	10										
	Dichanthium sericeum	Queensland Bluegrass	Poaceae							0.1	5						
*	*Echinochloa crus-galli*	Barnyard Grass	Poaceae			0.1	2										
*	*Echinochloa spp.*		Poaceae											0.5	50		
	Elymus scaber	Common Wheatgrass	Poaceae							1	50					0.2	5

1.	Scientific Name	Common Name	Family	Plot DS1		Plot RRG2		Plot DS5		Plot DS4		Plot DS15		Plot DS16		Plot DS19	
				C	A	C	A	C	A	C	A	C	A	C	A	C	A
*	*Eragrostis spp.*	African Lovegrass	Poaceae											0.5	50		
*	*Hordeum leporinum*	Barley Grass	Poaceae					1	50			0.2	10	0.2	20	0.2	10
	Juncus filicaulis		Juncaceae									0.1	5				
	Juncus usitatus		Juncaceae			0.1	5										
*	*Lolium perenne*	Perennial Ryegrass	Poaceae	10				5		5		0.2	10			0.2	10
	Panicum effusum	Hairy Panic	Poaceae											1	50		
	Paspalidium aversum	Bent Summer Grass	Poaceae	50													
*	*Paspalum dilatatum*	Paspalum	Poaceae	0.5	5	10		0.2	5								
	Rytidosperma spp.	Wallaby Grass	Poaceae									0.5	10				
	Rytidosperma setaceum	Small-flowered Wallaby-grass	Poaceae											0.2	10		
	Senecio bathurstianus		Asteraceae	0.1	1												
*	*Senecio spp.*	Groundsel, Fireweed	Asteraceae					0.1	2								
*	*Tragopogon porrifolius subsp. porrifolius*	Salsify	Asteraceae	5				0.1	2								
*	*Verbena bonariensis*	Purpletop	Verbenaceae	1	20												
FERNS																	
	Marsilea drummondii	Common Nardoo	Marsileaceae	20		0.1	100	1	100			2	50				

B.2 PLOT PHOTOS

Plot Number	PCT Number and Condition	Plot Photos
Plot DS1	PCT 78 Moderate	

Plot Number	PCT Number and Condition	Plot Photos
Plot RRG2	PCT 78 Moderate/Good	

Plot Number	PCT Number and Condition	Plot Photos
Plot DS5	PCT 281 Moderate	

Plot Number	PCT Number and Condition	Plot Photos
Plot DS4	PCT 281 Moderate	

Plot Number	PCT Number and Condition	Plot Photos
Plot DS15	PCT 201 Moderate/Good	

Plot Number	PCT Number and Condition	Plot Photos
Plot DS16	PCT 201 Moderate/Good	

Plot Number	PCT Number and Condition	Plot Photos
Plot DS19	PCT 201 Moderate/Good	

B.3 FAUNA SURVEY RESULTS

Group	Common Name	Scientific Name	Count
Amphibia	Emerald-spotted Tree Frog	Litoria peronii	3
Amphibia	Spotted Marsh Frog	Limnodynastes tasmaniensis	2
Amphibia	Striped Marsh Frog	Limnodynastes peronii	1
Aves			53
Aves	Australasian Pipit	Anthus novaeseelandiae	1
Aves	Australian King-Parrot	Alisterus scapularis	1
Aves	Australian Magpie	Cracticus tibicen	3
Aves	Australian Wood Duck	Chenonetta jubata	2
Aves	Brown Goshawk	Accipiter fasciatus	1
Aves	Common Myna	Sturnus tristis	1
Aves	Common Starling	Sturnus vulgaris	3
Aves	Crested Pigeon	Ocyphaps lophotes	3
Aves	Dollarbird	Eurystomus orientalis	4
Aves	Eastern Rosella	Platycercus eximius	3
Aves	Galah	Eolophus roseicapillus	2
Aves	Grey Teal	Anas gracilis	1

Group	Common Name	Scientific Name	Count
Aves	Laughing Kookaburra	Dacelo novaeguineae	2
Aves	Little Corella	Cacatua sanguinea	1
Aves	Magpie-lark	Grallina cyanoleuca	2
Aves	Masked Owl	Tyto novaehollandiae	1
Aves	Musk Lorikeet	Glossopsitta concinna	2
Aves	Nankeen Kestrel	Falco cenchroides	2
Aves	Noisy Miner	Manorina melanocephala	3
Aves	Olive-backed Oriole	Oriolus sagittatus	1
Aves	Pied Butcherbird	Cracticus nigrogularis	2
Aves	Rufous Songlark	Cincloramphus mathewsi	1
Aves	Striated Pardalote	Pardalotus striatus	1
Aves	Sulphur-crested Cockatoo	Cacatua galerita	2
Aves	Superb Fairy-wren	Malurus cyaneus	1
Aves	Welcome Swallow	Hirundo neoxena	1
Aves	White-faced Heron	Egretta novaehollandiae	1
Aves	White-winged Chough	Corcorax melanorhamphos	1
Aves	Willie Wagtail	Rhipidura leucophrys	2

Group	Common Name	Scientific Name	Count
Aves	Yellow-billed Spoonbill	Platalea flavipes	1
Aves	Yellow-rumped Thornbill	Acanthiza chrysorrhoa	1
Mammalia	White-striped Free-tailed Bat	Austronomus australis	1
Reptilia	Snake-eyed Skink	Cryptoblepharus sp.	1

APPENDIX C PERSONNEL

Name	Title	Qualifications	Role
Aleksei Atkin	Acting Technical Lead - Ecology	Master of Wildlife Management Bachelor of Natural Science (Nature Conservation) Accredited NSW BAM Assessor (BAAS17093)	BAM Assessor, surveyor, report preparation
Mitch Palmer	Acting Principal Ecologist	Bachelor of Science Accredited NSW BAM Assessor (BAAS17051)	BAM Assessor, surveyor, report review
Brendon True	Ecologist	Master of Conservation Biology Bachelor of Science (Ecology and Biodiversity)	BAM Assessor, surveyor
Elijah Elias	Ecologist	Bachelor of Biodiversity Conservation	Surveyor

APPENDIX D BAM CALCULATOR CREDIT REPORT

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00009114/BAAS17051/17/00009115	Dunedoo Solar Farm	20/08/2020
Assessor Name	Assessor Number	BAM Data version *
Aleksei Atkin	BAAS17093	30
Proponent Name(s)	Report Created	BAM Case Status
	11/09/2020	Open
Assessment Revision	Assessment Type	Date Finalised
5	Major Projects	To be finalised

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Endangered Ecological Community	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
White Box Yellow Box Blakely's Red Gum Woodland	Endangered Ecological Community	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Nil

BAM Biodiversity Credit Report (Variations)

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	0.6	14.00
78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Not a TEC	0.3	5.00
201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	0.1	1.00

78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	**Like-for-like credit retirement options**			
	Class	Trading group	HBT	IBRA region
	Inland Riverine Forests This includes PCT's: 9, 36, 78, 112, 249, 356, 362	Inland Riverine Forests >=50% and <70%	Yes	Inland Slopes,Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options			
	Formation	Trading group	HBT	IBRA region
	Forested Wetlands	Tier 6 or higher	Yes (including artificial)	IBRA Region: NSW South Western Slopes, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	**Like-for-like credit retirement options**			
	Name of offset trading group	Trading group	HBT	IBRA region

	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions This includes PCT's: 201, 202, 1384	-	Yes	Inland Slopes,Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options			
	Formation	Trading group	HBT	IBRA region
	Grassy Woodlands	Tier 2 or higher	Yes (including artificial)	IBRA Region: NSW South Western Slopes, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Like-for-like credit retirement options

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

Variation options

Formation	Trading group	HBT	IBRA region

	Grassy Woodlands	Tier 3 or higher	Yes (including artificial)	IBRA Region: NSW South Western Slopes, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00009114/BAAS17051/17/00009115

Proposal Name
Dunedoo Solar Farm

BAM data last updated *
20/08/2020

Assessor Name
Aleksei Atkin

Assessor Number
BAAS17093

BAM Data version *
30

Proponent Names

Report Created
11/09/2020

BAM Case Status
Open

Assessment Revision
5

Assessment Type
Major Projects

Date Finalised
To be finalised

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Endangered Ecological Community	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
White Box Yellow Box Blakely's Red Gum Woodland	Endangered Ecological Community	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Nil

BAM Biodiversity Credit Report (Like for like)

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	0.6	14.00
78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Not a TEC	0.3	5.00
201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	0.1	1.00

78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	**Like-for-like credit retirement options**			
	Class	Trading group	HBT	IBRA region
	Inland Riverine Forests This includes PCT's: 9, 36, 78, 112, 249, 356, 362	Inland Riverine Forests >=50% and <70%	Yes	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	**Like-for-like credit retirement options**			
	Name of offset trading group	Trading group	HBT	IBRA region

	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions This includes PCT's: 201, 202, 1384	-	Yes	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	**Like-for-like credit retirement options**			
	Name of offset trading group	Trading group	HBT	IBRA region

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

Species Credit Summary

No Species Credit Data

BAM Candidate Species Report

Proposal Details

Assessment Id 00009114/BAAS17051/17/00009115	Proposal Name Dunedoo Solar Farm	BAM data last updated * 20/08/2020
Assessor Name Aleksei Atkin	Report Created 11/09/2020	BAM Data version * 30
Assessor Number BAAS17093	Assessment Type Major Projects	BAM Case Status Open
	Assessment Revision 5	Date Finalised To be finalised

* 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.

List of Species Requiring Survey

Name	Presence	Survey Months
Lophochroa leadbeateri Major Mitchell's Cockatoo	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug **Sep Oct Nov Dec**
Calyptorhynchus lathami Glossy Black-Cockatoo	No (surveyed)	Jan Feb Mar **Apr May Jun** **Jul Aug** Sep Oct Nov Dec
Hamirostra melanosternon Black-breasted Buzzard	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug **Sep Oct Nov** Dec
Dichanthium setosum Bluegrass	No (surveyed)	**Jan Feb Mar Apr May** Jun Jul Aug Sep Oct **Nov Dec**
Diuris tricolor Pine Donkey Orchid	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug **Sep Oct** Nov Dec

Litoria booroolongensis Booroolong Frog	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct **Nov** **Dec**
Polytelis swainsonii Superb Parrot	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug **Sep** **Oct** **Nov** Dec
Petaurus norfolcensis Squirrel Glider	No (surveyed)	**Jan** **Feb** **Mar** **Apr** **May** **Jun** **Jul** **Aug** **Sep** **Oct** **Nov** **Dec**
Phascogale tapoatafa Brush-tailed Phascogale	No (surveyed)	**Jan** **Feb** **Mar** **Apr** **May** **Jun** Jul Aug Sep Oct Nov **Dec**
Phascolarctos cinereus Koala	No (surveyed)	**Jan** **Feb** **Mar** **Apr** **May** **Jun** **Jul** **Aug** **Sep** **Oct** **Nov** **Dec**
Pomaderris queenslandica Scant Pomaderris	No (surveyed)	**Jan** **Feb** **Mar** **Apr** **May** **Jun** **Jul** **Aug** **Sep** **Oct** **Nov** **Dec**
Swainsona recta Small Purple-pea	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug **Sep** **Oct** **Nov** Dec
Swainsona sericea Silky Swainson-pea	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug **Sep** **Oct** **Nov** Dec
Acacia ausfeldii Ausfeld's Wattle	No (surveyed)	Jan Feb Mar Apr May Jun Jul **Aug** **Sep** **Oct** Nov Dec
Euphrasia arguta Euphrasia arguta	No (surveyed)	**Jan** **Feb** **Mar** Apr May Jun Jul Aug Sep Oct **Nov** **Dec**
Haliaeetus leucogaster White-bellied Sea-Eagle	No (surveyed)	Jan Feb Mar Apr May Jun **Jul** **Aug** **Sep** **Oct** **Nov** **Dec**

BAM Candidate Species Report

List of Species Not On Site

Name
Aprasia parapulchella Pink-tailed Legless Lizard
Austrostipa wakoolica A spear-grass
Lathamus discolor Swift Parrot
Miniopterus orianae oceanensis Large Bent-winged Bat
Prasophyllum petilum Tarengo Leek Orchid
Pteropus poliocephalus Grey-headed Flying-fox
Anthochaera phrygia Regent Honeyeater

BAM Credit Summary Report

Proposal Details

Assessment Id
00009114/BAAS17051/17/00009115

Proposal Name
Dunedoo Solar Farm

BAM data last updated *
20/08/2020

Assessor Name
Aleksei Atkin

Report Created
11/09/2020

BAM Data version *
30

Assessor Number
BAAS17093

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
5

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
Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion								
3	201_Moderate	47.8	0.1	0.25	High Sensitivity to Potential Gain	2.00	TRUE	1
							Subtotal	**1**

River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion							
2	78_Good	46.3	0.3	0.25	High Sensitivity to Potential Gain	1.75		5
							Subtotal	**5**
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion							
1	281_Moderate	47.3	0.6	0.25	High Sensitivity to Potential Gain	2.00	TRUE	14
							Subtotal	**14**
							Total	**20**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00009114/BAAS17051/17/00009115	68	5	11/09/2020

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Aleksei Atkin	BAAS17093	Dunedoo Solar Farm	Open

Assessment Type	Date Finalised
Major Projects	To be finalised

PCT list

Price calculated	PCT common name	Credits
Yes	**78 -** River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	5
Yes	**201 -** Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	1
Yes	**281 -** Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	14

Species list

Price calculated	Species	Credits

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

Biodiversity payment summary report

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Inland Slopes	**78 -** River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	No	Inland Riverine Forests >=50% and <70%	19.12%	$266.02	1.4077	$8,188.19	5	$40,940.97
Inland Slopes	**201 -** Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Yes	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	19.38%	$287.12	2.3389	$8,856.14	1	$8,856.14
Inland Slopes	**281 -** Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Yes	White Box Yellow Box Blakely's Red Gum Woodland	15.97%	$284.50	2.1064	$8,532.95	14	$119,461.35

Subtotal (excl. GST)	**$169,258.46**
GST	**$16,925.85**

Total ecosystem credits (incl. GST)	**$186,184.31**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price

No species available

Grand total	**$186,184.31**

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00009114/BAAS17051/17/00009115	Dunedoo Solar Farm	20/08/2020
Assessor Name	Report Created	BAM Data version *
Aleksei Atkin	11/09/2020	30
Assessor Number	Assessment Type	BAM Case Status
BAAS17093	Major Projects	Open
	Assessment Revision	Date Finalised
	5	To be finalised

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Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Australian Painted Snipe	Rostratula australis	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Black-breasted Buzzard	Hamirostra melanosternon	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Black-necked Stork	Ephippiorhynchus asiaticus	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Brolga	Grus rubicunda	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

Diamond Firetail	Stagonopleura guttata	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Flame Robin	Petroica phoenicea	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Freckled Duck	Stictonetta naevosa	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Glossy Black-Cockatoo	Calyptorhynchus lathami	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

Grey-headed Flying-fox	Pteropus poliocephalus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Koala	Phascolarctos cinereus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Large Bent-winged Bat	Miniopterus orianae oceanensis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Little Lorikeet	Glossopsitta pusilla	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion

Little Lorikeet	Glossopsitta pusilla	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Major Mitchell's Cockatoo	Lophochroa leadbeateri	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Regent Honeyeater	Anthochaera phrygia	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Scarlet Robin	Petroica boodang	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Speckled Warbler	Chthonicola sagittata	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion

Spotted-tailed Quoll	Dasyurus maculatus	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Superb Parrot	Polytelis swainsonii	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
Swift Parrot	Lathamus discolor	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
White-bellied Sea-Eagle	Haliaeetus leucogaster	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

BAM Vegetation Zones Report

Proposal Details

Assessment Id
00009114/BAAS17051/17/00009115

Assessment name
Dunedoo Solar Farm

BAM data last updated *
20/08/2020

Assessor Name
Aleksei Atkin

Report Created
11/09/2020

BAM Data version *
30

Assessor Number
BAAS17093

Assessment Type
Major Projects

BAM Case Status
Open

* 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.

Assessment Revision
5

Date Finalised
To be finalised

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	281_Moderate	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Moderate	0.58		

2	78_Good	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Good	0.26	1	
3	201_Moderate	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Moderate	0.06	1	

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00009114/BAAS17051/17/00009115	Dunedoo Solar Farm	20/08/2020
Assessor Name	Assessor Number	BAM Data version *
Aleksei Atkin	BAAS17093	30
Proponent Name(s)	Report Created	BAM Case Status
	11/09/2020	Open
Assessment Revision	Assessment Type	Date Finalised
6	Major Projects	To be finalised

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box Yellow Box Blakely's Red Gum Woodland	Endangered Ecological Community	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Endangered Ecological Community	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

Nil

BAM Biodiversity Credit Report (Variations)

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	0.6	14.00
201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	0.1	1.00
78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Not a TEC	0.2	4.00

78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	**Like-for-like credit retirement options**			
	Class	Trading group	HBT	IBRA region
	Inland Riverine Forests This includes PCT's: 9, 36, 78, 112, 249, 356, 362	Inland Riverine Forests >=50% and <70%	Yes	Inland Slopes,Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options			
	Formation	Trading group	HBT	IBRA region
	Forested Wetlands	Tier 6 or higher	Yes (including artificial)	IBRA Region: NSW South Western Slopes, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	**Like-for-like credit retirement options**			
	Name of offset trading group	Trading group	HBT	IBRA region

	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions This includes PCT's: 201, 202, 1384	-	Yes	Inland Slopes,Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options			
	Formation	Trading group	HBT	IBRA region
	Grassy Woodlands	Tier 2 or higher	Yes (including artificial)	IBRA Region: NSW South Western Slopes, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Like-for-like credit retirement options

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

Variation options

Formation	Trading group	HBT	IBRA region

	Grassy Woodlands	Tier 3 or higher	Yes (including artificial)	IBRA Region: NSW South Western Slopes, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00009114/BAAS17051/17/00009115

Proposal Name
Dunedoo Solar Farm

BAM data last updated *
20/08/2020

Assessor Name
Aleksei Atkin

Assessor Number
BAAS17093

BAM Data version *
30

Proponent Names

Report Created
11/09/2020

BAM Case Status
Open

Assessment Revision
6

Assessment Type
Major Projects

Date Finalised
To be finalised

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box Yellow Box Blakely's Red Gum Woodland	Endangered Ecological Community	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Endangered Ecological Community	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

Nil

BAM Biodiversity Credit Report (Like for like)

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	0.6	14.00
201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	0.1	1.00
78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Not a TEC	0.2	4.00

78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	**Like-for-like credit retirement options**			
	Class	Trading group	HBT	IBRA region
	Inland Riverine Forests This includes PCT's: 9, 36, 78, 112, 249, 356, 362	Inland Riverine Forests >=50% and <70%	Yes	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	**Like-for-like credit retirement options**			
	Name of offset trading group	Trading group	HBT	IBRA region

	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions This includes PCT's: 201, 202, 1384	-	Yes	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	**Like-for-like credit retirement options**			
	Name of offset trading group	Trading group	HBT	IBRA region

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

Species Credit Summary

No Species Credit Data

BAM Candidate Species Report

Proposal Details

Assessment Id 00009114/BAAS17051/17/00009115	Proposal Name Dunedoo Solar Farm	BAM data last updated * 20/08/2020
Assessor Name Aleksei Atkin	Report Created 11/09/2020	BAM Data version * 30
Assessor Number BAAS17093	Assessment Type Major Projects	BAM Case Status Open
	Assessment Revision 6	Date Finalised To be finalised

* 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.

List of Species Requiring Survey

Name	Presence	Survey Months
Lophochroa leadbeateri Major Mitchell's Cockatoo	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug **Sep Oct Nov Dec**
Calyptorhynchus lathami Glossy Black-Cockatoo	No (surveyed)	Jan Feb Mar **Apr May Jun** **Jul Aug** Sep Oct Nov Dec
Hamirostra melanosternon Black-breasted Buzzard	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug **Sep Oct Nov** Dec
Dichanthium setosum Bluegrass	No (surveyed)	**Jan Feb Mar Apr May** Jun Jul Aug Sep Oct **Nov Dec**
Diuris tricolor Pine Donkey Orchid	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug **Sep Oct** Nov Dec

Litoria booroolongensis Booroolong Frog	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct **Nov** **Dec**
Polytelis swainsonii Superb Parrot	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug **Sep** **Oct** **Nov** Dec
Petaurus norfolcensis Squirrel Glider	No (surveyed)	**Jan** **Feb** **Mar** **Apr** **May** **Jun** **Jul** **Aug** **Sep** **Oct** **Nov** **Dec**
Phascogale tapoatafa Brush-tailed Phascogale	No (surveyed)	**Jan** **Feb** **Mar** **Apr** **May** **Jun** Jul Aug Sep Oct Nov **Dec**
Phascolarctos cinereus Koala	No (surveyed)	**Jan** **Feb** **Mar** **Apr** **May** **Jun** **Jul** **Aug** **Sep** **Oct** **Nov** **Dec**
Pomaderris queenslandica Scant Pomaderris	No (surveyed)	**Jan** **Feb** **Mar** **Apr** **May** **Jun** **Jul** **Aug** **Sep** **Oct** **Nov** **Dec**
Swainsona recta Small Purple-pea	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug **Sep** **Oct** **Nov** Dec
Swainsona sericea Silky Swainson-pea	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug **Sep** **Oct** **Nov** Dec
Acacia ausfeldii Ausfeld's Wattle	No (surveyed)	Jan Feb Mar Apr May Jun Jul **Aug** **Sep** **Oct** Nov Dec
Euphrasia arguta Euphrasia arguta	No (surveyed)	**Jan** **Feb** **Mar** Apr May Jun Jul Aug Sep Oct **Nov** **Dec**
Haliaeetus leucogaster White-bellied Sea-Eagle	No (surveyed)	Jan Feb Mar Apr May Jun **Jul** **Aug** **Sep** **Oct** **Nov** **Dec**

BAM Candidate Species Report

List of Species Not On Site

Name
Aprasia parapulchella Pink-tailed Legless Lizard
Austrostipa wakoolica A spear-grass
Lathamus discolor Swift Parrot
Miniopterus orianae oceanensis Large Bent-winged Bat
Prasophyllum petilum Tarengo Leek Orchid
Pteropus poliocephalus Grey-headed Flying-fox
Anthochaera phrygia Regent Honeyeater

BAM Credit Summary Report

Proposal Details

Assessment Id
00009114/BAAS17051/17/00009115

Proposal Name
Dunedoo Solar Farm

BAM data last updated *
20/08/2020

Assessor Name
Aleksei Atkin

Report Created
11/09/2020

BAM Data version *
30

Assessor Number
BAAS17093

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
6

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
Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion								
2	201_Moderate	47.8	0.1	0.25	High Sensitivity to Potential Gain	2.00	TRUE	1
							Subtotal	**1**

River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion							
3	78_Good	46.3	0.2	0.25	High Sensitivity to Potential Gain	1.75		4
							Subtotal	**4**
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion							
1	281_Moderate	47.3	0.6	0.25	High Sensitivity to Potential Gain	2.00	TRUE	14
							Subtotal	**14**
							Total	**19**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00009114/BAAS17051/17/00009115	68	6	11/09/2020

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Aleksei Atkin	BAAS17093	Dunedoo Solar Farm	Open

Assessment Type	Date Finalised
Major Projects	To be finalised

PCT list

Price calculated	PCT common name	Credits
Yes	**281 -** Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	14
Yes	**201 -** Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	1
Yes	**78 -** River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	4

Species list

Price calculated	Species	Credits

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

Biodiversity payment summary report

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Inland Slopes	**281 -** Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Yes	White Box Yellow Box Blakely's Red Gum Woodland	15.97%	$284.50	2.1064	$8,532.95	14	$119,461.35
Inland Slopes	**201 -** Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Yes	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	19.38%	$287.12	2.3389	$8,856.14	1	$8,856.14
Inland Slopes	**78 -** River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	No	Inland Riverine Forests >=50% and <70%	19.12%	$266.02	1.4077	$8,188.19	4	$32,752.78

Subtotal (excl. GST)	**$161,070.27**
GST	**$16,107.03**

Biodiversity payment summary report

Total ecosystem credits (incl. GST)	**$177,177.30**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price

No species available

Grand total	**$177,177.30**

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00009114/BAAS17051/17/00009115	Dunedoo Solar Farm	20/08/2020
Assessor Name	Report Created	BAM Data version *
Aleksei Atkin	11/09/2020	30
Assessor Number	Assessment Type	BAM Case Status
BAAS17093	Major Projects	Open
	Assessment Revision	Date Finalised
	6	To be finalised

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Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Australian Painted Snipe	Rostratula australis	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Black-breasted Buzzard	Hamirostra melanosternon	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Black-necked Stork	Ephippiorhynchus asiaticus	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Brolga	Grus rubicunda	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion

Diamond Firetail	Stagonopleura guttata	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Flame Robin	Petroica phoenicea	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Freckled Duck	Stictonetta naevosa	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Glossy Black-Cockatoo	Calyptorhynchus lathami	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion

Grey-headed Flying-fox	Pteropus poliocephalus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Koala	Phascolarctos cinereus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Large Bent-winged Bat	Miniopterus orianae oceanensis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Little Lorikeet	Glossopsitta pusilla	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

Little Lorikeet	Glossopsitta pusilla	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Major Mitchell's Cockatoo	Lophochroa leadbeateri	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Regent Honeyeater	Anthochaera phrygia	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Scarlet Robin	Petroica boodang	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Speckled Warbler	Chthonicola sagittata	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion

Spotted-tailed Quoll	Dasyurus maculatus	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Superb Parrot	Polytelis swainsonii	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Swift Parrot	Lathamus discolor	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
White-bellied Sea-Eagle	Haliaeetus leucogaster	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion
		78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion

BAM Vegetation Zones Report

Proposal Details

Assessment Id
00009114/BAAS17051/17/00009115

Assessment name
Dunedoo Solar Farm

BAM data last updated *
20/08/2020

Assessor Name
Aleksei Atkin

Report Created
11/09/2020

BAM Data version *
30

Assessor Number
BAAS17093

Assessment Type
Major Projects

BAM Case Status
Open

* 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.

Assessment Revision
6

Date Finalised
To be finalised

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	281_Moderate	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Moderate	0.58	1	

2	201_Moderate	201-Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Moderate	0.06	1	
3	78_Good	78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Good	0.21	1	

APPENDIX E HOLLOW BEARING TREE INVENTORY

Name	Species	DBH (cm)	Small Hollow (< 10 cm),	Medium (10 – 20 cm)	Large (> 20 cm).	Fissuring	Signs of use	Removed or retained
Paddock Tree 1	*Angophora floribunda*	110	1	1	10	No	No	Retained
Paddock Tree 2	*Eucalyptus camaldulensis*	100	1	1	0	No	No	Retained
Paddock Tree 3	*Eucalyptus camaldulensis*	140	1	1	0	No	No	Retained
Paddock Tree 4	*Eucalyptus camaldulensis*	160	1	1	0	No	No	Retained
Paddock Tree 5	*Eucalyptus camaldulensis*	80	1	0	0	No	No	Retained
Paddock Tree 6	*Eucalyptus camaldulensis*	65	1	0	0	No	No	Retained
Paddock Tree 7	*Angophora floribunda*	80	1	0	0	No	No	Retained
Paddock Tree 8	*Eucalyptus camaldulensis*	65	1	0	0	No	No	Retained
HBT 1	*Angophora floribunda*	40	1	0	0	No	No	Retained
HBT 2	*Angophora floribunda*	90	1	0	0	Yes	No	Retained
HBT 3	*Eucalyptus camaldulensis*	60	1	0	0	No	No	Retained
HBT 4	*Eucalyptus camaldulensis*	60	1	0	0	No	No	Retained
HBT 5	*Eucalyptus camaldulensis*	90	0	1	1	No	No	Retained
HBT 6	*Eucalyptus camaldulensis*	100	0	1	0	No	No	Retained
HBT 7	Stag	70	0	1	0	No	No	Retained

Name	Species	DBH (cm)	Small Hollow (< 10 cm),	Medium (10 – 20 cm)	Large (> 20 cm).	Fissuring	Signs of use	Removed or retained
HBT 8	*Eucalyptus camaldulensis*	90	1	1	0	No	No	Retained
HBT 9	*Eucalyptus camaldulensis*	200	1	1	1	No	No	Retained
HBT 10	*Eucalyptus camaldulensis*	90	1	0	0	No	No	Retained
HBT 11	*Angophora floribunda*	100	1	0	0	Yes	No	Retained
HBT 12	*Eucalyptus camaldulensis*	90	1	0	0	No	No	Retained
HBT 13	Stag	60	1	0	0	No	No	Retained
HBT 14	*Eucalyptus camaldulensis*	0	1	0	0	No	No	Retained
HBT 15	*Eucalyptus camaldulensis*	70	0	1	0	No	No	Retained
HBT 16	Stag	110	0	1	0	No	No	Retained
HBT 17	*Eucalyptus camaldulensis*	90	1	1	0	No	No	Retained
HBT 18	*Eucalyptus camaldulensis*	70	1	0	0	No	No	Retained
HBT 19	*Eucalyptus camaldulensis*	60	1	0	0	No	No	Retained
HBT 20	*Eucalyptus camaldulensis*	110	0	1	0	No	No	Retained
HBT 21	*Eucalyptus camaldulensis*	0	1	0	0	No	No	Retained
HBT 22	*Eucalyptus melliodora*	50	1	0	0	No	No	Retained
HBT 23	*Eucalyptus camaldulensis*	180	1	1	0	No	No	Retained
HBT 24	*Eucalyptus camaldulensis*	100	1	1	0	No	No	Retained
HBT 25	*Eucalyptus camaldulensis*	150	0	1	0	No	No	Retained
HBT 26	Stag	80	1	0	0	No	No	Retained

Name	Species	DBH (cm)	Small Hollow (< 10 cm),	Medium (10 – 20 cm)	Large (> 20 cm).	Fissuring	Signs of use	Removed or retained
HBT 27	*Eucalyptus camaldulensis*	100	1	1	0	No	No	Retained
HBT 28	*Eucalyptus camaldulensis*	100	1	1	0	No	No	Retained
HBT 29	Stag	80	0	0	0	No	No	Retained
HBT 30	*Eucalyptus camaldulensis*	0	1	0	0	No	No	Retained
HBT 31	Stag	50	1	0	0	No	No	Retained
HBT 32	*Eucalyptus camaldulensis*	150	1	1	0	No	No	Retained
HBT 33	Stag	0	1	0	1	No	No	Retained
HBT 34	*Eucalyptus camaldulensis*	80	1	1	0	No	No	**Removed**
HBT 35	Stag	50	1	1	0	No	No	Retained
HBT 36	Stag	0	0	0	0	No	No	Retained
HBT 37	Stag	50	1	1	0	No	No	Retained
HBT 38	*Eucalyptus camaldulensis*	65	1	1	0	No	No	Retained
HBT 39		0	0	0	0	No	No	Retained
HBT 40		0	0	0	0	No	No	Retained

APPENDIX F EPBC ACT PROTECTED MATTERS SEARCH

APPENDIX G EPBC ACT HABITAT ASSESSMENT

Species	Description of Habitat	Presence of Habitat	Likelihood of occurrence	Possible impact?
TEC				
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions EPBC-EEC	A woodland community of flora and fauna is found on the grey, self-mulching clays of periodically waterlogged floodplains, swamp margins, ephemeral wetlands, and stream levees. The structure of the community may vary from tall riparian woodlands to very open 'savanna like' grassy woodlands with a sparse midstorey of shrubs and saplings. Typically these woodlands form mosaics with grasslands and wetlands, and are characterised by Coolibah (Eucalyptus coolabah) and, in some areas, Black Box (E. largiflorens). Other tree species may be present including River Cooba (Acacia stenophylla), Cooba (A. salicina), Belah (Casuarina cristata) and Eurah (Eremophila bignoniiflora).	Absent	Low	No
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia EPBC-EEC	Inland Grey Box Woodland includes those woodlands in which the most characteristic tree species, Eucalyptus microcarpa (Inland Grey Box), is often found in association with E. populnea subsp. bimbil (Bimble or Poplar Box), Callitris glaucophylla (White Cypress Pine), Brachychiton populneus (Kurrajong), Allocasuarina luehmannii (Bulloak) or E. melliodora (Yellow Box), and sometimes with E. albens (White Box). Shrubs are typically sparse or absent, although this component can be diverse and may be locally common, especially in drier western portions of the community. A variable ground layer of grass and herbaceous species is present at most sites. At severely disturbed sites the ground layer may be absent. The community generally occurs as an open woodland 15–25 m tall but in some locations the overstorey may be absent as a result of past clearing or thinning, leaving only an understorey. Inland Grey Box Woodland occurs predominately within the Riverina and South West Slopes regions of NSW down to the Victorian border. It includes Albury to the east and may extend out west towards Hay. This community also extends across the slopes and plains in Central and Northern NSW up to the	Absent	Low	No

Species	Description of Habitat	Presence of Habitat	Likelihood of occurrence	Possible impact?
	Queensland Border. This includes Yetman and Inverell in the North, Molong to the east of the Central Slopes and plains and out towards Nymagee to the west.			
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland EPBC-CEEC	This community is strongly reliant on soil type as it is associated with fine textured, often cracking clays derived from either basalt or quaternary alluvium. The ecological community generally occurs on flat to low slopes, of no more than 5% (or less than 1 degree) inclination. As slope increases, grassy woodlands dominated by trees such as Acacia pendula (weeping myall), Eucalyptus coolabah (coolibah), E. populnea (poplar box) or E. melliodora (yellow box) occur. In the Darling Downs component of the ecological community, Dichanthium sericeum (bluegrass) tends to be the dominant grass species. In the Liverpool Plains component of the ecological community, Austrostipa aristiglumis (plains grass) tends to dominate. However, the Darling Downs grasslands also include plains grass as a significant winter growing component. Drier sites of the ecological community may include a higher proportion of Astrebla spp. (Mitchell grass). The ecological community also contains a variety of wildflowers such as daisies, lilies and orchids, occupying the spaces between tussocks. Many of these plants are only easily seen in the spring.The upper, tree canopy layer is also typically absent but may comprise scattered trees (e.g. paddock trees) to less than 10% projective foliage cover."	Absent	Low	No
Poplar Box Grassy Woodland on Alluvial Plains EPBC-EEC	The ecological community is a type of temperate to semi-arid grassy eucalypt woodland that is sparsely scattered inland of the Great Dividing Range from around Cowra in NSW to near Collinsville in Queensland. This eucalypt woodland is mainly associated with alluvial plains including back plains, higher terraces and levees along rivers, ephemeral watercourses and depressions. The ecological community varies from a grassy woodland to grassy open woodland with an overstorey dominated by Eucalyptus populnea (poplar/bimble box) and an understorey mostly composed of native perennial forbs and grasses but may include some shrubs and sedges, depending on the season, rainfall and location in the landscape. Patches of the ecological community generally lack a substantial mid (tall shrub) layer. Shrubby forms of poplar box woodland typically occur on lower nutrient sandier soils, and are not part of the proposed national ecological community. Much of the landscape where the ecological community originally	Absent	Low	No

Species	Description of Habitat	Presence of Habitat	Likelihood of occurrence	Possible impact?
	occurred has been cleared and modified for agriculture, mining and energy, or peri-urban/infrastructure land uses.			
Weeping Myall Woodlands EPBC-EEC	This ecological community is scattered across the eastern parts of the alluvial plains of the Murray-Darling river system. The community is also known as Boree particularly in the southern part of its distribution. Typically, it occurs on red-brown earths and heavy textured grey and brown alluvial soils within a climatic belt receiving between 375 and 500 mm mean annual rainfall. The structure of the community varies from low woodland and low open woodland to low sparse woodland or open shrubland, depending on site quality and disturbance history. The tree layer grows up to a height of about 10 metres and invariably includes Acacia pendula (Weeping Myall or Boree) as one of the dominant species or 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	Low	No
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland EPBC-CEEC	White Box Yellow Box Blakely's Red Gum Woodland (commonly referred to as Box-Gum Woodland) is an open woodland community (sometimes occurring as a forest formation), in which the most obvious species are one or more of the following: White Box *Eucalyptus albens*, Yellow Box *E. melliodora* and Blakely's Red Gum *E. blakelyi.* Intact sites contain a high diversity of plant species, including the main tree species, additional tree species, some shrub species, several climbing plant species, many grasses and a very high diversity of herbs.	Present	Present	No
Aves				
Anthochaera phrygia Regent Honeyeater EPBC-CE	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Occurs in woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	Present	Moderate	No
Botaurus poiciloptilus Australasian Bittern	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours	Absent	Low	No

Species	Description of Habitat	Presence of Habitat	Likelihood of occurrence	Possible impact?
EPBC-E	permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleocharis spp.).			
Calidris ferruginea Curlew Sandpiper EPBC-CE	Intertidal mudflats in both fresh and brackish waters in sheltered coastal areas, such as estuaries, bays, inlets, and lagoons. Also recorded inland, including around ephemeral and permanent lakes, dams, and waterholes, usually with bare edges of mud or sand.	Absent	Low	No
Falco hypoleucos Grey Falcon EPBC-V	Chiefly distributed throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. Like other falcons it utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse;	Present	Low	No
Grantiella picta Painted Honeyeater EPBC-V	Boree/Weeping Myall, Brigalow, and Box-Gum Woodlands and Box-Ironbark Forests. Specialist feeder on the fruits of mistletoes.	Present	Moderate	No
Hirundapus caudacutus White-throated Needletail EPBC-V	White-throated Needletails almost always forage aerially, at heights up to 'cloud level', above a wide variety of habitats ranging from heavily treed forests to open habitats, such as farmland, heathland or mudflats, though they sometimes forage much closer to the ground in open habitats, once as low as about 15 cm in a coastal saltworks. The species has been recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows	Present	Low	No
Lathamus discolor Swift Parrot EPBC-CE	On the coast and southwest slopes in areas with abundant flowering eucalypts or lerp. Feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, and White Box and Lerp infested trees such as Grey Box and Black Butt.	Absent	Moderate	No

Species	Description of Habitat	Presence of Habitat	Likelihood of occurrence	Possible impact?
Leipoa ocellata Mallee Fowl EPBC-V	Semi-arid to arid shrublands and low woodlands, especially those dominated by Mallee and/or Acacia which are tall, dense, and floristically rich. A sandy to sandy-loam substrate and abundance of leaf litter are required for breeding.	Absent	Low	No
Polytelis swainsonii Superb Parrot EPBC-V	Box-Gum, Box-Cypress, and Boree Woodlands and River Red Gum Forests. They nest in hollows of large trees in tall open forest or woodland.	Present	Moderate	No
Rostratula australis Australian Painted Snipe EPBC-E	Shallow terrestrial freshwater or occasionally brackish wetlands, including temporary and permanent lakes, swamps, and claypans, as well as inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms, and bore drains. Fringes of swamps, dams, and nearby marshy areas with cover of grasses, lignum, low scrub, or open timber. Shallow wetlands with areas of bare wet mud.	Present	Low	No
Fish				
Galaxias rostratus Flathead Galaxias EPBC-CE	Flathead Galaxias are found in still or slow moving water bodies such as wetlands and lowland streams. The species has been recorded forming shoals. They have been associated with a range of habitats including rock and sandy bottoms and aquatic vegetation.	Marginal	Low	No
Maccullochella peelii Murray Cod EPBC-V	Utilises a diverse range of habitats from clear rocky streams, such as those found in the upper western slopes of NSW (including the ACT), to slow-flowing, turbid lowland rivers and billabongs. Frequently found in the main channels of rivers and larger tributaries. The species is considered a main-channel specialist. Murray Cod tend to occur in floodplain channels and anabranches when they are inundated.	Marginal	Low	No
Macquaria australasica Macquarie Perch EPBC-E	They are a riverine, schooling species and prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks. Spawning occurs just above riffles (shallow running water).	Marginal	Low	No
Mammalia				

Species	Description of Habitat	Presence of Habitat	Likelihood of occurrence	Possible impact?
Chalinolobus dwyeri Large-eared Pied Bat EPBC-V	Caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features.	Marginal	Low	No
Dasyurus maculatus Spotted-tail Quoll EPBC-E	Variety of vegetation types including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Marginal	Low	No
Nyctophilus corbei Corben's Long-eared Bat EPBC-V	Variety of vegetation types, most commonly Mallee, Bulloke, and Box-dominated communities, but most common in vegetation with distinct canopy and dense understorey. Roost in tree hollows, crevices, and under loose bark.	Marginal	Low	No
Phascolarctos cinereus Koala EPBC-V	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.	Present	Moderate	No
Pteropus poliocephalus Grey-headed Flying-fox EPBC-V	Range of vegetation communities including rainforest, open forest, and closed and open woodland. Roost sites usually near water, including lakes, rivers, and coastlines.	Present	Moderate	No
Reptiles				
Aprasia parapulchella Pink-tailed Worm-lizard EPBC-V	Inhabits sloping open woodland areas with predominantly native grassy ground layers. Commonly found beneath small, partially-embedded rock.	Marginal	Low	No
Delma impar Striped legless lizard EPBC-V	Inhabits grassland 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 *Rhytidosperma spp* and exotic components.	Marginal	Low	No

Species	Description of Habitat	Presence of Habitat	Likelihood of occurrence	Possible impact?
FLORA				
Androcalva procumbens (Commersonia procumbens) EPBC-V	Occurs in sandy and often disturbed sites mainly confined to the Dubbo;-Mendooran;- and Gilgandra region, also in Pilliga and Nymagee areas. Recorded in Eucalyptus dealbata and Eucalyptus sideroxylon communities, Melaleuca uncinata scrub, under mallee eucalypts with a Calytrix tetragona understorey, and in a recently burnt Ironbark and Callitris area.	Marginal	Low	No
Dichanthium setosum Bluegrass EPBC-V	Associated with heavy basaltic black soils and red-brown loams with clay subsoils in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture.	Present	Moderate	No
Euphrasia arguta EPBC-CE	Eucalypt forest with a mixed grass and shrub understorey in an open disturbed area and along the roadside.	Marginal	Low	No
Homoranthus darwinioides EPBC-V	Grows in in various woodland habitats with shrubby understoreys, usually in gravely sandy soils. Landforms the species has been recorded growing on include flat sunny ridge tops with scrubby woodland, sloping ridges, gentle south-facing slopes, and a slight depression on a roadside with loamy sand.	Marginal	Low	No
Leucochrysum albicans var. tricolor Hoary Sunray EPBC-E	Variety of grassland, woodland and forest habitats, generally on relatively heavy soils	Marginal	Low	No
Prasophyllum petilum Tarengo Leek Orchid EPBC-E	Open sites within Natural Temperate Grassland	Marginal	Low	No
Prasophyllum sp. Wybong (C. Phelps ORG 5269) A leek-orchid	Perennial orchid, appearing as a single leaf over winter and spring in open eucalypt woodland and grassland	Marginal	Low	No

Species	Description of Habitat	Presence of Habitat	Likelihood of occurrence	Possible impact?
EPBC-CE				
Swainsona recta Small Purple-pea EPBC-E	Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils.	Present	Moderate	No
Thesium austral Austral Toadflax EPBC-V	Coastal headlands or grassland and grassy woodland away from the coast in association with Kangaroo Grass (*Themeda triandra*)	Marginal	Low	No
Tylophora linearis EPBC-E	Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of Eucalyptus fibrosa, *Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla* and *Allocasuarina luehmannii.*	Marginal	Low	No
Migratory Terrestrial Species				
Hirundapus caudacutus White-throated Needletail EPBC-V, M	White-throated Needletails almost always forage aerially, at heights up to 'cloud level', above a wide variety of habitats ranging from heavily treed forests to open habitats, such as farmland, heathland or mudflats, though they sometimes forage much closer to the ground in open habitats, once as low as about 15 cm in a coastal saltworks. The species has been recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows	Present	Low	No
Motacilla flava Yellow Wagtail EPBC-M	This species occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra. In the north of its range it is also found in large forest clearings. It breeds from April to August, although this varies with latitude.	Present	Low	No
Myiagra cyanoleuca Satin Flycatcher EPBC-M	The Satin Flycatcher is found along the east coast of Australia in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests. The Satin Flycatcher nests in loose colonies of two to five pairs nesting at intervals of about 20 m - 50 m apart. It builds a broad-based, cup-shaped nest of shredded bark and grass, coated with	Present	Low	No

Species	Description of Habitat	Presence of Habitat	Likelihood of occurrence	Possible impact?
	spider webs and decorated with lichen. The nest is placed on a bare, horizontal branch, with overhanging foliage, about 3 m - 25 m above the ground.			
Rhipidura rufifrons Rufous Fantail EPBC-M	The Rufous Fantail is found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. During migration, it may be found in more open habitats or urban areas The Rufous Fantail builds a small compact cup nest, of fine grasses bound with spider webs, that is suspended from a tree fork about 5 m from the ground. The bottom of the nest is drawn out into a long stem.	Marginal	Low	No
Migratory Wetland Species				
Actitis hypoleucos Common Sandpiper EPBC-M	Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. Has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags.	Present	Low	No
Calidris acuminata Sharp-tailed Sandpiper EPBC-M	They are widespread in both inland and coastal locations and in both freshwater and saline habitats.	Present	Low	No
Calidris ferruginea Curlew Sandpiper EPBC-CE, M	Intertidal mudflats in both fresh and brackish waters in sheltered coastal areas, such as estuaries, bays, inlets, and lagoons. Also recorded inland, including around ephemeral and permanent lakes, dams, and waterholes, usually with bare edges of mud or sand.	Present	Low	No
Calidris melanotos Pectoral Sandpiper EPBC-M	The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing	Marginal	Low	No

Species	Description of Habitat	Presence of Habitat	Likelihood of occurrence	Possible impact?
	vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum.			
Gallinago hardwickii Latham's Snipe EPBC-M	Occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). Known to occur in the upland wetlands of the New England Tablelands and Monaro Plateau.	Marginal	Low	No

APPENDIX H EPBC ACT ASSESSMENT OF SIGNIFICANT IMPACT

The *Environment Protection and Biodiversity Conservation Act 1999* specifies whether a development is likely to significantly impact federally listed TECs, threatened species, or migratory species. The following assessments consider the significance of the likely impacts associated with the proposed works on:

- White Box, Yellow Box, Blakely's Red Gum Grassy Woodland CEEC; and
- Dollarbird *Eurystomus orientalis*.

WHITE BOX, YELLOW BOX, BLAKELY'S RED GUM GRASSY WOODLAND

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

a) reduce the extent of an ecological community?
The Development Site contains approximately 2.18 ha of vegetation which conforms to the EPBC listed form of White Box, Yellow Box, Blakely's Red Gum Grassy Woodland. Approximately 0.58 ha of this community would be impacted near the substation by the construction of the transmission line. The proposal avoids the highest quality areas of this community in the southern part of the Development Site where large patches of intact canopy are present. The amount of vegetation to be impacted is relatively small in the context of the remaining community within the locality. The 0.58 ha of vegetation to be impacted does not occur at the edge of the community's range and will not reduce the extent of the community.
b) fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines; or adversely affect habitat critical to the survival of an ecological community
The proposal has been designed to avoid impacts to the highest quality and most intact areas of native vegetation within the Development Site. No further fragmentation or isolation of habitat is considered likely as a result of the proposal. The White Box Grassy Woodland within the Development Footprint is highly disturbed and modified by historical clearing and agricultural land management practices. This vegetation is not considered habitat critical to the survival of the community.
c) Will modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns

It is predicted that the proposal could have impacts on,

- surface water flows across the ground due to the presence of solar panels,
- change in light levels reaching the ground due to shading of panels,
- modification to ground moisture levels where solar panels may block or concentrate rain over certain areas.

There is little scientific information on the effects of solar farms on these factors. Until sufficient monitoring of Solar farms is carried out, it is largely unknown whether solar farms are likely to have a detrimental impact on abiotic factors. A 'worst case' assumption would be that alterations to sunlight reaching the ground and changes to surface water flows due to the large surface area of solar panels over the ground, could modify abiotic factors necessary for survival of the community.

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

The proposal will impact approximately 0.58 ha of poor condition White Box Grassy Woodland which involves a reduction of native species composition within that area. However, an area of a higher quality and more intact form of the community within the Development Site will be retained. This is considered likely to ensure that the species complexity and composition of the community remains similar within the subject site and within the locality. As such, the proposal would not cause a substantial change in the species composition of White Box Grassy Woodland.

e) cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

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

The proposal is not considered likely to generate an increase in invasive species harmful to the ecological community. The community occurs in a poor-moderate condition form throughout much of its extent within the subject site as a result of adjacent agricultural land use and historical clearing, which has denuded the native seedbank and increased the number of exotic invasive weeds within the subject site. The proposal is not considered likely to exacerbate this impact to the point that it would constitute a substantial reduction in the quality or integrity of the community within the subject site.

The proposal is not considered likely to interfere with the recovery of the community as a larger and higher quality remnant will be avoided and retained. Additionally, the area surrounding the transmission line which will be avoided and retained, ensuring that the recovery of the community within the subject site continues.

Conclusion

Though the proposal will generate a net decrease of 0.58 ha in the extent of the White Box Grassy Woodland, the extent of removal is not considered likely to generate a significant impact to the community such that it would no longer remain viable within the subject site or locality. The proposal has avoided the highest quality portion of the community. A referral under the EPBC Act is not considered necessary.

DOLLARBIRD EURYSTOMUS ORIENTALIS

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

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

The Dollarbird *Eurystomus orientalis* arrives in northern and eastern Australia in September each year to breed. In March or April the birds return to New Guinea and adjacent islands to spend the winter. During breeding season, eggs are laid in an unlined tree hollow and are incubated by both adults.

Important habitat is defined as:

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

The subject site does not contain important habitat for the Dollarbird as the population is spread over much of northern and eastern Australia, no critical breeding or foraging habitat is present, the site is not at the limit of the species' range, and the species conservation status is listed as secure in NSW. The proposal will not substantially modify existing native vegetation that Dollarbirds may rely on for foraging and breeding habitat on occasion. Habitat will remain viable within the subject site and the broader locality, ensuring that the species remains viable.

b) result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or

The proposal is not considered likely to result in the establishment of any invasive species that area harmful to the species.

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

Four individuals of the species are not considered to constitute an ecologically significant proportion of the species. Also, the proposal will not remove hollow bearing River Red-gum *Eucalyptus camaldulensis* along the Talbragar River adjacent to the Development Site which are utilised by the species. As such, the proposal is not considered likely to seriously disrupt the life cycle of an ecologically significant proportion of the Dollarbird population.

Conclusion

The proposal is not considered likely to significantly impact the Dollarbird. The extent of impact to suitable habitat is considered minimal and habitat will be retained within the subject site, ensuring that the species remains viable within the subject site and locality. A referral under the EPBC Act is not considered necessary.

APPENDIX I DETAILED DESIGN

Legend

Development layout
- Fence
- Road
- Site compound
- Solar array
- Substation
- Transformer
- Transmission line track and tower
- Essential Energy substation expansion
- Development site
- Subject land
- Site access point

Road
- Local Road
- Primary Road
- Track-Vehicular

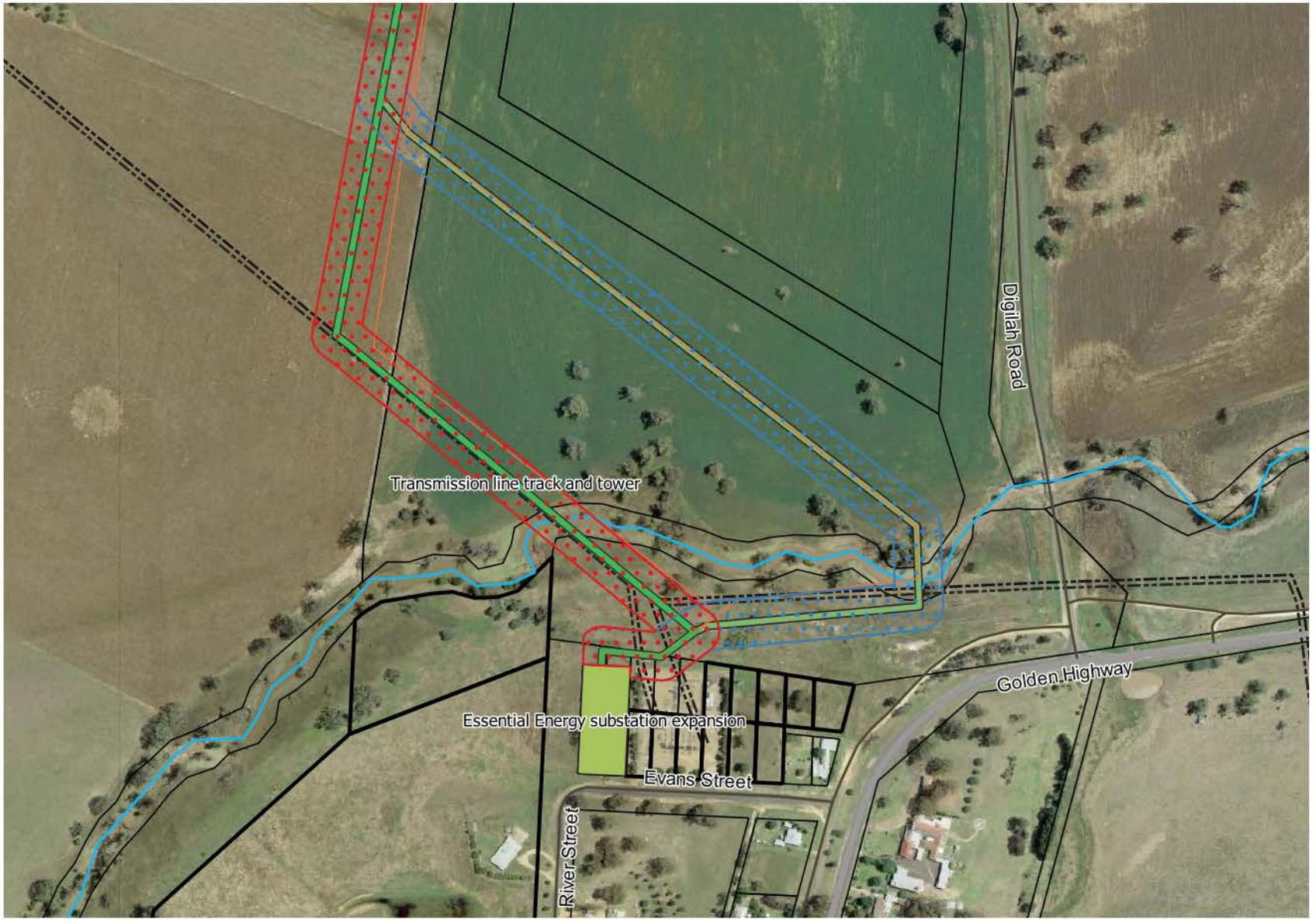
Waterway
- Non Perennial
- Perennial

Lot boundary
- Surveyed boundary
- LPI approx boundary

Ref: 17-362 Dunedoo Solar Farm 8.1.2020 \ Figure 4 3 Dunedoo solar farm solar array layout
Author: clancy.b
Date created: 19.06.2020
Datum: GDA94 / MGA zone 55

0 100 200 300 m

NGH



Legend

Development layout

Option 1 transmission line corridor

Option 2 transmission line corridor

Existing transmission line

Road

Local Road

Primary Road

Track-Vehicular

Lot boundary

Surveyed boundary

LPI approx boundary

Ref: 17-362 Dunedoo Solar Farm 8.1.2020 \
Figure 4 11 Proposed Transmission Line options to connect with existing feeders en route to the Essential Energy substation
Author: clancy.b
Date created: 07.09.2020
Datum: GDA94 / MGA zone 55

0 25 50 75 100 m

NGH