APPENDIX D BIODIVERSITY ASSESSMENT

EPURON

Biodiversity Assessment Report

NEVERTIRE SOLAR FARM

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ACRONYMS AND ABBREVIATIONS

BBAM	BioBanking Assessment Methodology
BCC	BioBanking Credit Calculator
BOS	Biodiversity Offset Strategy
CEEC	Critically Endangered Ecological Community
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
FBA	Framework for Biodiversity Assessment
ha	Hectares
km	Kilometres
m	Metres
NSW	New South Wales
OEH	(NSW) Office of Environment and Heritage (formerly DECCW)
PCTs	Plant Community Types
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy (NSW)
sp/spp	Species/multiple species
TSC Act	*Threatened Species Conservation Act 1995* (NSW)

EXECUTIVE SUMMARY

Epuron proposes to develop approximately 200ha of the 255ha proposal site for a 105 megawatt solar photovoltaic array and associated infrastructure within the Warren Shire Local Government Area, NSW. This Biodiversity Assessment Report (BAR) has been prepared by NGH Environmental on behalf of Epuron. The aim of this BAR is to address the biodiversity matters raised in the Secretary's Environmental Assessment Requirements (SEARs) and to address the requirements of the Framework for Biodiversity Assessment (FBA), developed for Major Projects as part of the Biodiversity Offsets Policy for Major Projects. This BAR forms part of an Environmental Impact Statement (EIS) for a State Significant Development (SDD), prepared under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The FBA underpins the Biodiversity Offsets Policy for Major Projects. It contains the assessment methodology that is adopted by the policy to assess impacts and provide offset guidance for Major Projects. This report follows the BAR format required by the FBA. Specifically, this assessment uses the *site-based* landscape assessment methodology, in accordance with Appendix 4 of the FBA for major proposals.

Comprehensive mapping and field surveys were completed in accordance with the requirements in the FBA, and resulted in the identification of three threatened species, one migratory species and one Endangered Ecological Community (EEC) within the development site and adjacent vegetation. Threatened species identified within the development site included:

- Grey-crowned Babbler (Eastern subspecies) *Pomatostomus temporalis temporalis* – Vulnerable (TSC Act)
- Spotted Harrier *Circus assimilis* – Vulnerable (TSC Act)

Both of the species are ecosystem credit species. In addition, a single male Koala (Vulnerable TSC Act) was heard vocalising in woodland vegetation adjacent to the development site. The impacts to these species have been thoroughly assessed.

The clearing of a total of 0.84 ha of one Plant Community Type (PCT) constituting predicted habitat for threatened fauna, resulted in the generation of 14 Ecosystem Credits. No Endangered Ecological Communities (EECs) would be impacted by the proposal. Approximately 0.57 ha of vegetation within the development site had site value scores of <17 and as such did not generate ecosystem credits.

One species credit species, Sloane's Froglet (*Crinia sloanei*) is assumed to occur within the development site as survey timing was not suitable for this species. This species generates 295 species credits and would require an offset unless appropriately timed survey demonstrate the species does not occur onsite.

Consideration has been given to avoiding and minimising impacts to biodiversity throughout each phase of the proposal to date. Site selection options have been assessed against key environmental, social and economic criteria. Mitigation and management measures will be put in place to adequately address impacts associated with the proposal, both direct and indirect.

A Biodiversity Offset Strategy (BOS) will be prepared in accordance with the FBA. It is proposed that an offset will be established subject to consent conditions within 2 years of the commencement of construction, which would be adequate for the retirement of the biodiversity credits required for the proposal.

1 INTRODUCTION

The Nevertire 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 Assessment Report (BAR) assesses the impacts of the proposed Nevertire Solar Farm (the proposal) according to the NSW Framework for Biodiversity Assessment (FBA) as required by the Secretary's Environmental Assessment Requirements (SEARs) for the proposal.

As stipulated in Section 1.3 of the FBA, proponents must identify and assess the impacts of the proposal on all nationally listed threatened species and threatened ecological communities that may be on the development site. This is addressed in Section 5. The following sections present the detail required to adequately assess the impacts on biodiversity for the Nevertire Solar Farm proposal according to the FBA.

1.1 THE PROPOSAL

1.1.1 Site location

The Nevertire Solar Farm development site is located approximately 1km west of the Nevertire Village and 90km west of Dubbo, within the Warren Shire Council Local Government Area (LGA). The site would be accessed directly off the Mitchell Highway, on the southern site boundary. The power to be generated at the solar farm would be fed into the national grid via an existing substation within Nevertire, approximately 1.5km east of the site (Figure 1-1).

1.1.2 Site description

The Nevertire Solar Farm development site is identified as Lot 26 DP 755292. The site is approximately 255ha, the majority of which has been cleared of native vegetation and is cultivated. The site is currently sown with wheat. There are patches of remnant native vegetation, mainly on the site's periphery, along the western boundary, along the centre of the northern boundary and in the north-east corner of the site.

One waterway, Boggy Cowal, is located along the western boundary. One farm dam is located within the site. There is an existing perimeter access track.

Access to the Nevertire Solar Farm proposal site would off the Mitchell Highway (State Highway), which borders the south of the site.

The proposed transmission line, east of the solar farm site would occur within the road reserve of Belerenga Street and intersect the Nevertire Warren railway line, Lot 100 DP 1179330, Lot 37 DP 755292 and Lot 7309 DP 1167738. It would be situated north of the Nevertire Community Park and Noel Waters Oval, and south of the Nevertire sewerage treatment plant.

1.1.3 Proposal description

The Nevertire Solar Farm proposal would comprise of the installation of a solar plant with a capacity up to 105MW that would supply electricity to the national electricity grid. Epuron proposes to develop around 200ha of the 255ha proposal site, retaining existing viable native vegetation remnants that occur on the array site. An indicative development area is illustrated in Figure 1-2.

The proposal would include the following elements:

- An access track off the Mitchell Highway.
- Flat plate PV modules in a fixed or tracking arrangement.
- Onsite 132kV substation.
- A site office and maintenance building.
- Internal inverter stations to allow conversion of DC module output to AC electricity.
- Underground electrical conduits and cabling to connect the arrays on the array site.
- Internal access tracks to allow for site maintenance.
- Perimeter security fencing.
- Grid connection to the existing substation approximately 1.5km east of the site via an overhead and underground line (132kv).
- Native vegetation screening, where required to break up views of infrastructure.

In total, the construction phase of the proposal is expected to take 11 months. The Nevertire Solar Farm is expected to operate for around 30 years. Approximately 2-3 operations and maintenance personnel would operate the plant. The solar farm would be decommissioned at the end of its operational life; all above ground infrastructure and below ground infrastructure less than 500mm deep would be removed in consultation with the landowner, with the site to be returned to its existing land capability.

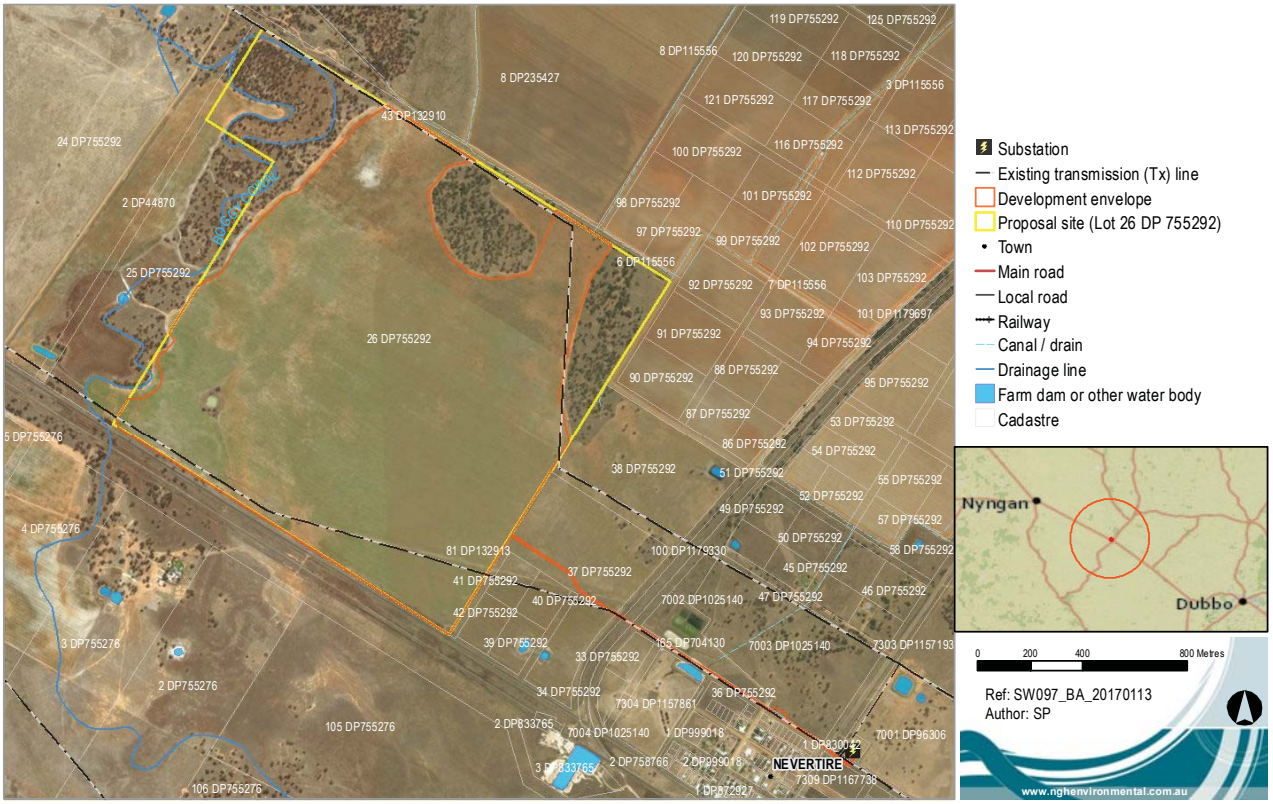

Figure 1-1 Site context

1.2 STUDY AIMS

This BAR has been prepared by NGH Environmental on behalf of Epuron.

The aim of this BAR is to address the requirements of the FBA, developed for Major Proposals, as required in the Secretary's Environmental Assessment Requirements (SEARs) and summarised below.

Secretary's Environmental Assessment Requirement	Where addressed
The EIS must address the following specific issues: • **Biodiversity** – including an assessment of the likely biodiversity impacts of the development (particularly in relation to the Boggy Cowal waterway), having regard to the *NSW Biodiversity Offsets Policy Major Proposals*, and in accordance with the *Framework for Biodiversity Assessment*, unless otherwise agreed by the Department.	**Sections 5 -8.**

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

1.3 REPORT STRUCTURE

This BAR follows the reporting requirements of Sections 1 and 2 of the FBA, including the following:

Section 1

- Identification of biodiversity values subject to the proposed major development (The Proposal) – Chapter 2 (Landscape Features), Chapter 3 (Native Vegetation), Chapter 4 (Threatened Species)

Section 2

- Impacts of the proposal on biodiversity as part of an application for approval to undertake a Major Proposal under the NSW planning legislation - Chapter 6 (Avoid and Minimise Impacts), Chapter 7 (Impact Summary).

1.4 DEFINITIONS

Nevertire Solar Farm ('the proposal)

This refers to all infrastructure and activities required to construct, operate and decommission the proposed solar farm.

The proposal is contained within the Warren Shire LGA.

The development site ('development site')

This refers to the main site containing most operational infrastructure in addition to the broader area within which infrastructure would be located. This includes the solar array, temporary construction facilities, the access track and cabling and the easement for the transmission line, east of the main site.

The development site is the area assessed in this BAR. The development site is approximately 200 ha (Figure 1-2) (Figure 1-3).

Assessment circles

Two landscape assessment circles (the inner and outer assessment circles) have been used in the assessment. They are centred over the area of greatest impact and take into account both cover and condition of vegetation. The inner assessment circle: outer assessment circle ratio is 1:10, as per the requirements of the FBA, Appendix 4. The area of the inner and outer assessment circles for this assessment are 100 ha and 1,000 ha respectively.

1.5 SOURCES OF INFORMATION USED

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

- Aerial maps, proposal layers and environmental layers provided by Epuron and OEH.
- Australian Government's Species Profiles and Threats database (SPRAT) http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 2.
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Species Profiles and Threats Database (SPRAT).
- Environment Australia (2001) A Directory of Important Wetlands in Australia. 3rd Edition. Environment Australia, Canberra.
- NSW OEH's BioBanking credit calculator (http://www.environment.nsw.gov.au/bbccapp/ui/mynews.aspx)
- NSW OEH's threatened species database http://www.threatenedspecies.environment.nsw.gov.au/index.aspx
- OEH Threatened Species Profiles
- Office of Environment and Heritage (OEH) (2007). Mitchell Landscapes with per cent cleared estimates.
- OEH Vegetation Information System (VIS) Classification Database (OEH 2016)
- Office of Environment and Heritage (OEH) (2014). Framework for Biodiversity Assessment: NSW Biodiversity Offsets Policy for Major Proposals. Published by Office of Environment and Heritage for the NSW Government.

1.6 OEH CONSULTATION

Consultation was undertaken with OEH on 21 December 2016 regarding options for assessing whether a threatened species (Sloane's Froglet) occurs at the site. It was confirmed by David Geering (Conservation Planning Officer – OEH, North West) that the FBA must be followed and that the options were to survey for it, assume the presence of the species or obtain an expert report. It is a commitment of the proposal (refer Section 6) to conduct appropriately timed surveys to determine the presence of this species.

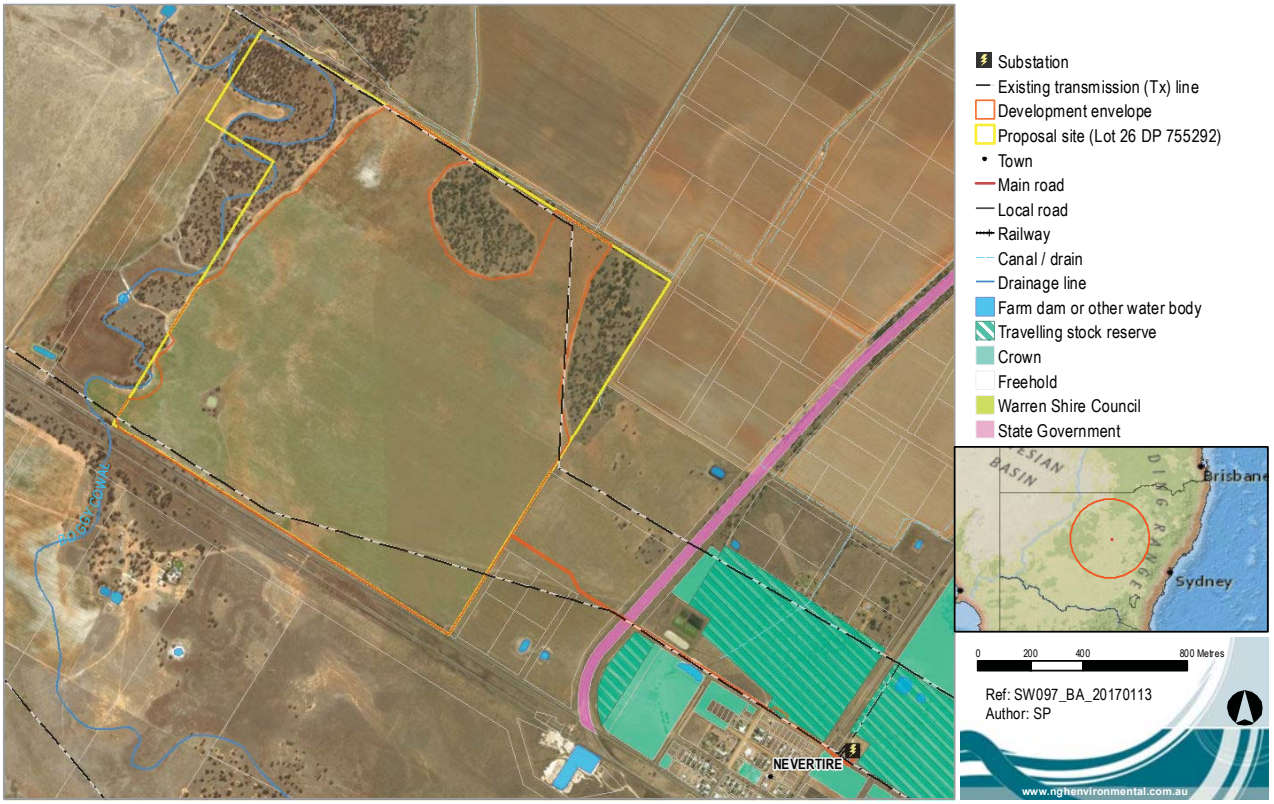

Figure 1-2 Site Map

Figure 1-3 Location Map

2 LANDSCAPE FEATURES

Epuron proposes to develop approximately 200ha of the 255ha proposal site. The proposal site comprises freehold land, identified as Lot 26 DP 755292 (Figure 1-2). It is bounded by agricultural land, mostly cropping, to the west, north and east. The Mitchell Highway is along the southern boundary and provides access to the eastern end of the site.

2.1 IBRA BIOREGIONS AND SUBREGIONS

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 Darling Riverine Plains Bioregion and the Bogan - Macquarie Subregion (IBRA v.7 2012). The geology of the region is Jurassic to Cretaceous, with landforms described as low plateaus; sand and clay plains. The dominant pre-European vegetation type is considered to be Eucalypt woodland dominated by Poplar Box (*Eucalyptus populnea*), Silver-leaved Ironbark (*Eucalyptus melanophloia*), Cypress Pine (*Callitris spp.*) and Wattle (*Acacia spp.*) (ASRIS accessed 28/11/16).

The dominant IBRA subregion affected by the proposal is the Bogan - Macquarie Subregion. This was entered in the BioBanking Credit Calculator (BCC) for the proposal.

2.2 NSW LANDSCAPE REGIONS (MITCHELL LANDSCAPES)

Three Mitchell Landscapes occur within the development site; Boggy Cowal Channels and Floodplains, Boggy Cowal Alluvial Plains and Trangie Terrace (Table 2-1) (Figure 1-2).

- Boggy Cowal Channels and Floodplains occurs around the outer edge of the development site, and is currently 65% cleared (OEH, 2016).
- Boggy Cowal Alluvial Plains occurs throughout the central portion of the development site, and is currently 82% cleared (OEH, 2016)
- Trangie Terrace occurs to the north of the development site, and is currently 87% Cleared (OEH, 2016)

The Mitchell Landscape descriptions are provided in Table 2-1 below.

Table 2-1 Description of the Mitchell Landscape relevant to the proposal (DECC 2002)

Mitchell Landscape
Boggy Cowal Channels and Floodplains (106,058.18 ha)
Pleistocene fluvial sediments of channel and meander plain facies of the Carrabear Formation associated with the Boggy Cowal distributary stream system. Sediments are mainly fine sands, relatively clean in channels and forming structureless red-brown loamy sand on the plains. Originally mainly white cypress pine *Callitris glaucophylla* woodland, now extensively cleared. Slightly heavier soils in shallow depressions dominated by bimble box *Eucalyptus populnea*, belah *Casuarina cristata* and myall *Acacia pendula*.
Boggy Cowal Alluvial Plains (244,794.66 ha)
Pleistocene fluvial sediments of backplain facies of the Carrabear Formation associated with the Boggy Cowal distributary stream system. Medium to heavy grey cracking clays with extensive gilgai. Carbonate nodules common in the subsoil and worked to gilgai crests, local relief to 2m. Extensive grasslands with scattered stands of myall *Acacia pendula*, bimble box *Eucalyptus populnea*, black box *Eucalyptus largiflorens* and belah *Casuarina cristata*.
Trangie Terrace (110,427.15 ha)
The oldest fluvial units recognised in the upper section of the Macquarie-Bogan alluvial fan. Slightly elevated plain with northwest slope of late Pliocene and Pleistocene fluvial sand and gravel channel facies on an abandoned meander plain with flanking silty clay with sand layers of backplain facies of the Trangie Formation. Red texture-contrast soils are widespread with red sandy loams on coarser sediments, overall relief 5 to 7m. Mostly spear grass *Austrostipa sp.* and wallaby grass *Austrodanthonia sp.* with scattered to dense patches of myall *Acacia pendula* or bimble box *Eucalyptus populnea*. The myall country probably originally carried an old man saltbush *Atriplex nummularia* understorey but little remains. White cypress pine *Callitris glaucophylla*, budda *Eremophila mitchellii* and wilga *Geijera parviflora* on sandy soils. Extensively grazed and cultivated.

The dominant Mitchell Landscape affected by the proposal is Boggy Cowal Alluvial Plains and this was entered into the BCC for the proposal.

2.3 NATIVE VEGETATION EXTENT

Using GIS, an inner and outer assessment circle with the ratio of 1:10 was established. A 100 ha inner assessment circle and 1,000 ha outer assessment was established over the proposal site and centred over the area of native vegetation that is impacted most by the proposal.

As the natural vegetation that would have occurred at the site was woodland, native vegetation mapping used over-storey as a surrogate for native vegetation cover, and is considered conservative as this would include non-native vegetation that may still provide some habitat value. The local area's native vegetation is derived from woodland and as such, no natural grasslands are relevant to the study area.

The total area of native vegetation mapped within the outer assessment circle is 223.10 ha. Refer to Figure 1-3.

2.4 CLEARED AREAS

Cleared areas in the development site are primarily used for cropping agriculture and provide very little in terms of fauna habitat. These areas provide suitable foraging habitat for raptors, parrots, cockatoos and

macropods, and introduced species such as cats, foxes and rabbits. Approximately 199ha (99.5%) within the site boundary is cleared (non-native vegetation) land.

2.5 RIVERS AND STREAMS

No rivers or streams occur within or adjacent to the development site.

2.6 WETLANDS

Naturally occurring areas of inundation occur within the western portion of the development site, forming ephemeral wetlands. While still cropped, these areas become inundated following heavy rainfall events, and form part of Boggy Cowal. These areas are considered likely to provide suitable foraging habitat for groups such as wading birds and ducks, in addition to suitable breeding habitat for frogs, although they are generally considered low quality due to a sparse covering of aquatic vegetation.

There is one man-made dam within the development site that provides similar habitat values and may even connect to the ephemeral wetland areas given sufficient rainfall.

The closest Nationally Important Wetland to the development site is the Macquarie Marshes, located approximately 95 km to the north of the development site.

2.7 STATE OR REGIONALLY SIGNIFICANT BIODIVERSITY LINKS

State significant biodiversity links, regionally significant biodiversity links, very large area biodiversity links, large area biodiversity links or local area biodiversity links are defined in the FBA. To date, no biodiversity corridor plans have been approved by the Chief Executive of the OEH.

No state or regionally significant biodiversity links occur within the development site and within the inner and outer assessment circles.

2.8 LANDSCAPE VALUE SCORE COMPONENTS

A BioBanking Credit Calculator (BCC) assessment was completed for this proposal. The proposal ID for the assessment is 0035/2016/4008MP Version 1 and the assessment type was selected as 'Major proposal'. This section summarises the values entered into the Landscape values section of the BCC assessment.

2.8.1 Method applied

The proposal conforms to the definition of a *site-based development* according to the FBA; a development other than a linear-shaped development, or a multiple fragmentation impact development. As a result, the site-based landscape assessment methodology has been used in the assessment, in accordance with Appendix 4 of the FBA for major proposals. Key information entered into the BCC is detailed below.

2.8.2 Percent native vegetation cover in the landscape

The following steps were completed in accordance with Appendix 4 of the FBA. They were completed based on the proposal footprint as of November 2016.

Assessing percent current extent of native vegetation cover in the inner and outer assessment circles

Using GIS an inner and outer assessment circle with the ratio of 1:10, was established and centred on the area of native vegetation that is most impacted by the proposal.

- The total area of the inner assessment circle is 100 ha
- The total area of the outer assessment circle, including the development site, is 1,000 ha
- Current native vegetation cover within the inner assessment circle is 27.90%, rounding this gives a native vegetation cover of 28%
- Current native vegetation cover within the outer assessment circle is 22.31%, rounding this gives a native vegetation cover of 22%

Assessing percent future extent of native vegetation cover

Using the same inner and outer assessment circles:

- Future native vegetation cover in the inner assessment circle is 27.06%, rounding this gives a native vegetation cover of 27%
- Future native vegetation cover in the outer assessment circle is 22.17%, rounding this gives a native vegetation cover of 22%

2.8.3 Connectivity value

A connecting link is when native vegetation on the site adjoins native vegetation surrounding the site and the native vegetation:

- is in moderate to good condition, and
- has a patch size >1 ha, and
- is separated by a distance of <100 m (or <30 m for non-woody ecosystems), and
- is not separated by a large water body, dual carriageway, wider highway or similar hostile link.

The moderate to good vegetation on the site is not connected to adjacent vegetation. No connecting links occur at the development site.

State or regional biodiversity links may also occur as defined in the defining criteria from FBA table 10 below.

Extract from the FBA Table 10: Connectivity value scores for site based development

Category of connecting link	Defining criteria
State significant biodiversity link	An area identified as being part of a state significant biodiversity link in a plan approved by the Chief Executive, OEH OR A riparian buffer 50 m either side of a 6th order stream or greater OR A riparian buffer 50 m around an important wetland or an estuarine area
Regionally significant biodiversity link	An area identified as being part of a regionally significant biodiversity link and in a plan approved by the Chief Executive, OEH OR A riparian buffer 20 m either side of a 4th or 5th order stream

There are no state or regional significant biodiversity links within the outer assessment circle and as such, none would be impacted by the proposal.

Connectivity value

The development would not impact on any connecting links or state or regional biodiversity links. A connectivity value class width of 0-5m was entered into the BCC for both before and after development. No native overstorey was entered into overstorey condition and no midstorey/groundcover was entered into midstorey/groundcover condition for both before and after development

2.8.4 Area to perimeter ratio

As the proposal is a site-based development and not a linear-shaped development or a multiple fragmentation development, the area to perimeter ratio for the proposal is not required to be assessed.

2.8.5 Patch size

The moderate to good vegetation at the site is not connected to adjacent vegetation. As such, the patch sizes entered for each vegetation zone were equal to the areas of each zone. As documented in Section 3.1.3 below, the moderate to good vegetation zones at the site are 0.84 ha and 0.04 ha. As the BCC does not allow for patch sizes of less than 1 ha, a patch size of 1 ha was entered for each moderate to good vegetation zone.

2.8.6 Landscape value score

Entering the data documented above into the BCC returned a landscape value score of 1.00.

3 NATIVE VEGETATION

3.1 PLANT COMMUNITY TYPES

3.1.1 Vegetation communities

One Plant Community Type (PCT) was identified in the development site, Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW (PCT 56).

Cleared areas that were dominated by non-indigenous vegetation were not considered to provide habitat for threatened species or communities and thus have not been included in the BCC calculations.

Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW (PCT 56)

Within the development site, PCT 56 occurred as:

- A small patch (0.84 ha) of moderate to good woodland vegetation around an existing dam within the proposed solar array area
- Derived grassland vegetation along the proposed transmission line with 0.07 ha in moderate to good condition and 0.51 hectares in low condition

The distribution of this vegetation type at the development site is shown on Figure 3-1 and a summary of the key details provided in Table 3-1.

This PCT was determined during the survey on the basis of plot data collected within the development envelope and on surveys conducted in adjacent less disturbed vegetation. The overstorey was characteristically dominated by Poplar Box (*Eucalyptus populneus* subsp. *bimbil*) with a sub component of Belah (*Casuarina cristata*) and occasional Wilga (*Geijera parviflora*). Western Rosewood (*Alectryon oleifolius* subsp. *canescens*) was present as occasional individuals within the less disturbed vegetation to the north of the solar array site. Characteristic shrub species of PCT 56 present include Thorny Saltbush (*Rhagodia spinescens*), Climbing Saltbush (*Einadia nutans* subsp. *nutans*), Ruby Saltbush (*Enchylaena tomentosa*) and Galvanised Burr (*Sclerolaena birchii*). The ground cover was heavily invaded with exotic annuals, perennial grasses and forbs. Where a native groundcover was present, Curly Windmill Grass (*Enteropogon acicularis*) was often the dominant grass species which is also listed as a diagnostic species for PCT 56. Common diagnostic forbs included Mallee Goodenia (*Goodenia fascicularis*), Tufted Bluebell (*Wahlenbergia communis*) and Blue Crowfoot (*Erodium crinitum*).

A range of other native shrub, grass and forb species were also recorded during the plot surveys. All species recorded, percentage cover and estimated numbers of individuals within each plots is included in Appendix A.

The development site is located on an alluvial plain and soils were comprised of a clay-loam which is consistent with the description of PCT 56.

Table 3-1 Summary of Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW in the development site.

Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW		
Vegetation formation	Semi-arid woodlands (shrubby)	
Vegetation class	Sand Plain Mallee Woodlands	
Vegetation type	**Plant Community Type (PCT) ID**	56
	Biometric Vegetation Type ID	CW167
	Common Community Name	Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW
Approximate extent within proposal	This vegetation community includes the majority of native vegetation within the development site of which 8.82 ha is proposed to be cleared (Figure 3-1).	
Condition	Moderate to good (poor) woodland and Moderate to good (medium) to Low condition derived grassland.	
Survey Effort	6 biometric plots (approximately 12 hours) as mapped on Figure 3-6.	
Conservation Status	This vegetation community is not listed as an endangered ecological community (EEC) under the NSW *Threatened Species Conservation Act 1995* (TSC Act) or the EPBC Act.	
Estimate of percent cleared	80%	
Threatened plant species habitat	This community provides habitat for the Slender Darling Pea (*Swainsona murrayana*) however, targeted surveys did not detect this species.	
Fauna Habitat	This vegetation community provides numerous habitat types for fauna. Canopy trees provide foraging and nesting/resting habitat for birds and arboreal fauna. The mid-storey provides foraging and nesting habitat for smaller birds, as well as refuge for small-medium sized mammals and reptiles. Ground cover plants, logs and fallen leaves also provide shelter and foraging habitat for terrestrial fauna. Where hollow-bearing trees are present, they may provide daytime resting habitat for bats and mammals, and roosting habitat for birds.	

Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	
Examples	 Figure 3-1 Example of moderate to good (poor) condition Poplar Box - Belah woodland in the development site.  Figure 3-2 Example of moderate to good (medium) condition Poplar Box - Belah woodland derived grassland in the development site.

Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	
	

Figure 3-3 Example of low condition Poplar Box - Belah woodland derived grassland in the development site (foreground).

Cleared areas (exotic dominated and cropped land)

Highly disturbed and modified vegetation community occupies the majority of the site and is found where there is a prevalence of exotic or planted exotic flora species that make up groundcover (Figure 3-4). Within the proposed array area, the groundcover is mainly the crop species Wheat (**Triticum aestivum*) with various other common agricultural weeds. Along the transmission line route there are areas surrounding the sewage ponds and south of Belerenga Street that are almost entirely exotic grass species including Perennial Rye Grass (**Lolium perenne*), Wild Oats (**Avena sp*) and Phalaris (**Phalaris aquatica*). Areas within the development site that comprise exotic dominated vegetation are those not mapped as native vegetation on Figure 3-5

As this vegetation was either cleared or had virtually no native component in any strata, then in accordance with the FBA, this vegetation does not need to be assessed further.

Figure 3-4 An example of exotic-dominated (cropped) vegetation within the development site (foreground)

3.1.2 Endangered Ecological Communities

Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW is not listed as an EEC under the TSC Act or EPBC Act. As such, no EECs occur within the development site.

A few scattered Myall (*Acacia pendula*) trees were identified to the north of the proposed transmission line which could represent the remains of what was previously an area of Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion (PCT 27). This community would be considered part of the Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions EEC. As the EEC is characterised by the presence of Myall, where Myall trees are present at the site, the EEC is considered to occur (refer to Figure 3-7). No Myall trees occur within the development site and as such there would be no impacts to this PCT or the EEC.

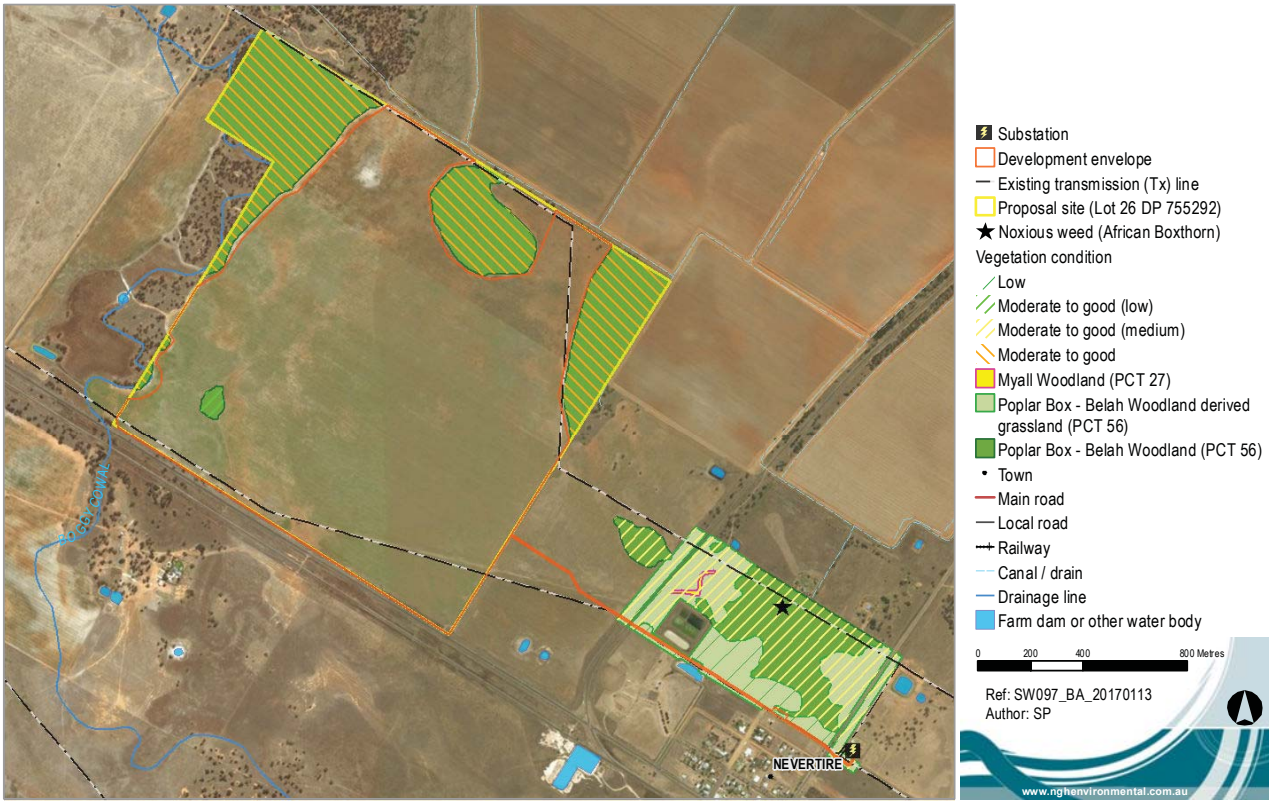

Figure 3-5 PCTs at the development site

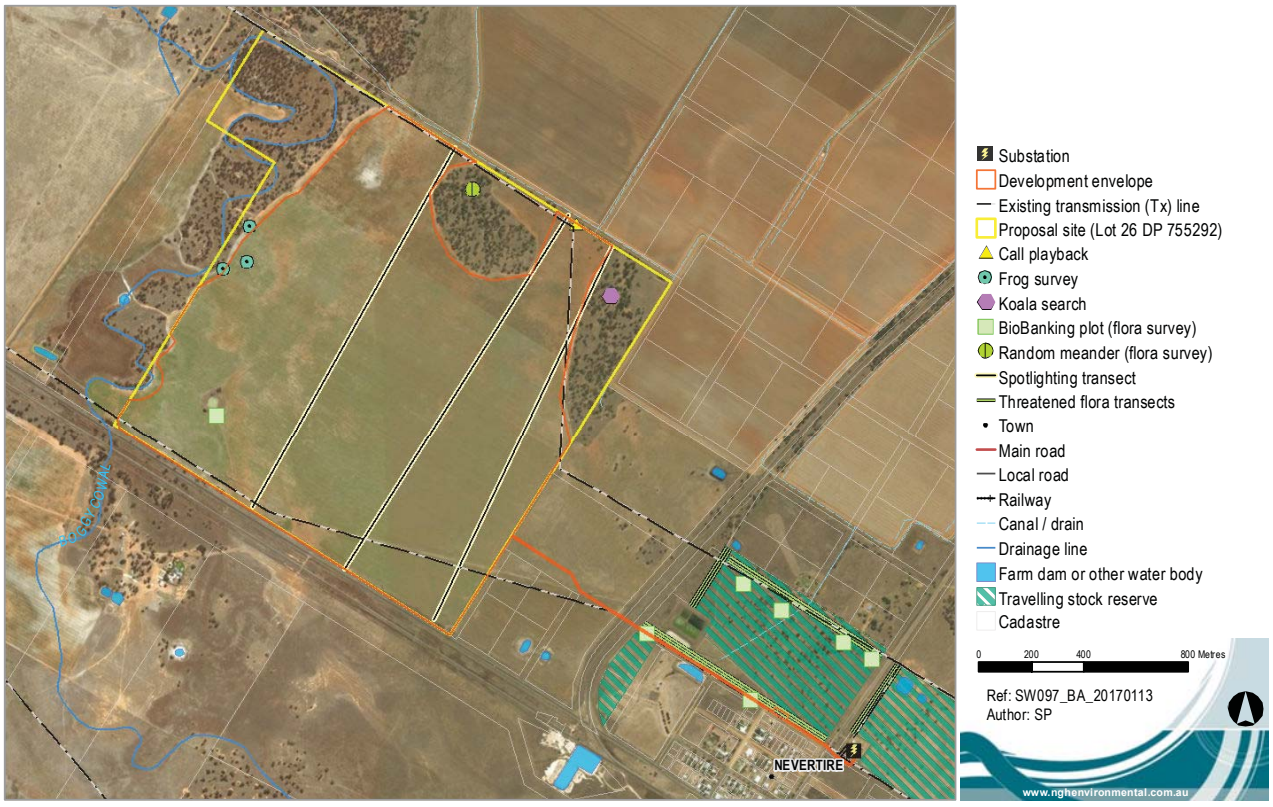

Figure 3-6 Survey locations at the development site

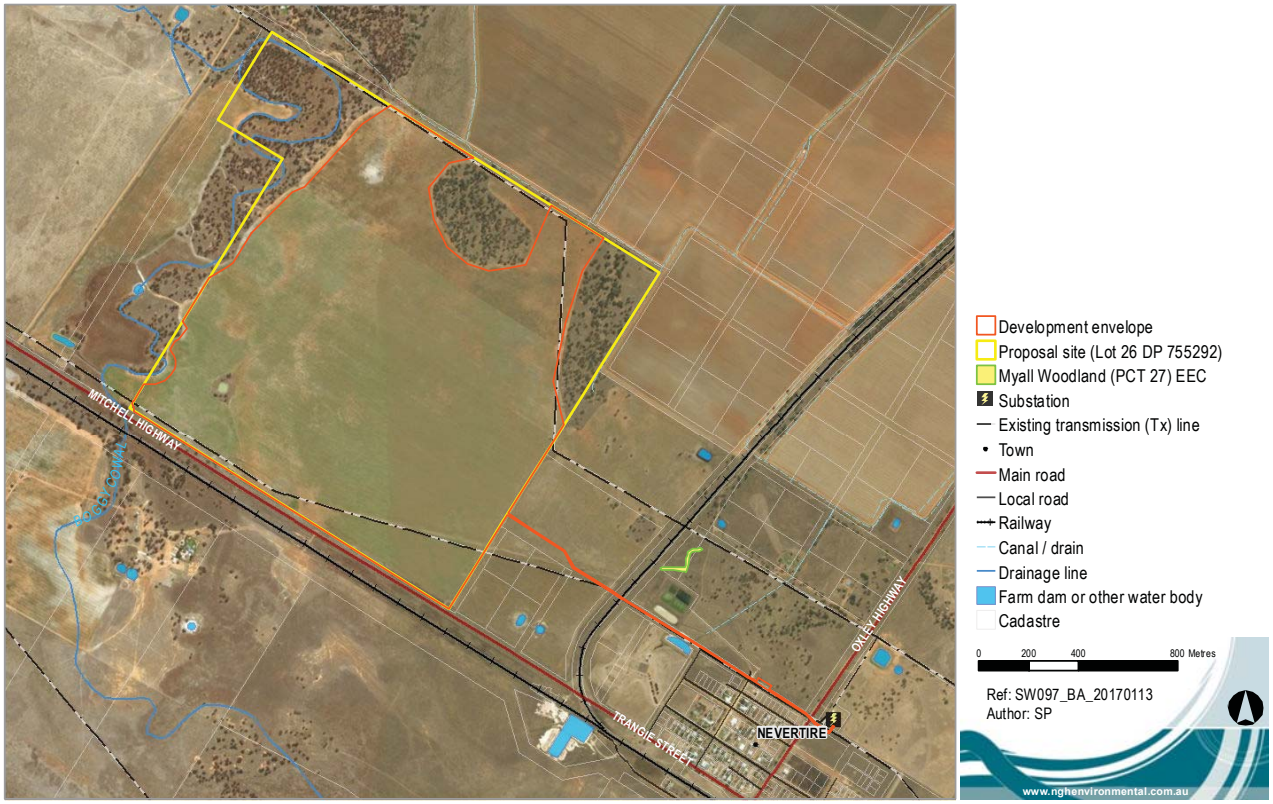

Figure 3-7 EECs at the development site

3.1.3 Vegetation zones in the BCC

The vegetation zones that would be impacted by the proposal, as entered into the BCC, their condition class, number of biometric plots undertaken within them and their current site value score, as determined by the BCC, are listed in Table 3-2 below.

Table 3-2 Vegetation zones for the development site

Zone ID	Vegetation zones	Condition class	Area (ha) within development site	Survey effort (number of plots)	Site value score (current)
1	PCT #56 BVT CW167 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Moderate – good (poor)	0.84	1	29.17
2	PCT #56 BVT CW167 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW[1]	Low	0.53	2	14.58
3	PCT #56 BVT CW167 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW[1]	Moderate – good (medium)	0.04	1	13.02
Total			**1.41**	**4**	

Notes:

- Threatened species subzones / management zones were entered equivalent to the vegetation zones. No additional polygons were mapped.
- No vegetation zones had site value scores of <17.

3.1.4 Site values (plot data entered into BCC)

The following plot data was collected in October 2016 for vegetation zones 1, 2 and 3 (Table 3-3). Another three plots were also conducted within the woodland to the north of the proposed transmission line which would have comprised a separate vegetation zone. However, subsequent revision of the proposal design has removed infrastructure from this zone and it is no longer included in this assessment.

[1] Occurring as a derived grassland with no overstorey or midstorey present

Table 3-3 Plot data

Zone 1: PCT #56 - CW167 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW Moderate to good (poor) condition

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
NVTSA1	8	7.5	0	4	0	6	86	1	0	15	565931	6478857	55

Zone 2: PCT #56 - CW167 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW Low condition

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
NVTTL2	16	0	0	44	4	4	86	0	0	0	567973	6477767	55
NVTTL3	8	0	0	28	0	6	96	0	0	0	567578	6478014	55

Zone 3: PCT #56 - CW167 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW Moderate to good (medium) condition

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
NVTTL6	12	0	0	72	0	12	82	0	0	0	568433	6477916	55

4 THREATENED SPECIES

4.1 GEOGRAPHIC/HABITAT FEATURES

Two geographic/habitat features suitable for ecosystem credit species were generated by the BCC. These features and whether they would be impacted by the proposal is shown in Table 4-1 below.

Table 4-1 Geographic / habitat features

Impact	Common name	Scientific name	Feature
Yes	Sloane's Froglet	*Crinia sloanei*	Land within 50 meters of identified breeding habitat[2]
No	Grey Falcon	*Falco hypoleucos*	Land containing within 100 m of riparian woodland on inland rivers containing mature living eucalypts or isolated paddock trees overhanging water or dry watercourses

Potential breeding habitat for Sloane's Froglet was identified at the development site as Boggy Cowal and adjacent ephemeral wetlands.

4.2 ECOSYSTEM CREDIT SPECIES

The following species are all species predicted by the BCC to occur, based on the data entered for the landscape assessment and vegetation zones in the assessment. These constitute all species which will generate ecosystem credits in the credit calculations.

Table 4-2 Ecosystem credit species predicted to occur.

Common name	Scientific name	TS offset multiplier
Diamond Firetail	*Stagonopleura guttata*	1.3
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	1.8
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis subsp. temporalis*	1.3
Little Eagle	*Hieraaetus morphnoides*	1.4
Little Pied Bat	*Chalinolobus picatus*	2.1
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	1.9
Painted Honeyeater	*Grantiella picta*	1.3
Pied Honeyeater	*Certhionyx variegatus*	1.3
Red-tailed Black-Cockatoo (inland subspecies)	*Calyptorhynchus banksii subsp. samueli*	1.8

[2] 'identified breeding habitat', as defined for 'breeding habitat' in the TSPD - *Typically breeds in ephemeral wetlands, or periodically inundated areas of permanent wetlands, in grasslands, woodlands, and disturbed environments*.

Spotted Harrier	*Circus assimilis*	1.4
Square-tailed Kite	*Lophoictinia isura*	1.4
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	2.2

4.3 SPECIES CREDIT SPECIES PRESENT

4.3.1 Candidate species

The following species were returned by the BCC as requiring survey. Targeted surveys were undertaken for all species excluding Sloane's Froglet as survey timing was not appropriate for this species which is identified as winter in the BCC. Table 4-3 summarises whether each species was detected during surveys and furthermore, if they are expected to be impacted by the proposal and therefore are required to be offset. Details regarding targeted surveys undertaken is provided below.

Table 4-3 Threatened species requiring survey

Common name	Scientific name	Surveys	Present/presumed present	Affected by the proposal
Koala	*Phascolarctos cinereus*	Detected within vegetation adjacent to the development site	Yes	Unlikely – habitat for this species would not be impacted
Red-backed Button-quail	*Tumix maculosus*	Not detected during targeted survey	No	Unlikely – not recorded within the development site nor within over 200km of the site
Slender Darling Pea	*Swainsona murrayana*	Not detected during targeted survey	No	Unlikely – not recorded within the development site during targeted surveys
Sloane's Froglet	*Crinia sloanei*	Timing not suitable for targeted surveys for this species	Yes	Development site occurs within potential breeding habitat for this species

4.3.2 Targeted survey methodologies

Comprehensive and targeted survey methods and results are included below. The following section sets out the surveys undertaken that underpin the knowledge of the development site. This information is used in the BCC assessment and particularly, to support the decisions regarding candidate species that would be affected by the proposal. Section 7.2.2 also addresses this issue.

Flora and fauna field surveys were undertaken in October 2016 to ensure that the majority of species likely to be occurring within the development site could be detected, and in accordance with the threatened species survey timing matrix produced by the BCC. This includes flowering times of threatened flora. The exception is Sloane's Froglet which can only be adequately surveyed for during winter (June – August).

Fauna habitat assessment

An assessment of habitat types available and their quality and suitability as threatened species habitat was conducted across the development site. Factors such as arboreal resources, ground-layer resources, vegetation structure, connectivity and disturbance were noted.

A number of trees occurring within the development site were considered to be potentially hollow-bearing. An assessment was undertaken of all accessible trees within the development site to record the species, presence of hollows, tree height, diameter and number, and size and location of hollows. Photographs were taken of each tree surveyed. The hollow-bearing tree data is presented in Appendix B.

Waterbodies and ephemeral waterways were assessed for their fauna habitat potential and their likely utilisation by species within the locality.

Incidental sightings of fauna and their traces (e.g. scats, tracks, scratches) made while present on the site were also recorded.

Approximately 12 hours were spent assessing fauna habitat within the development site.

An opportunistic record of fauna species observed during the fauna assessments was taken.

Koala

The dominant overstorey species in the small area of woodland within the proposed solar array, Poplar Box, is listed as a secondary food tree species for the Koala by the NSW OEH for the western areas of NSW. It is also listed as a feed tree species on Schedule 2 of State Environmental Planning Policy (SEPP) 44 – Koala Habitat Protection. Surveys of the small woodland area were undertaken for the Koala by actively searching each of the five trees that occur within the small area of woodland. Nocturnal spotlighting surveys were also undertaken within the woodland area adjacent to the north-eastern boundary of the proposed solar array area (refer Figure 3-6).

Approximately two person hours were spent on surveys for the Koala.

Red-backed Button-quail

This species is known to occur in grasslands, heath and crops and is generally nocturnal. Poplar Box – Belah Woodland is not listed as a vegetation type that this species is associated with. Further, the nearest record for this species is over 200km east of the development site. As such it is considered highly unlikely that the species would occur at the site. Targeted surveys were however conducted for the species. Three nocturnal transects spaced approximately 200m apart were walked across the entire cropped area (refer to Figure 3-6). Approximately 2.5 person hours was spent on the surveys. Active searching was also undertaken during diurnal targeted flora surveys as habitat was potentially suitable. It was anticipated that birds would be flushed if present due to the close proximity of the transects being walked.

Slender Darling Pea

Targeted surveys were conducted within suitable habitat for the Slender Darling Pea. Surveys were undertaken within the optimal detection period for this species.

Surveys were conducted in accordance with the NSW Guide to Surveying Threatened Plants, and included formal linear transects within the development site, in addition to random meanders (after Cropper 1993) in areas of adjacent less disturbed habitat. Formal linear transects (parallel field traverses) were walked consecutively by three surveyors at a distance of 10 m. Transects were walked within linear corridors, and random meanders were conducted within discreet vegetation patches (refer to Figure 3-6). A total of

approximately 12 km of linear transects were completed within the development footprint (within vegetation considered likely to constitute suitable threatened flora habitat).

Approximately six person hours were spent surveying the development site to search for threatened plant species.

4.3.3 Previous surveys conducted in the local area

It is unclear whether dedicated biodiversity surveys have been undertaken within the locality, however evidence from the Atlas of Living Australia indicates that occasional opportunistic surveys are undertaken, with records from the Eremeae eBird website and Birdlife Australia being present within the locality, in addition to flora records from the Australian Virtual Herbarium.

4.3.4 Targeted survey results

Two threatened species listed under the NSW TSC Act were detected during the survey (Figure 4-1), including:

- Grey-crowned Babbler (Eastern subspecies) *Pomatostomus temporalis temporalis* – Vulnerable (TSC Act)
- Spotted Harrier *Circus assimilis* - Vulnerable (TSC Act)

These species are ecosystem credit species which are already accounted for in the assessment and do not generate species credits. The results of targeted surveys for the species requiring survey are detailed below along with a discussion regarding habitat suitability for Sloane's Froglet.

Koala

No Koala's or signs of Koala's were detected during the survey of the small woodland area within the proposed array area. As such, the area is not considered to currently support a Koala population and it would not comprise *Core Koala Habitat* under SEPP44. As Poplar Box is a feed species under Schedule 2 of SEPP44 and it comprises more than 15% of the total number of trees in the tree component, the area is defined as *Potential Koala Habitat* under SEPP44. However, only five trees occur within this small area (0.84 ha) of woodland which is surrounded by Wheat crop on all sides and is at least 250m from the nearest woodland area. The nearest woodland area is also disturbed and fragmented. As such, it is considered unlikely that the five trees would be preferred or utilised by the Koala on a regular basis and the area is not considered to provide habitat for the species.

An individual male Koala was heard calling from the area of more intact woodland adjacent to the north-eastern boundary of the development site. Intensive survey of this area by spotlight, failed to locate any Koala's. It is considered likely that it was a dispersing male who was travelling through this woodland which would not be impacted by the proposal.

Red-backed Button-quail

The Red-backed Button-quail was not detected during targeted surveys. Considering this and that the nearest record for the species is over 200km to the east, the species is considered highly unlikely to occur at the site.

Slender Darling Pea

The Slender-Darling Pea was not detected during the surveys. No other *Swainsona* species were recorded during the survey. It is considered unlikely that the species would have been overlooked if present and as such it is not considered to occur at the development site.

Sloane's Froglet

Targeted surveys were not undertaken for Sloane's Froglet *Crinia sloanei* within the correct survey period; in accordance with the BCC, the species requires survey during winter in order to conclude the species does not occur. A literature review and background records search were both undertaken in order to determine whether the site constitutes suitable habitat for the species. The nearest record of the species is approximately 25 km to the north-west of the site, within riparian vegetation along Crooked Creek. There is some connectivity between the site and this record, with a complex of drainage channels and floodplains occurring throughout the locality. Vegetation connectivity is limited, restricted to disjunct riparian corridors and vegetation patches along paddock boundaries. Many of the cropped paddocks in the local area construct drainage channels to assist cotton irrigation.

The species is endemic to the Murray-Darling Basin from where it has been recorded from widely scattered locations in north central Victoria and central western NSW from the Victorian to the Queensland border. Nearly, three quarters of the records are from the Riverina Bioregion which straddles southern NSW and Central Victoria, with a further 18% of records within the NSW South Western Slopes. Other records are from the Darling Riverine Plains, Cobar Peneplain and from the edges of the Victorian Midlands, Brigalow Belt - South and Murray Darling Depression bioregions (EPBC Act Threatened Species Nomination Form, 2014).

The species lives and breeds in temporary and permanent waterbodies including oxbows off creeks and rivers, farm dams, large and small natural wetlands, constructed frog ponds and temporary puddles. It prefers wetlands that contain riparian and aquatic vegetation. Most often it has been found in waterbodies that contain grasses and reeds that are of medium height and have small stem diameters such as couch, watercouch or the Common spikerush, *Eleocharis acuta*. Waterbodies containing this type of vegetation are essential for Sloane's Froglet as it lays its eggs attached to vegetation rather than as a frothy mass on the surface of the water like some other frogs. Gilgai and other depressions are favoured habitat on clay plains, while elsewhere they are generally restricted to temporary ponds in the river valley and up to 8 km on either side of large rivers. As well as requiring particular breeding habitat, Sloane's Froglet needs connections between breeding and refuge sites. Inland Australia's extremely variable climate means that for Sloane's Froglet to survive, it has to move across the landscape when it is wet. Sloane's Froglet uses roadside drains, table drains, irrigation channels and inundated grasslands to move from one spot to another (EPBC Act Threatened Species Nomination Form, 2014).

The site contains some areas of suitable breeding habitat in the form of temporary and permanent waterbodies (mapped on Figure 4-1), with areas of suitable shelter habitat occurring in the form of woodland containing woody ground debris to the immediate north and west of the site. However, though suitable habitat is present, the quality of the habitat is considered low as a result the ongoing cropping which occurs within the temporary waterbodies, modification of surrounding drainage (constructed drainage channels for cotton irrigation) and the historic clearing which has taken place within the paddocks and adjacent woodlands, leading to a low level of vegetation connectivity and limited built up of woody ground debris. The species appears to be sparsely distributed within its known distribution, so is considered unlikely to occur in such as disturbed and isolated area of habitat or be impacted by the development.

In advance of OEH consultation regarding this species or further winter surveys, the species has been entered as being impacted by the development. The area entered is equivalent to the area of inundation present in the October 2016 survey.

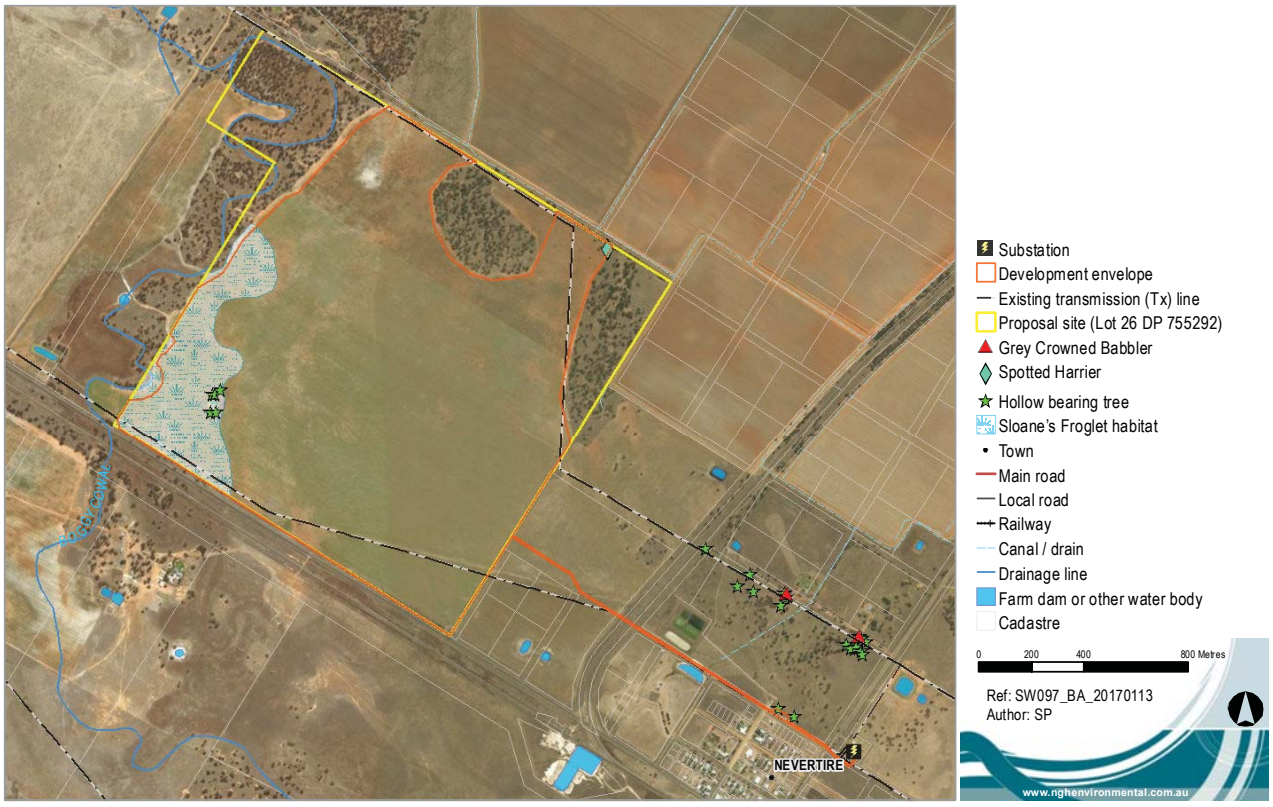

Figure 4-1 Fauna survey results

Weather conditions during the field surveys

Weather conditions during the surveys were fine with mild night time and warm daytime temperatures. There was no rain. Table 4-4 lists the weather conditions as recorded at Trangie (approximately 28km east of the site) over the survey period.

Table 4-4 Weather conditions during the field surveys, recorded at Trangie, approximately 28 km east of the site.

Date	Temperature min (°C)	Temperature max (°C)	Rain (mm)	Wind speed @ 9am (km/h)
24/10/2016	4.0	28.0	0	11
25/10/2016	4.9	24.5	0	6
26/10/2016	11.1	28.1	0	13

4.3.5 Summary of species credit species

In summary, applying the above information to the BCC assessment, the following data were entered into the BCC.

Common name	Scientific name	Impacted by development?	ID method	Loss (ha)	Survey date
Koala	*Phascolarctos cinereus*	No	Survey	0.00	25/10/2016
Red-backed Button-quail	*Tumix maculosus*	No	Survey	0.00	25/10/2016
Slender Darling Pea	*Swainsona murrayana*	No	Survey	0.00	25/10/2016
Sloane's Froglet	*Crinia sloanei*	Yes	Assumed	22.72	NA

5 EPBC MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC protected matters report was undertaken on the 12 October 2016 (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 Appendix C). 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

Four wetlands of international importance were returned from the protected matters report. The nearest of these (within 100km of the development site) is the Macquarie Marshes. All other wetlands returned from the search are over 500km away. The Macquarie Marshes occurs approximately 95km north of the development site. It is fed by the Macquarie River. There is no apparent connectivity between Boggy Cowal and the Macquarie River.

5.2 THREATENED ECOLOGICAL COMMUNITIES

Five threatened ecological communities were returned from the protected matters report. One of these, the Weeping Myall Woodlands EEC occurs in close proximity to the development site but, not within it.

5.3 THREATENED SPECIES

Ten threatened species were returned from the protected matters report. Of these, three are considered to have the potential to utilise the habitats at the development site:

- Superb Parrot (*Polytelis swainsonii*) – Vulnerable EPBC Act
- Corben's Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable EPBC Act
- Koala (*Phascolarctos cinereus*) – Vulnerable EPBC Act

5.4 MIGRATORY SPECIES

Four listed migratory species were returned from the protected matters report. None of these species are considered likely to occur at the site on a regular basis or rely on the habitats present.

6 AVOID AND MINIMISE IMPACTS

6.1 DIRECT IMPACTS

6.1.1 Site selection and planning phase

A preliminary constraints analysis was conducted by NGH Environmental (2016) which informed the site layout design. Vegetation constituting the highest ecological constraints such as forming components of EECs and providing threatened flora and fauna habitat were avoided as far as practical, with the net outcome being an impact of only 1.41 ha of native vegetation removal (largely in a degraded state), out of a total development site of approximately 200 ha (approximately <0.01%). Key changes to the proposal design included:

- The integration of a 40m buffer on Boggy Cowal to avoid impacts to associated riparian habitats
- Selection of the southern transmission line route, avoiding impacts to woodland vegetation and threatened species habitat

The final design footprint is detailed in Figure 6-1

6.1.2 Construction phase

The construction phase of the proposal has the potential to impact a number of biodiversity values of the site through habitat clearance, refer to Table 6-1 below.

Table 6-1 Potential direct impacts to biodiversity during the construction phase

Impact	Frequency	Intensity	Duration	Consequence
Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks)	Regular	High	Construction phase	• Direct loss of native flora and fauna habitat including 5 hollow-bearing trees • Injury and mortality to fauna during clearing of fauna habitat • Introduction and spread of noxious weeds and pathogens • Disturbance to fallen timber, dead wood and bush rock

A range of mitigation measures will be implemented to ensure that impacts on biodiversity during the construction phase are avoided where possible, and minimised where they cannot be avoided. The mitigation measures that would be employed during the construction phase are provided in Table 6-2. Mitigation measures have considered methods of clearing, clearing operations, timing of construction and other measures that would minimise impacts of the proposal on biodiversity values.

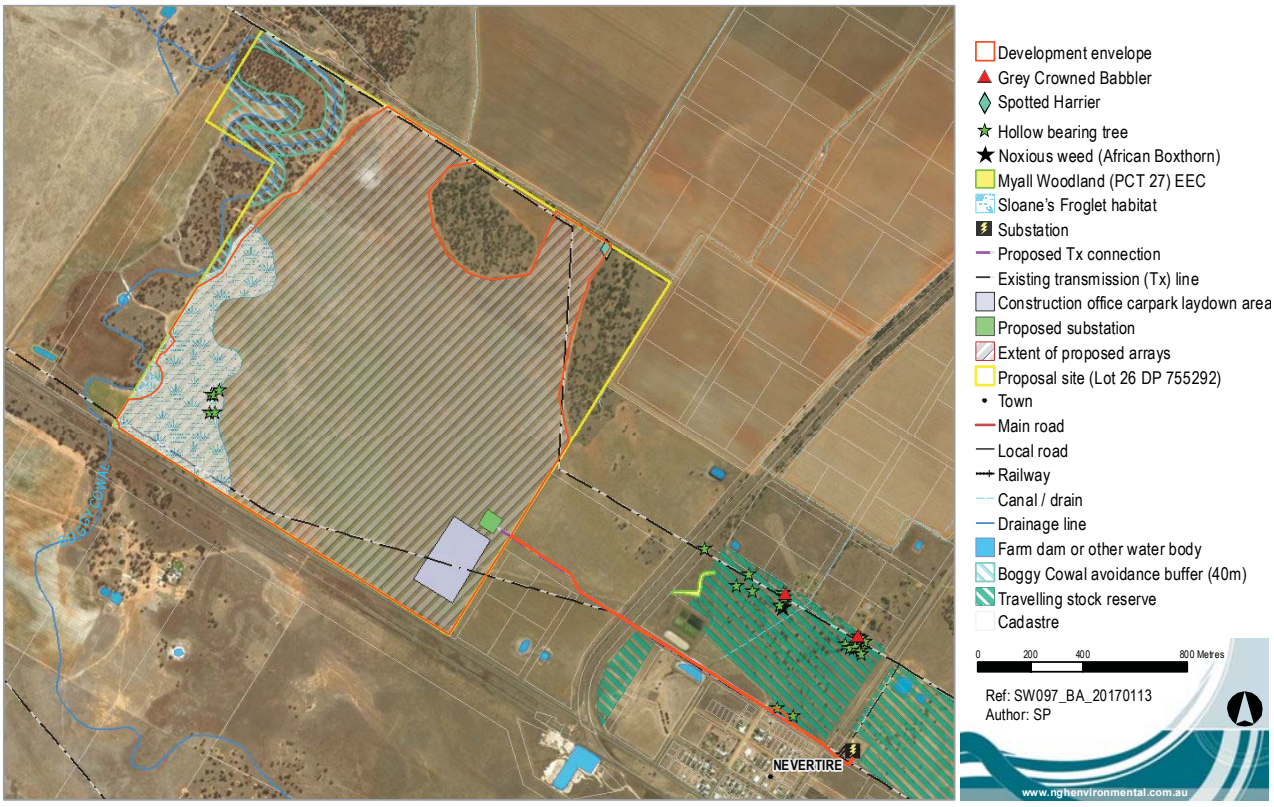

Figure 6-1 Proposed development and operational footprint

Table 6-2 Measures proposed to avoid and minimise direct impacts of the proposal during the construction phase

Impact	Consequence	Measures to be implemented	Timing	Outcome
Removal or degradation of threatened and/or migratory species habitat	• Impacts to threatened species (Sloane's Froglet)	• Appropriately timed surveys (June – August) would be implemented to determine if Sloane's Froglet occurs within the development site. • If identified within the development site either: o The proposal would be modified to avoid habitat for this species o The species credit requirements (calculated using the constructed impact area on mapped habitat) would be offset for the species according to the FBA • If not identified within the development site, the species credit requirement would be zero and no further action would be undertaken.	Pre-construction phase	Impacts to threatened species are avoided or, if unavoidable, offset
	• Impacts to hollow dependant fauna	• Hollow-bearing trees within the development site would not be cleared between June and January, to avoid the breeding season of Superb Parrot and Corben's Long-eared Bat and the core hibernation period for Corben's Long-eared Bat. • If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure these species do not occur.	Construction phase	Impacts to threatened hollow dependent species are minimised
Habitat clearance	• Direct loss of native flora and fauna habitat	• Preparation of a Flora and Fauna Management Plan (FFMP) that would incorporate protocols for:	Pre-construction phase Construction phase	Minimise the impacts of habitat removal on native flora and fauna

Impact	Consequence	Measures to be implemented	Timing	Outcome
		○ 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 ○ The relocation of fauna during dam dewatering ○ Weed management ○ Unexpected threatened species finds ○ Rehabilitation of disturbed areas The FFMP would form part of the Nevertire Solar Farm Construction Environmental Management Plan (CEMP).		
	• Potential over clearing and/or damage of habitat outside of the development site.	• Stockpiling materials and equipment and parking vehicles will be avoided within the dripline (extent of foliage cover) of any native tree. • Prior to the commencement of work, a physical vegetation clearing boundary at the approved clearing limit is to be clearly demarcated and implemented. The delineation of such a boundary may include the use of temporary fencing, flagging tape, parawebbing or similar.	Construction phase	Prevention of over-clearing

6.1.3 Operational phase

Maintaining vegetation beneath the panels will be important to arrest erosion that would occur if bare areas develop. It is noted however, that even with limited ground cover, the solar farm site would have a much less impact on erosion and sedimentation to nearby waterways than current cropping operations. Sodic soils are likely to be present onsite, increasing erosion risks. It is a commitment of the proposal to prepare a ground cover management plan.

Visual screening is part of the project description and is understood that some sections of the site's periphery would be planted with small trees or shrubs. This represents an opportunity to provide additional habitat as part of the project, if suitable native species are selected.

It is noted that the 'lake effect' is where reflection of light from structures and materials on the ground (such as photovoltaic panels) give the impression of a constant reflective surface similar to that provided by water. Potential direct impacts could result if birds (thinking they were water) tried to land on the panel surfaces. Solar photovoltaic panels are designed to absorb rather than reflect light. Typical photovoltaic panels are designed to reflect only some 2% of incoming sunlight. The panels will not generally create noticeable reflection compared with an existing roof or building surfaces. The following chart (Figure 6-2) from Spaven Consulting (2011) shows that solar panels have a lower reflectivity than most other everyday objects. The potential for collision risks to birds due to the 'lake effect' is therefore considered low, and no specific mitigation to minimize impacts is recommended.

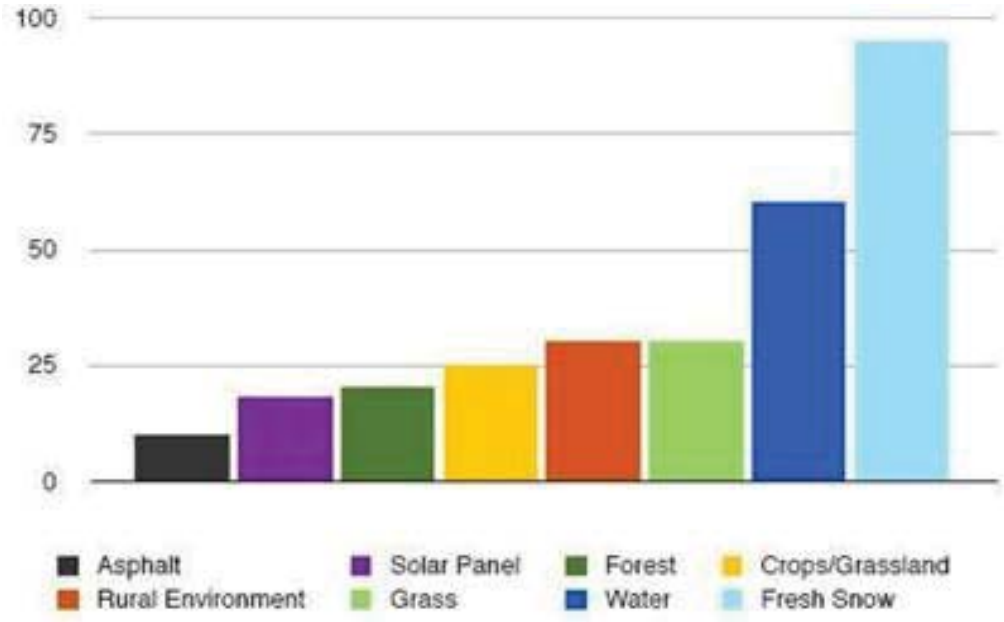

Figure 6-2 Comparative reflection analysis (Spaven Consulting 2011).

Where practical, measures to avoid other impacts on biodiversity during operation have been identified, including potential enhancement of habitat. Table 6-3 outlines the mitigation measures that would be implemented during operation, to ensure the operational phase avoids and minimises impacts on biodiversity to the greatest extent possible.

Section 7 outlines the requirements for biodiversity offsets for those impacts that cannot be avoided as a result of the proposal.

The operational phase of the proposal has potential to result in direct impacts to biodiversity values. Direct impacts are as follows:

Impact	Frequency	Intensity	Duration	Consequence
Shading by solar array infrastructure	Constant	Moderate	Operational phase	• Unstable ground surfaces and sedimentation of adjacent waterways
Existence of permanent solar infrastructure	Constant	Moderate	Operational phase	• Collision risk to birds and microbats (fencing, array infrastructure)

Table 6-3 Measures proposed to avoid and minimise direct impacts of the proposal during the operational phase

Impact	Consequence	Measures to be implemented	Timing	Outcome	Responsibility
Existence of permanent solar infrastructure	• Collision risks to birds and microbats on solar infrastructure, transmission lines and security fencing	• Where possible, use non barbed-wire on exterior fencing	Operational phase	Minimise impacts to fauna and flora from fencing	Proponent Contractor
Appropriate landscaping	• Increase the quality of habitat for native flora and fauna species	• Where possible, landscape plantings will be comprised of local indigenous species with the objective of increasing the diversity of the existing vegetation. Planting locations would be designed to improve the connectivity between patches in the landscape where consistent with landscaping outcomes.	Operational phase	Increase/improve native species diversity and connectivity	Proponent Contractor

6.2 INDIRECT IMPACTS

Vegetation and habitat removal are considered *direct impacts* of the proposal.

Indirect impacts could occur as a consequence of the proposal, and can include impacts such as soil and water contamination, creation of barriers to fauna movement, or the generation of excessive dust, light or noise. A number of indirect impacts to biodiversity during construction and operation have been identified in Table 6-4 below.

6.2.1 Site selection and planning phase

During the design phase of the proposal the layout of the solar farm was refined to avoid as much vegetation clearing as possible. This, in turn, minimises potential indirect impacts resulting from the clearing. This is consistent with the principles of avoiding and minimising biodiversity impacts, as outlined under the FBA.

6.2.2 Construction phase

Indirect impacts on biodiversity values during the construction phase of the proposal are outlined in Table 6-4 below. Measures to avoid and minimise these impacts are detailed in Table 6-5.

Table 6-4 Indirect impacts on biodiversity during the construction phase.

Impact	Frequency	Intensity	Duration	Consequence
Accidental spills and contamination from construction activities (including compound sites)	Rare	Moderate	Construction phase	Pollution of soils and dams
Earthworks	Regular	Moderate	Construction phase	Erosion and sedimentation and/or pollution of soils, dams and downstream habitats
Noise	Regular	Low	Construction phase	Construction machinery and activities may disturb local fauna
Dust generation	Regular	Low	Construction phase	Inhibit the function of plant species and communities, soils and dams
Light spills during night works	Rare	Low	Construction phase	Night works may alter fauna activities/movements
General construction activities	Regular	Moderate	Construction phase	Feral pest, weed and/or pathogen encroachment
Increased Vehicle Traffic	Regular	Low	Operational phase	Increase potential for fauna mortality through vehicle strike

Table 6-5 Measures proposed to avoid and minimise indirect impacts of the proposal during the construction phase

Impact	Measures to be implemented	Timing	Outcome	Responsibility
Accidental spills and contamination from construction activities	• Carry out refuelling of plant and equipment, chemical storage and decanting off site or at least 50 m away from waterways and farm dams in impervious bunds. • Ensure that dry and wet spill kits are readily available.	Construction phase	Prevent/minimise pollution of ephemeral waterways and dams, and sensitive adjacent habitat	Contractor
Earthworks	• An Erosion and Sediment Control Plan must be prepared in conjunction with the final design and will be implemented.	Construction phase	Prevent/minimise erosion and sedimentation of ephemeral waterways and dams, and sensitive adjacent habitat	Contractor
Dust generation	• The Construction Environmental Management Plan will include measures to prevent dust spreading to nearby habitats.	Construction phase	Prevent dust inhibiting the function of plant species and communities, ephemeral waterways and dams.	Contractor
Light spill	• Avoid nightworks. • If night work is unavoidable, ensure any floodlights are directed away from vegetation.	Construction phase	Prevent disturbance to local fauna.	Contractor
General construction activities	• Weed and hygiene protocols will be prepared and implemented.	Construction phase	Prevent feral pest, weed and/or pathogen encroachment into vegetation adjoining development site.	Proponent Contractor
Increased Vehicle Traffic	• Awareness training during site inductions, enforcement of site speed limits.	Operational phase	Minimise fauna strikes	Proponent Contractor

6.2.3 Operational phase

Indirect impacts on biodiversity values during the operational phase of the proposal are outlined in Table 6-6 below.

Table 6-6 Indirect impact on biodiversity during the operational phase.

Impact	Frequency	Intensity	Duration	Consequence
Light spill	Regular	Low	Operational phase	Alter movements of fauna through the landscape
Weed encroachment	Regular	Moderate	Operational phase	Ingress of weeds along the boundary of the development
Increased Vehicle Traffic	Regular	Low	Operational phase	Increase potential for fauna mortality through vehicle strike
Solar Array Microclimate	Regular	Moderate	Operational phase	Alter movement of fauna within site and through the landscape, potential shelter habitat for pest species
Mobilisation of sediments	Irregular	Moderate	Operational phase	Sedimentation of adjacent waterways (Boggy Cowal)

Table 6-7 Measures proposed to avoid and minimise indirect impacts of the proposal during the operational phase

Impact	Consequence	Measures to be implemented	Timing	Outcome	Responsibility
Light spill	Alter movements of fauna through the landscape	• Direct lights away from vegetation.	Operational phase	Minimise impacts to fauna movements and activity	Proponent
Weed encroachment	Ingress of weeds along the boundary of the development site	• Weed and planting protocols will be prepared and implemented.	Operational phase	Prevent spread of weeds	Proponent Contractor
Increased Vehicle Traffic	Increase potential for fauna mortality through vehicle strike	• Awareness training during site inductions regarding enforcing site speed limits.	Operational phase	Minimise fauna strikes	Proponent Contractor
Solar Array Microclimate	Alter movement of fauna within site and through the landscape, potential shelter habitat for pest species	• Feral species to be monitored and a management plan to be prepared and implemented to reduce feral species abundance.	Operational phase	Monitor and manage feral fauna populations, ensure no restriction to movement of fauna	Proponent
Mobilisation of sediments	Sedimentation of downstream habitats	• A Ground Cover Management Plan is to be prepared and implemented. The objective is to ensure a stable ground cover during operation of the solar farm, minimising erosion and adverse water quality impacts. Agronomist input is a requirement for the plan, to ensure persistence and any impacts of sodicity are addressed. Highly managed grazing may be used to maintain the height of ground cover.	Pre-construction phase	No degradation to adjacent waterways	Proponent Contractor

6.3 CUMULATIVE IMPACTS

The clearing of native vegetation, which is a key threatening process at both State and Commonwealth level, is considered a major factor in the loss of biological diversity. At least 61 per cent of the native vegetation in NSW has been cleared or highly modified since European settlement (NSW Scientific Committee 2001), and the removal of vegetation for this proposal is contributing to this process. The amount of native vegetation to be removed (1.41 ha) is however, relatively minor compared to the size of the development. The vast majority of the development site (99%) is located within existing highly modified and exotic dominated vegetation and the native vegetation to be removed is already modified and degraded.

Cumulative impacts are considered best addressed by avoiding and minimising. The proposal largely avoids impacts to native vegetation and threatened species habitat and the cumulative contribution of the proposal to biodiversity impacts is considered to be negligible.

7 IMPACT SUMMARY

7.1 AREAS NOT REQUIRING ASSESSMENT

Areas without native vegetation or aquatic features do not need to be assessed further. Within the development site, these include treeless paddock areas with an understory of exotic agricultural crop species or previously disturbed sites that have been colonised by exotic species with little to no native component. The total area of land within the development site not requiring further assessment is approximately 199.27 ha.

7.2 AREAS NOT REQUIRING AN OFFSET

7.2.1 Impacts on native vegetation

Offsets are not required where the proposal would impact on PCTs that:

a) Have a site value score of <17; or
b) Are not identified as a Critically Endangered Ecological Community (CEEC) or EEC

Impacts are also not required for PCTs that are not associated with threatened species habitat and are not identified as CEECs/EECs.

As such, all impacts to native vegetation within the development site that has a site value score of <17 and is not a CEEC or EEC does not require offsets. This coincides with the derived grassland vegetation along the transmission line route.

7.2.2 Impacts on species and populations

Offsets are not required where the proposal:

a) Impacts on non-threatened species and populations that do not form part of a CEEC or EEC
b) Impacts on threatened species habitat associated with a PCT within a vegetation zone with a site value score of <17

As for native vegetation, the habitat provided by the derived grassland vegetation zones does not require an offset as the site value scores are <17 and the vegetation is not part of a CEEC or EEC.

Species credit species

As discussed in Section 4.3.4, the following species credit species are considered unlikely to occur within the habitats within the development site:

- Koala
- Red-backed Button-quail
- Slender Darling Pea

Impacts to these species are unlikely and offsets are not required.

Hollow-bearing trees

A total of 23 hollow-bearing trees were identified within and adjacent to the development site (Figure 6-1). Five of these trees would be removed by the proposal.

Hollows potentially provide roosting habitat for some species of microbats, parrots, owls and arboreal mammals. Hollow-dependant fauna species are likely to be impacted due to the proposal. However, the impacts on hollow-dependent fauna in the development site is likely to be low, as hollow abundance within vegetation surrounding the site is considered likely to be greater than that within the development site. Mitigation measures have been recommended to address the clearing risks to resident species (Section 5).

The number of hollows to be impacted is assessed within the BCC, via the plot data collected for each vegetation zone. This data adds to the value of the habitat to be removed, thereby requiring a greater number of credits to be retired. No specific requirement to offset hollows has been identified.

7.3 PCTS AND SPECIES POLYGONS REQUIRING AN OFFSET

7.3.1 Impacts on native vegetation

Offsets are required where the proposal would impact on any native vegetation that:

a) is identified as a CEEC that is specifically nominated in the SEARs for the Major Project as a CEEC for which an impact does not require further consideration;
b) is identified as an EEC that has a site value score ≥ 17, unless it is an EEC that is specifically nominated in the SEARs for the proposal as an EEC for which an impact requires further consideration; or
c) is associated with threatened species habitat and in a vegetation zone that has a site value score ≥ 17.

No EECs or CEECs occur within the development site. The proposal would have a direct impact on one vegetation zone with a site value score >17 as summarised in Table 6-4.

Table 7-1 Extent of vegetation communities within the development site and their impact areas

Vegetation Community	Threatened Ecological Community (TSC Act or EPBC Act)?	PCT Id	Biometric vegetation condition	Site value score	Extent of vegetation (ha) impacted in development site
PCT #56 BVT CW167 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	No	56	Moderate – good (poor)	29.17	0.84
Total Vegetation	-	-	-		**0.84**

7.3.2 Impacts on species and populations

Offsets are required where the proposal would impact on:

a) Any critically endangered species;
b) A threatened species or population that was not specifically nominated in the SEARs as a species or population for which an impact requires further consideration; or
c) Threatened species habitat associated with a PCT in a vegetation zone with a site value score of ≥17.

Ecosystem credit species

The BCC found that 12 threatened ecosystem credit fauna species were predicted to occur within the Poplar Box - Belah woodland PCT and thus require offsets, including:

Diamond Firetail	*Stagonopleura guttata*
Glossy Black-Cockatoo	*Calyptorhynchus lathami*
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis subsp. temporalis*
Little Eagle	*Hieraaetus morphnoides*
Little Pied Bat	*Chalinolobus picatus*
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*
Painted Honeyeater	*Grantiella picta*
Pied Honeyeater	*Certhionyx variegatus*
Red-tailed Black-Cockatoo (inland subspecies)	*Calyptorhynchus banksii subsp. samueli*
Spotted Harrier	*Circus assimilis*
Square-tailed Kite	*Lophoictinia isura*
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*

One vegetation zone within the Poplar Box - Belah woodland PCT had a site value score >17 (refer to Section 7.3.1 above) and requires offsets for the above species.

Species credit species

One species credit species is considered to have the potential to occur within the development site. Sloane's Froglet could not be adequately surveyed for at the time of the survey as survey timing was outside of the required survey period (June – August). Although considered unlikely to occur, without appropriate survey it is assumed to occur and this species generates offsets.

7.4 IMPACTS REQUIRING FURTHER CONSIDERATION

7.4.1 Impacts on landscape features

Impacts reducing width of riparian buffer of important rivers, streams and estuaries

Further consideration is required where the proposal would impact on areas of native vegetation within:

a) 20 m either side of a 4th and 5th order stream;

b) 50 m either side of a 6th order stream;
c) 50 m around an estuarine area.

No 4th, 5th or 6th order streams, or estuarine areas will be impacted by the proposal.

Impacts on important wetlands

Further consideration is required where the proposal would impact on an important wetland and/or its buffer distance of 50 m. Important wetlands are those identified as SEPP 14 Coastal wetlands or those listed in the Directory of Important Wetlands of Australia (DIWA). The Macquarie Marshes occurs approximately 95km north of the development site. It is fed by the Macquarie River of which Boggy Cowal may be a first order tributary. Given the distance from the development site, the potential for the proposal to indirectly impact on this wetland is low. Further, mitigation measures have been recommended in Section 6 to ensure that the potential for the mobilisation of sediments and pollutants is minimised.

The proposal would not impact on any important wetlands, nor on the buffer area of any important wetland, therefore further consideration is not required.

Impacts on species movements along corridors

No state significant biodiversity links as defined by the FBA are known to occur within the development site, therefore the proposal does not trigger the requirement for further consideration to impacts on species movement along corridors.

7.4.2 Impacts on native vegetation

Further consideration is required where there will be impacts to native vegetation that are likely to cause the extinction of an EEC/CEEC from an IBRA subregion or significantly reduce its viability. No CEECs or EECs would be impacted by the proposal. No EECs required consideration by the SEARs. No further consideration of impacts on native vegetation is required.

7.4.3 Impacts on threatened species

Further consideration is required where the proposal would impact:

a) Any critically endangered species;
b) A threatened species or population that is specifically nominated in the SEARS as a species or population that is likely to become extinct or have its viability significantly reduced in the IBRA subregion if it is impacted on by the development; or
c) a threatened species that has not previously been recorded in the IBRA subregion according to records in the NSW Wildlife Atlas.

No critically endangered species would be impacted by the proposal. There were no threatened species or populations nominated for consideration by the SEARs. No threatened species not previously recorded for the IBRA subregion were recorded during the surveys. No further consideration of impacts on threatened species is required.

7.4.4 Impacts to EPBC Listed Species

One EPBC listed species was recorded during the surveys; a single male Koala was heard calling from vegetation adjacent to the development site. Habitat for this species within the development site is isolated and highly degraded and it is considered unlikely that the Koala would utilise the habitats available.

The EPBC Referral Guidelines for the Koala (DoE 2014) documents the 'Koala habitat assessment tool' to assist proponents in determining if a proposal may impact on habitat critical to the survival of the Koala. The tool is provided as Table 7-2 below as it applies to the proposal. Impact areas that score five or more using the habitat assessment tool contain habitat critical to the survival of the Koala. The assessment in Table 7-2 resulted in a score of 6 and as such habitat within the study area is considered to be critical to the survival of the Koala and an assessment of significant impact according to the EPBC Act significant impact criteria is required.

Table 7-2: 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.	✓ Recorded during the surveys
	+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.	✓ Poplar Box is a listed food tree and is the only tree present in the upper strata
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known koala food tree present.	
	0 (low)	None of the above.	
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 1000 ha.	
	+1 (medium)	Area is part of a **contiguous landscape** < 1000 ha, but ≥ 500 ha.	
	0 (low)	None of the above.	✓
Key existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. Areas which score 0 for koala occurrence	✓ No Koala mortality observed during the survey

Attribute	Score	Inland	Applicable to the proposal?
		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.	✓ Study area is not considered a habitat refuge nor does it provide important connectivity to large areas surrounding a habitat refuge
Total	**6**	**Decision: Habitat critical to the survival of the Koala—assessment of significance required**	

An assessment of significant impact was completed for the Koala (Appendix D) and concluded that a significant impact was unlikely on the basis that the proposal would not:

- Lead to a reduction of the size or area of occupancy of an important population, or fragment or disrupt the breeding cycle of an important population
- Affect habitat critical to the survival of the species as the area to be removed is < 2ha
- Affect habitat or introduce disease such that the species would decline
- Introduce invasive species harmful to the Koala
- Interfere with the recovery of the species

An EPBC referral is not considered necessary.

Other EPBC Act listed entities with the potential to occur at the site are the Vulnerable Superb Parrot (*Polytelis swainsonii*) and Corben's Long-eared Bat (*Nyctophilus corbeni*). Both of these species have the potential to utilise the hollows within the development site as roosting, breeding and/or hibernation habitat. Specific mitigation measures have been recommended in Section 6 to avoid impacts to these species. With the implementation of these measures impacts to these species are unlikely and no further assessment is required.

EPBC Offset requirement

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.

7.5 ECOSYSTEMS AND SPECIES CREDITS

A total of 14 ecosystem credits and 295 species credits have been generated for the development site (BCC Major Project 0035/2016/4008MP Version 1). The BCC full credit report is provided in Appendix E.

Ecosystem credits

Ecosystem credits are required for the following PCTs:

- PCT 56 - Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW – 14 Credits

Species credits

Species credits are required for the following species:

- Sloane's Froglet (*Crinia sloanei*) – 295 credits

Further detail is provided in Table 7-3 below.

Table 7-3 Credit requirements

Ecosystem credits

PCT type code	Plant community type name	Management zone area (ha)	Loss in Landscape Value	Loss in site value score	EEC Multiplier	Offset Credits for TS	TS req highest req	with credit	TS multiplier	offset	Ecosystem credits required
CW167	Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	0.84	1.00	29.17	1.0	14	Yellow-bellied Sheathtail-bat		2.2		14
CW167	Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	0.53	1.00	14.58	1.0	0			0.0		0
CW167	Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	0.04	1.00	13.02	1.0	0	Yellow-bellied Sheathtail-bat		2.2		0

Species credits

Scientific name	Common name	TS offset multiplier	Species credits required
Crinia sloanei	Sloane's Froglet	1.3	295

8 BIODIVERSITY CREDIT REPORT

The final credit report for the development is provided as Appendix E. The credit extract report produced by the BCC is provided overleaf. The report includes the requirement for 14 ecosystem credits, and 295 species credits.

BioBanking Credit Calculator

Ecosystem credits

Office of Environment & Heritage

Proposal ID : 0035/2016/4008MP
Proposal name : Nevertire solar farm
Assessor name : Dave Maynard
Assessor accreditation number : 144
Tool version : v4.0
Report created : 20/12/2016 10:02

Assessment circle name	Landscape score	Vegetation zone name	Vegetation type name	Condition	Red flag status	Management zone name	Management zone area	Current site value	Future site value	Loss in site value	Credit required for bio. diversity	Credit required for TS	TS with highest credit requirement	Average species loss	Species TG Value	Final credit requirement for management zone
1	1.00	CW172_Moderate/Good_Poor	Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Moderate/Good_Poor	No	1	0.64	29.17	0.00	29.17	0	14	Yellow-bellied Sheathtail-bat	38.89	2.20	14
1	1.00	CW172_Low	Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Low	No	2	0.63	14.58	0.00	14.58	0	0		0.00	0.00	0
1	1.00	CW167_Moderate/Good_Medium	Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Moderate/Good_Medium	Yes	3	0.64	13.02	0.00	13.02	0	0	Yellow-bellied Sheathtail-bat	27.78	2.20	0

BioBanking Credit Calculator

Species credits

Office of Environment & Heritage

Proposal ID : 0035/2016/4008MP
Proposal name : Nevertire solar farm
Assessor name : Dave Maynard
Assessor accreditation number : 144
Tool version : v4.0
Report created : 19/01/2017 12:51

Scientific name	Common name	Species TG value	Identified population?	Can Id. popn. be offset?	Area / number of loss	Negligible loss	Red flag status	Number of credits
Crinia sloanei	Sloane's Froglet	1.30	No		22.72	0.00	No	295

9 CONCLUSIONS

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

- Comprehensive mapping and assessment completed in accordance with the requirements in Appendix 4 of the FBA
- The identification of three threatened species within the development site and adjacent vegetation, the impacts to which have been adequately assessed
- Mitigation measures which have been outlined in Table 6-2, Table 6-3, Table 6-5 and Table 6-7 to reduce the impacts to biodiversity
- The generation of 14 Ecosystem Credits within the development site, and 295 Species credits which will need to be offset

A Biodiversity Offset Strategy (BOS) will be developed and implemented as part of the approval of the proposal. This offset will be managed in perpetuity to ensure that threatened species habitats are enhanced in the future.

It is proposed that an offset will be established subject to consent conditions within 2 years of the commencement of construction, which would be adequate for the retirement of biodiversity credits of a number and class specified in Table 7-3.

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

(a) acquiring or retiring credits under the BioBanking scheme in the TSC Act;
(b) making payments into an offset fund that has been established by the NSW Government; or
(c) providing suitable supplementary measures.

10 REFERENCES

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APPENDIX A SPECIES LISTS

Flora species list

			NVTTL1		NVTTL2		NVTTL3		NVTTL4		NVTTL5		NVTTL6		NVTSA1	
Scientific name	Common name	Family	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.
Trees																
Eucalyptus populnea subsp. bimbil	Bimble Box	Myrtaceae	0	2							20	2			10	1
Geijera parviflora	Wilga	Rutaceae	0.5	2							40	11				
Schinus areira	Pepper Tree	Anacardiaceae									3	1				
Shrubs																
Atriplex spp.	A Saltbush	Chenopodiaceae			0.1	1										
Chenopodium sp		Chenopodiaceae							0.1	2						
Chenopodium curvispicatum		Chenopodiaceae			0.1	1					0.1	1				
Einadia nutans subsp. nutans	Climbing Saltbush	Chenopodiaceae					0.1	1	0.1	1	2	15				
Enchylaena tomentosa	Ruby Saltbush	Chenopodiaceae	0.5	10	0.1	1			0.1	1	0.1	1	0.1	2		
**Lycium ferocissimum*	African Boxthorn	Solanaceae	1	2							0.1	1				
Rhagodia spinescens	Thorny Saltbush	Chenopodiaceae	15	20					2	1	10	20				
Schinus areira	Pepper Tree	Anacardiaceae														
Sclerolaena birchii	Galvinized Burr	Chenopodiaceae	0.1	1					1	5					0.1	1
Sclerolaena convexula	Tall Copperburr	Chenopodiaceae			0.1	1										
Senna artemisioides subsp. filifolia		Fabaceae (Caesalpinioideae)									0.1	1				
Sida spp.		Malvaceae									0.1	1				
Solanum esuriale	Quena	Solanaceae							0.1	4	0.1	5	0.5	40		
Forbs																
**Alternanthera spp.*	Joyweed	Amaranthaceae											0.1	4		
Apophyllum anomalum	Warrior Bush	Capparaceae									0.1	1				

			NVTTL1		NVTTL2		NVTTL3		NVTTL4		NVTTL5		NVTTL6		NVTSA1	
Scientific name	Common name	Family	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.
Asteraceae indeterminate	Daisies	Asteraceae											0.1	4		
Brachyscome spp.		Asteraceae			0.1	5	0.1	1								
Bulbine semibarbata	Wild Onion	Asphodelaceae							1	50						
Calotis lappulacea	Yellow Burr-daisy	Asteraceae	0.5	10	0.1	2										
**Centaurea melitensis*	Maltese Cockspur	Asteraceae							0.1	1						
Chamaesyce drummondii	Caustic Weed	Euphorbiaceae			0.1	1										
**Chenopodium murale*	Nettle-leaf Goosefoot	Chenopodiaceae									0.2	3				
Convolvulus erubescens	Pink Bindweed	Convolvulaceae													0.1	1
**Conyza spp.*	A Fleabane	Asteraceae									1	25	0.2	25	0.1	2
Crassula sieberiana	Australian Stonecrop	Crassulaceae	0.1	50												
**Echium plantagineum*	Patterson's Curse	Boraginaceae	5	100	1	10			1	10			0.2	25	0.1	1
Erodium crinitum	Blue Crowfoot	Geraniaceae	2	200					0.1	2	0.1	2			0.1	2
Euchiton sphaericus	Star Cudweed	Asteraceae									0.1	2			–	–
Galenia pubescens	Galenia	Aizoaceae									0.1	15				
Goodenia sp		Goodeniaceae											0.5	30		
Goodenia fascicularis	Mallee Goodenia	Goodeniaceae	0.1	2	0.5	20	0.1	3	1	10						
Goodenia pinnatifida		Goodeniaceae									0.2	30				
**Hypochaeris radicata*	Catsear	Asteraceae											0.1	6		
Leiocarpa semicalva subsp. semicalva		Asteraceae			3	10										
**Lepidium africanum*	Common Peppercress	Brassicaceae	2	200					1	40						

			NVTTL1		NVTTL2		NVTTL3		NVTTL4		NVTTL5		NVTTL6		NVTSA1	
Scientific name	Common name	Family	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.
Malva parviflora	Small-flowered Mallow	Malvaceae													20	30
**Marrubium vulgare*	White Horehound	Lamiaceae													–	–
**Medicago laciniata*	Cut-leaved Medic	Fabaceae (Faboideae)	70	1000	2	50	2	20	2	20					30	100
**Medicago sativa*	Lucerne	Fabaceae (Faboideae)									1	20				
**Melilotus indicus*	Hexham Scent	Fabaceae (Faboideae)							2	50						
Oxalis spp.		Oxalidaceae			1	20	0.1	5	0.1	2	0.1	5				
Plantago drummondii		Plantaginaceae					0.1	1								
**Rapistrum rugosum*	Turnip Weed	Brassicaceae	0.1	5	0.2	3	1	15	2	9	0.2	10				
Rhodanthe corymbiflora	Small White Sunray	Asteraceae	0.1	5	1	10			2	20			0.1	4		
Rumex brownii	Swamp Dock	Polygonaceae	0.1	1					0.1	1						
**Rumex conglomeratus*	Clustered Dock	Polygonaceae			0.1	1										
**Silybum marianum*	Variegated Thistle	Asteraceae													2	2
**Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae									0.2	15				
**Sisymbrium irio*	London Rocket	Brassicaceae	0.1	5												
Sisymbrium spp.		Brassicaceae													5	40
**Solanum nigrum*	Black-berry Nightshade	Solanaceae									0.1	1				
**Sonchus oleraceus*	Common Sowthistle	Asteraceae	5	100	0.2	5	1	20	1	5	15	100			4	12
**Trifolium glomeratum*	Clustered Clover	Fabaceae (Faboideae)	10	50												
Vittadinia cuneata	A Fuzzweed	Asteraceae							1	20						

			NVTTL1		NVTTL2		NVTTL3		NVTTL4		NVTTL5		NVTTL6		NVTSA1	
Scientific name	Common name	Family	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.	% cover	# indiv.
Wahlenbergia communis	Tufted Bluebell	Campanulaceae	0.1	5					0.1	1	2	150	0.1	6	_	_
Grasses																
Austrostipa aristiglumis	Plains Grass	Poaceae	15	250					0.1	3			10	200		
Austrostipa scabra	Speargrass	Poaceae									15	80				
**Avena sativa*	Oats	Poaceae					50	1000+	10	100	5	50			20	200
**Avena spp.*	Oats	Poaceae			40	1000+							1	50		
**Bromus catharticus*	Praire Grass	Poaceae									0.5	20				
**Bromus hordeaceus*	Soft Brome	Poaceae									0.1	5				
Chloris truncata	Windmill Grass	Poaceae			5	50					1	5				
Enteropogon acicularis	Curly Windmill Grass	Poaceae	5	500	15	300	10	100	60	2000	20	100	40	1000	0.5	5
**Eragrostis cilianensis*	Stinkgrass	Poaceae							0.1	5						
**Hordeum leporinum*	Barley Grass	Poaceae	5	100							3	30	1	15	25	800
**Lolium perenne*	Perennial Ryegrass	Poaceae	20	1000	30	1000+	50	1000+	30	1000	20	200	40	20,000	15	200
**Phalaris aquatica*	Phalaris	Poaceae	0.1	10	5	100	5	20					1	10	2	20
Rytidosperma spp.	A Wallaby Grass	Poaceae	1	50					0.2	20						
**Vulpia spp.*	Rat's-tail Fescue	Poaceae							0.1	10						
Graminoids																
Carex inversa	Knob Sedge	Cyperaceae			0.5	25	0.2	2	0.1	2			3	12		
Eleocharis acuta		Cyperaceae			5	1000+										
Juncus aridicola	Tussock Rush	Juncaceae			0.1	5							1	30		
Isolepis victoriensis		Cyperaceae											0.1	3		
Cyperus spp.		Cyperaceae									4	40				

			NVTTL1		NVTTL2		NVTTL3		NVTTL4		NVTTL5		NVTTL6		NVTSA1	
Scientific name	**Common name**	**Family**	**% cover**	**# indiv.**	**% cover**	**# indiv.**	**% cover**	**# indiv.**	**% cover**	**# indiv.**	**% cover**	**# indiv.**	**% cover**	**# indiv.**	**% cover**	**# indiv.**
**Cyperus eragrostis*	Umbrella Sedge	Cyperaceae									0.1	2				
Ferns																
Marsilea drummondii	Common Nardoo	Marsileaceae					0.2	25			0.3	200	0.5	100		

Fauna species list

Class	Scientific Name	Common Name	Status (TSC/EPBC)	Number	Observation Type
Amphibia					
	Cyclorana alboguttata	Striped Burrowing Frog			W, off site
	Cyclorana platycephala	Water-holding frog			W, off site
	Limnodynastes fletcheri	Barking Frog			W
	Limnodynastes salmini	Salmon-striped Frog			W
	Litoria peronii	Peron's Tree Frog			W
	Litoria rubella	Desert Tree Frog			W
	Neobatrachus sudellae	Common Spadefoot Toad		2	O/W
Aves					
	Pomatostomus temporalis subsp. temporails	Grey-crowned Babbler	V - TSC	5	O/W
	Circus assimilis	Spotted Harrier	V - TSC	1	O
	Gymnorhiza tibicen	Australian Magpie		3	O/W
	Northiella haematogaster	Blue Bonnet		4	O
	Manorina melanocephala	Noisy Miner		6	O/W
	Cacatua roseicapillus	Galah		8	O/W
	Cracticus nigrogularis	Pied Butcherbird		3	O/W
	Ocyphaps lophotes	Crested Pigeon		5	O/W
	Platycercus eximius	Eastern Rosella		2	O/W
	Dacelo novaeguineae	Laughing Kookaburra		1	W
	Nymphicus hollandicus	Cockatiel		1	W
	Milvus migrans	Black Kite		2	O
	Grallina cyanoleuca	Australian Magpie Lark		3	O/W
	Anas gracilis	Grey Teal		2	O
	Sturnus vulgaris	Common Starling		6	O/W
	Dendrocygna eytoni	Plumed Whistling Duck		3	W
	Dromaius novaehollandiae	Emu		2	O
	Entomyzon cyanotis	Blue-faced Honeyeater		7	O/W
	Struthidea cinerea	Apostle bird		8	O/W
	Corvus bennetti	Little Crow		2	W
	Cincloramphus mathewsi	Rufous Songlark		2	O/W
	Tachybaptus novaehollandiae	Australasian grebe		1	O
	Malurus leucopterus	White winged fairy wren		3	O/W
	Megalurus timoriensis	Tawny grassbird		1	O/W
	Haliastur sphenurus	Whistling kite		1	O, off site
	Egretta novaehollandiae	White faced heron		1	O/W
	Falco cenchroides	Nankeen Kestrel (breeding)		2	O/W
	Rhipidura leucophrys	Willie wagtail		5	O/W
	Pardalotus punctatus	Striated Pardalote		2	O/W

Class	Scientific Name	Common Name	Status (TSC/EPBC)	Number	Observation Type
Mammalia					
	Macropus giganteus	Eastern Grey Kangaroo		4	O
	Phascolarctos cinereus	Koala		1	W, off site

APPENDIX B HOLLOW-BEARING TREE DATA

X	Y	ID	Species	Height (m)	DBH (cm)	Small Trunk	Medium Trunk	Large Trunk	Small Limb	Medium Limb	Large Limb	Small Fissure	Medium Fissure	Large Fissure	Waypoint	Image
147.7197	-31.8302	HBT 1	E populnea	12	70					1					949	shpimg_148.jpg
147.7196	-31.83	HBT 2	E populnea	12	90	1	1			1					950	shpimg_149.jpg
147.7182	-31.8294	HBT 3	E populnea	7	60	2			1						951	shpimg_150.jpg
147.7164	-31.8286	HBT 4	Stag	12	50	3	1		6						952	shpimg_152.jpg
147.7178	-31.8298	HBT 5	E populnea	12	120		1		1						953	shpimg_153.jpg
147.7184	-31.83	HBT 6	Stag	14	70	2	3		5			2			954	shpimg_154.jpg
147.7195	-31.8305	HBT 7	E populnea	15	0	1				2					955	shpimg_155.jpg
147.7222	-31.8318	HBT 8	E populnea	15	90	2	1		3	2					956	shpimg_157.jpg
147.7225	-31.832	HBT 9	Stag	12	50	2	1		2						957	shpimg_158.jpg
147.7223	-31.8319	HBT 10	E populnea	10	50		1		1	1					958	shpimg_159.jpg
147.7226	-31.8319	HBT 11	E populnea	16	110		1	1	4	3					959	shpimg_160.jpg
147.7228	-31.832	HBT 12	E populnea	9	50					1					960	shpimg_161.jpg
147.7228	-31.8321	HBT 13	E populnea	10	60					2					961	shpimg_163.jpg
147.7229	-31.8317	HBT 14	E populnea	12	70				3	2					962	shpimg_164.jpg
147.7228	-31.8316	HBT 15	Stag	8	50		2								963	shpimg_165.jpg
147.7226	-31.8315	HBT 16	E populnea	12	70		2		2						964	shpimg_166.jpg
147.7201	-31.8343	HBT 17	E populnea	10	80		1	2	1	1					965	shpimg_167.jpg
147.7194	-31.834	HBT 18	E populnea	12	60		1		2	2					966	shpimg_168.jpg
147.6964	-31.8239	HBT 19	E populnea	8	40		1		6	2					697	shpimg_170.jpg
147.6965	-31.8233	HBT 20	E populnea	14	60		3		4	3					968	shpimg_172.jpg
147.6966	-31.8233	HBT 21	Stag	14	65	1	5		7	5					969	shpimg_173.jpg
147.6968	-31.8232	HBT 22	E populnea	14	90		1	1	3	2					970	shpimg_175.jpg

X	Y	ID	Species	Height (m)	DBH (cm)	Small Trunk	Medium Trunk	Large Trunk	Small Limb	Medium Limb	Large Limb	Small Fissure	Medium Fissure	Large Fissure	Waypoint	Image
147.6966	-31.8239	HBT 23	E populnea	14	50		2		3						971	shpimg_176.jpg

APPENDIX C EPBC PROTECTED MATTERS SEARCH

ngh environmental

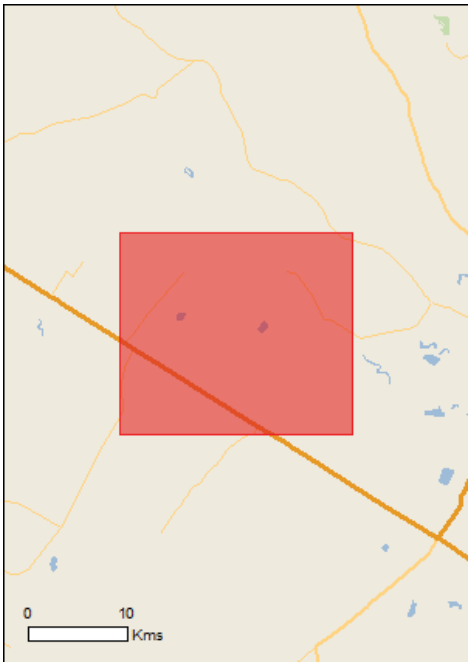
EPBC Act Protected Matters Report

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

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

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

Report created: 12/10/16 11:18:18



Coordinates
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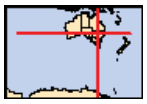

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	10
Listed Migratory Species:	4

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	9
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	20
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	700 - 800km upstream
Riverland	600 - 700km upstream
The coorong, and lakes alexandrina and albert wetland	800 - 900km upstream
The macquarie marshes	50 - 100km upstream

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community likely to occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community likely to occur within area
Wetlands and inner floodplains of the Macquarie Marshes	Approval Disallowed	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Mammals		
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land - Australian Telecommunications Commission

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Macquarie Marshes	NSW

Caveat

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

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

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

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

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-31.60163 147.43183,-31.60163 147.64219,-31.75781 147.64219,-31.75781 147.43183,-31.60163 147.43183

Acknowledgements

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

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Parks and Wildlife Commission NT, Northern Territory Government
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

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

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

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APPENDIX D EPBC ACT ASSESSMENTS OF SIGNIFICANCE

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

- Koala (Vulnerable)

Different significant impact criteria apply depending on the level at which a species or community is listed (i.e. vulnerable, endangered, critically endangered etc.). The appropriate criteria have been applied to the entities listed above.

In the context of the assessments below, 'the action' refers to 'the proposal' as described in Section 1.

SIGNIFICANT IMPACT CRITERIA

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

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

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

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

KOALA - *PHASCOLARCTOS CINEREUS*

The individual of the species detected adjacent to the site, is not considered an important population of the species. The one male that was heard vocalising is likely to have been a dispersing male and the lack of other observations of Koala's or evidence of their presence supports the fact that a resident population does not occur within or adjacent to the site. Further there are only two known records for the species within 50km of the site from Warren in 1994 and Trangie in 1908.

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The site is not identified in any recovery plans for the species and it is not considered to support a key source population for breeding or dispersal as the few records of the species in the locality, indicate that a high density of the species from which individuals would disperse is unlikely. Similarly, it is unlikely that a population occurs that is necessary for the maintenance of genetic diversity. Though limited records of the species occur within the locality, the site is not considered to be at the limit of the species range, with records being present further west of the site in areas such as Menindee, Byrock, Bourke and Ivanhoe.

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

As discussed above, the site is not considered to support an important population of the species. As such, the proposal is not considered likely to lead to a long-term decrease in the size of an important population of the species. The proposal is not considered likely to lead to a long-term decrease in the size of the population in the locality, as the vegetation removal is minor and occurs predominantly in isolated patches. Large remnant patches have been avoided, and connectivity of habitat around the site will be maintained and enhanced.

reduce the area of occupancy of an important population

As discussed above, the site is not considered to support an important population of the species. As such, the proposal is not considered likely to reduce the area of occupancy of an important population. The proposal will remove approximately 0.84 ha of suitable foraging and shelter habitat for the species. This vegetation removal occurs predominantly in one location within the site, in an area of remnant trees surrounding a farm dam. It is considered unlikely that this area of vegetation is utilised as regular habitat for the species due to the sparse and isolated nature of the trees. Large remnant patches have been avoided, and connectivity of habitat around the site will be maintained and enhanced.

fragment an existing important population into two or more populations

As discussed above, the site is not considered to support an important population of the species. As such, the proposal is not considered likely to fragment an important population into two or more populations. Connectivity will be retained around the site, with the major areas of vegetation being avoided, and connectivity between patches enhanced in the long-term.

adversely affect habitat critical to the survival of a species

The EPBC Act referral guidelines for the vulnerable koala (DoE, 2014) focus on the impacts of proposals to habitat critical to the survival of the koala. Table 4 of the guidelines provide a habitat assessment tool that allows for a flowchart to be followed in determining impacts to habitat critical to the survival of the species. This tool has been utilised in Section 7.4.4 of this BAR, and has determined that the habitat on site generates a score of 6. This score is higher than the minimum threshold of not constituting impacts to the species, however following the flowchart detailed below (figure 2), as the vegetation area to be removed comprises less than two hectares (0.84 ha being cleared), it is considered unlikely that the proposal will adversely affect habitat critical to the survival of the koala, and indicates that a referral is not recommended.

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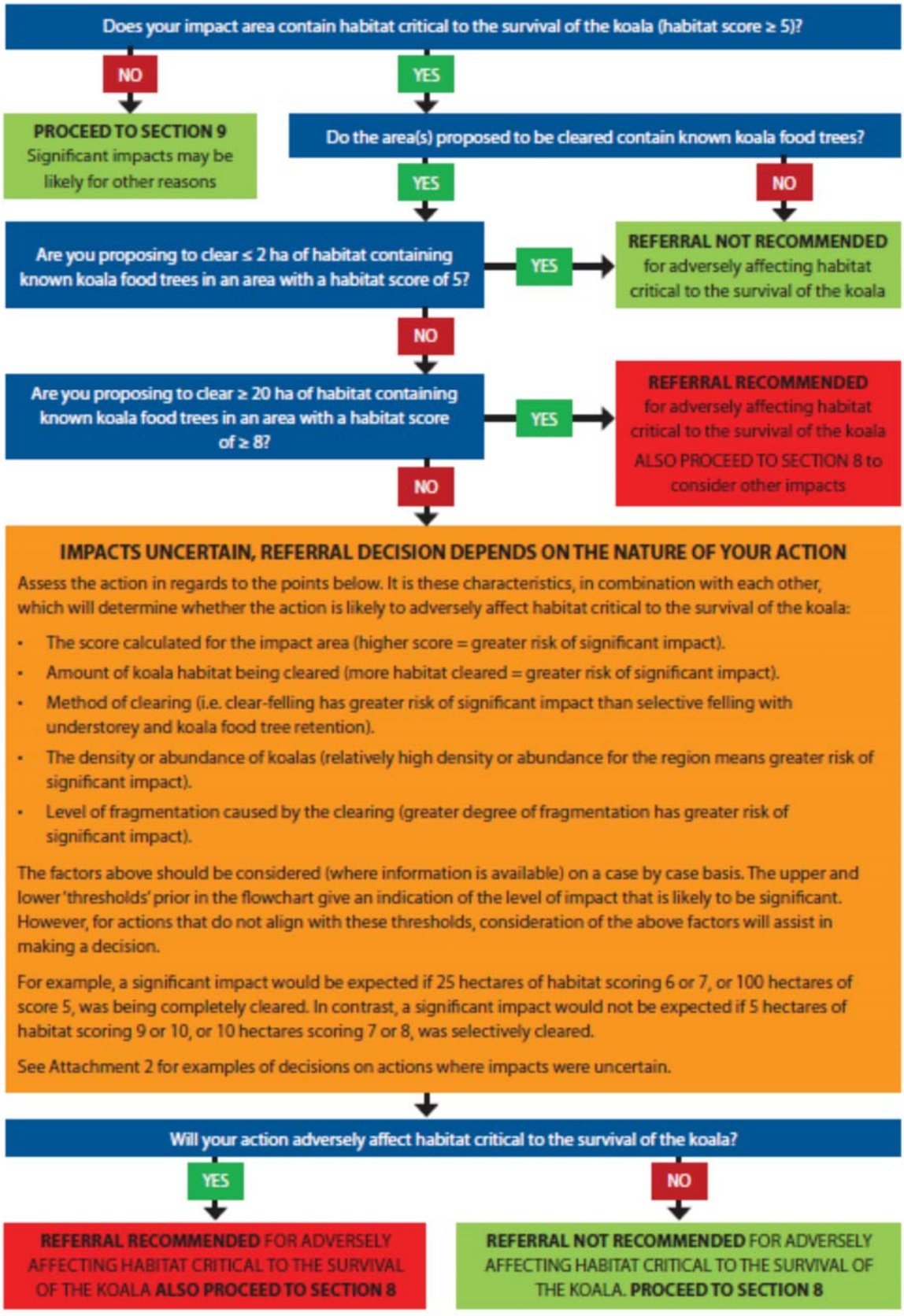
Figure 2: Assessing adverse effects on habitat critical to the survival of the koala



disrupt the breeding cycle of an important population

As discussed above, the site is not considered to support an important population of the species. As such, the proposal is not considered likely to disrupt the breeding cycle of an important population. The population occurring within the locality is considered likely to persist, as connectivity will be retained around the site, with the major areas of vegetation being avoided, and connectivity between patches enhanced in the long-term.

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

The proposal will remove 0.84 ha of suitable foraging and shelter habitat for the species, through direct clearing. The patch proposed for removal consist of sparse and isolated trees surrounding a dam, and is not considered likely to be utilised frequently by the species due to the larger extents of higher quality habitat being present to the north and west of the site. These areas of habitat have been avoided as part of the proposal, and connectivity between these areas will be enhanced in the future. As such, the removal of 0.84 ha of foraging and shelter habitat for the species is not considered likely to cause a decline in the species.

result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The proposal is not considered likely to result in invasive species becoming established within the koala's habitat. The proposal will modify the current landuse, potentially creating additional shelter habitat for predatory invasive species such as foxes and cats, however a management plan will be prepared and implemented which will monitor and manage these species within the site.

introduce disease that may cause the species to decline

Factors known to cause decline within the species include Chlamydia, while *Phytophthora cinnamomi* can impact on the species habitat. The proposal is not considered likely to act as a vector for Chlamydia. The potential for construction activities to introduce Phytophthora to the site is considered to be low as the site occurs in a relatively low rainfall area.

interfere substantially with the recovery of the species

The EPBC Act referral guidelines for the vulnerable koala (DoE, 2014) list several potential impacts that could interfere substantially with the recovery of the species, including:

• *Increasing koala fatalities in habitat critical to the survival of the koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities.*

• *Increasing koala fatalities in habitat critical to the survival of the koala due to vehicle-strikes to a level that is likely to result in multiple, ongoing mortalities.*

• *Facilitating the introduction or spread of disease or pathogens for example Chlamydia or Phytophthora cinnamomi, to habitat critical to the survival of the koala, that are likely to significantly reduce the reproductive output of koalas or reduce the carrying capacity of the habitat.*

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• Creating a barrier to movement to, between or within habitat critical to the survival of the koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the koala.

• Changing hydrology which degrades habitat critical to the survival of the koala to the extent that the carrying capacity of the habitat is reduced in the long-term.

The proposal will aim to avoid koala mortality through the establishment of environmental no-go areas within remnant patches, setting site speed limits, implementing hygiene protocols for plant and equipment, re-establishing vegetative connectivity between large remnant patches of vegetation adjacent to the site, and through ensuring that hydrological regimes remain unaltered as far as is practical to ensure that adjacent remnant vegetation remains.

Conclusion:

A significant impact to the Koala is considered unlikely as the proposal would not:

- Lead to a reduction of the size or area of occupancy of an important population, or fragment or disrupt the breeding cycle of an important population
- Affect habitat critical to the survival of the species as the area to be removed is < 2ha
- Affect habitat or introduce disease such that the species would decline
- Introduce invasive species harmful to the Koala
- Interfere with the recovery of the species

An EPBC referral is not considered to be warranted.

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