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Biodiversity Development Assessment Report, Sandigo Solar Farm, NSW



Final Report

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Accent Environmental
and ESCO Pacific

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A harvested wheat paddock within the development site.

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Table of Contents

1	Introduction	6
1.1	Project Overview.....	6
1.2	Site Description	6
1.3	Secretary’s Environmental Assessment Requirements	8
1.4	Sources of Information Used	9
1.5	Legislative Context	10
2	Methods.....	13
2.1	Assessment Area	13
2.2	Desktop Assessment	13
2.3	Site Assessment	13
2.4	Limitations and Qualifications	18
3	Landscape and Site Context.....	18
3.1	IBRA bioregions and Subregions and NSW Landscape Regions.....	19
3.2	Native vegetation and cleared areas in the landscape	20
3.3	Rivers and streams.....	22
3.4	Wetlands	22
3.5	Connectivity	22
3.6	Areas of Geological Significance and Soil Hazards.....	23
4	Native Vegetation	24
4.1	Vegetation Description	24
4.2	Plant Community Types	24
4.3	Threatened Ecological Communities	24
4.4	Vegetation Zones and Site Value (Condition)	29
5	Threatened species.....	37
5.1	Assessment Requirements.....	37
5.2	Ecosystem Credit Species.....	37
5.3	Other threatened species	48
5.4	EPBC Act Referral Assessment	52
6	Impact Assessment	54
6.1	Avoid and Minimise Impacts.....	54
6.2	Potential Impacts	54
6.3	Recommendations to Avoid, Minimise and Mitigate impacts.....	55
6.4	Impact Summary	56

7	Conclusion.....	60
8	References	61
9	Figures.....	64
10	Appendices.....	70
10.1	Location of Targeted Threatened Species Surveys	70
10.2	Plot Data.....	72
10.3	Plains-Wanderer Important Habitat Map	78
10.4	Protected Matters Search Tool.....	80
11	Attachment 1. Preliminary Biodiversity Report.....	91

Table of Figures

Figure 1.	Site Map	64
Figure 2.	Location Map	65
Figure 3.	Native vegetation within the assessment circle	66
Figure 4.	Hydrology within, and surrounding the development site	67
Figure 5.	Vegetation Zones within the development site, scattered paddock trees and location of Plot surveys.....	68
Figure 6.	Results of the threatened species assessments	69

List of Tables

Table 1.1.	Project details.....	6
Table 2.1.	Plots undertaken during current assessment.	14
Table 2.2.	Weather conditions encountered during nocturnal threatened species surveys in November 2017 (Bureau of Meteorology 2017).	16
Table 3.1.	Lower Slopes Subregion description	19
Table 3.2.	NSW (Mitchell) Landscapes within the development site and assessment circle.	20
Table 3.3.	Vegetation in the 1.5 km assessment circle.....	21
Table 4.1.	Candidate PCTs near the development site to determine likely historic PCT of small isolated patches within the development site, based on OEH PCT Descriptions. Species shown in bold match species found within the development site.	26
Table 4.2.	Vegetation zones within the development site	29
Table 4.3.	Inventory of paddock trees proposed to be impacted	33
Table 5.1.	Project specific assessment requirements.....	37
Table 6.1.	Number of ecosystem credits required for each paddock tree.....	57
Table 6.2.	Credit Profile Summary	59

List of Plates

Plate 1.1. Typical dam, from south of the development site, but within Lot 33 on Plan 754550, that lacks fringing and aquatic vegetation and is surrounded by exotic pasture grasses.....	8
Plate 4.1. Plot 21 in Zone 1 (looking south-west and north-east)	30
Plate 4.2. Plot 22 in Zone 1 (looking south and north)	30
Plate 4.3. Plot 23 in Zone 1 (looking east and west)	31
Plate 4.4. Plot 24 in Zone 1 (looking east and west)	31
Plate 4.5. Plot 25 in Zone 1 (looking east and west)	31
Plate 4.6. Plot 26 in Zone 1 (looking west and east)	32
Plate 4.7. Plot 27 in Zone 1 (looking west and east)	32
Plate 4.8. Plot 15 in Zone 2 (looking east and west)	34
Plate 4.9. Plot 16 in Zone 2 (looking east and west)	35
Plate 4.10. Plot 17 in Zone 2 (looking west and east)	35
Plate 4.11. Plot 18 in Zone 2 (looking south and north)	35
Plate 4.12. Plot 19 in Zone 2 (looking south and north)	36
Plate 4.13. Plot 20 in Zone 2 (looking south and north)	36
Plate 4.14. Plot 21 in Zone 2 (looking south and north)	36
Plate 5.1. Wedge-tailed Eagle chick on a nest (October 2017)	39
Plate 5.2. One of the Superb Parrots recorded during the current assessment	42

1 Introduction

1.1 Project Overview

The proposed Sandigo Solar Farm project is a utility-scale renewable energy development located approximately 30 kms southeast of Narrandera, New South Wales. The solar farm will generate up to approximately 100 MW of electricity, within a 231 ha disturbance footprint (hereafter the development site: Table 1.1; Figure 1). Development of associated infrastructure, including a grid connection and battery storage facilities are also proposed within this footprint. The construction of the solar farm will require the installation of temporary facilities such as material storage yards and a site compound, which will also be within the disturbance footprint. Sandigo has been chosen as the location for the project because of the relatively high solar irradiance in the region and the capacity of the TransGrid electricity network to transmit the power generated.

Table 1.1. Project details

Name	Sandigo Solar Farm
Address	174 Mitchells Road, Sandigo, New South Wales, 2700
Applicant	ESCO Pacific Pty Ltd (ESCO Pacific)
Council	Narrandera Shire Council
Titles	Parts of the following lots: • Lot 55 on Plan 754550 (168.1 ha); • Lot 33 on Plan 754550 (53.4 ha); and • Lot 35 on Plan 754550 (9.1 ha).
Total indicative area	Secured land required for solar energy generation: up to 231 ha
Land use	Predominantly cropping, with sheep grazing in fallow years
Capacity	Up to approximately 100 MW
Connection	TransGrid 132kV Transmission line

1.2 Site Description

The development site is bound to the west by Mitchells Road, and private freehold property elsewhere (Figure 2). Kywong Faithfull Road passes to the south of the development site. The road reserves of Mitchells Road and Kywong Faithfull Road, as well as the proposed site access of Kywong Boree Creek Road, to the east of the development site, have been included in the development site for this assessment.

The land parcels that comprise the development site are a mixture of grazed and cropped paddocks with houses and supporting infrastructure (driveways, silos, sheds). Crops within the development

site include Wheat *Triticum aestivum*, Barley *Hordeum* spp. and Canola *Brassica napus*. All three of these crops are grown in rotation, interspersed with years in which the paddocks are sowed with Rye-grass *Lolium* spp., Lucerne *Medicago sativa* subsp. *sativa* or other crops that are nitrogen fixing, return nutrients to the soil, and are also suitable for grazing. In those years, sheep graze the paddocks keeping the biomass low.

Native vegetation is largely absent from the development site, with scattered paddock trees the most obvious remnants of the historic vegetation communities that once covered the area. Despite this, some areas of native vegetation remain around the edges of the development site and in the road reserves that adjoin the development site. Most of this vegetation consists of an overstorey of White Cypress Pine *Callitris glaucophylla*, Western Grey Box *Eucalyptus microcarpa*, and Buloke *Allocasuarina luehmannii* (in descending order of dominance), over a highly modified and predominantly exotic understorey. The mid-storey is largely absent, and recruitment is limited or excluded by regular grazing, and ongoing soil disturbances from cultivation and cropping.

There are three dams within the development site (Figure 1). These dams generally appeared to have been lined with clay and this, in combination with regular grazing by sheep, has resulted in the absence of fringing or aquatic native vegetation (Plate 1). There are no creeks or drains within the development site and no natural wetlands or swamps were observed during the current assessment. North of the development site, and north of the Sturt Highway, Sandy Creek, a tributary to the Murrumbidgee River, flows. The vegetation in this area changes from that typical of plains to riparian in nature, with River Red-gums *Eucalyptus camaldulensis* becoming the dominant species, replacing the Grey Box and White Cypress Pine trees. There is not expected to be any impact to this vegetation.

The land-use within the development site is similar to that surrounding it i.e. cropping and grazing. These surrounding properties generally support very little native vegetation, apart from scattered paddock trees and vegetation within road reserves, or fringing the boundaries of the property. Properties to the south and west of the development site are owned by the same landholder, and form part of the crop rotation system employed within the development site.



Plate 1.1. Typical dam, from south of the development site, but within Lot 33 on Plan 754550, that lacks fringing and aquatic vegetation and is surrounded by exotic pasture grasses.

1.3 Secretary's Environmental Assessment Requirements

An Environmental Impact Statement (EIS) has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs), which were provided to ESCO Pacific on 30 November 2017 by the Department of Planning and Environment (Application number: SSD 8872).

The SEARs require that an assessment of the likely biodiversity impacts of the development be conducted, having regard to the *Biodiversity Conservation Act 2016* (NSW), as well as the Biodiversity Assessment Method (NSW Office of Environment and Heritage 2017c) and the Threatened Species Assessment Guidelines - Assessment of Significance (Department of Environment and Climate Change 2007).

Attachment 1 of the SEARs provides a list of some of the environmental planning instruments, guidelines, policies, and plans that may be relevant to the environmental assessment of this development. Other policies and plans relevant to this biodiversity assessment include:

- State Environmental Planning Policy No. 44 – Koala Habitat Protection; and,
- Narrandera Local Environmental Plan 2013.

The Biodiversity Assessment Methodology (BAM) comprises three stages that set out the biodiversity assessment requirements and offset practices for major projects.

Stage 1 – Biodiversity assessment requirements and survey methods that must be undertaken by a proponent to identify, map and describe the native plant community types (PCTs), threatened species and threatened species’ habitat on the development site and an offset site.

Stage 2 – Impact assessment requirements for demonstrating how any impacts on biodiversity values have been avoided and minimised at the planning, construction and operational phases of the development.

Stage 2 measures the loss to biodiversity caused by the remaining direct and indirect impacts of the development. The assessments quantify the loss and gain in biodiversity values through the determination of biodiversity credits. The loss of biodiversity values caused by the project is expressed as a biodiversity credit requirement (i.e. the number and type of biodiversity credits that would be required to offset the impact of development).

Both Stage 1 and Stage 2 are documented in this biodiversity development assessment report (BDAR), which is required to accompany the EIS.

Stage 3 – Is an assessment of the management requirements at a Biodiversity Stewardship Site, where offsets for impacts to biodiversity values can be managed to achieve an improvement of biodiversity values within the state.

As a result of the current investigations for Stage 1 and Stage 2 (this report) it is anticipated that offsetting would be minimal. This is due to the applicant (ESCO Pacific) designing the proposed development to avoid areas of ecological value identified within the landscape.

1.4 Sources of Information Used

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

- Imagery:
 - Aerial imagery: ArcGIS World Map base imagery;
- Australian Government Department of the Environment and Energy:
 - Protected Matters Search Tool
<http://www.environment.gov.au/epbc/pmst/index.html> (PMST);
 - Species Profiles and Threats Database (SPRAT) <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>;
 - Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (Department of the Environment, Water, Heritage and the Arts, 2013 EPBC Act Policy Statement);
 - Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0;
 - The Directory of Important Wetlands of Australia (DIWA);
- NSW Office of Environment and Heritage (OEH):
 - BioNet - the database for the Atlas of NSW Wildlife;
 - Threatened species database
<http://www.threatenedspecies.environment.nsw.gov.au/index.aspx>;

- NSW (Mitchell) Landscapes - version 3.1;
- NSW Vegetation Information System (VIS) Classification – version 2.1;
- Riverina Regional Native Vegetation PCT Map Version v1.2 - VIS_ID 4469;
- NSW Land and Property Information:
 - Narrandera Shire cadastral information (electricitytransmissionline, hydroarea, hydroline, Lot, roadsegment, Suburb) in shapefile format
<https://maps.six.nsw.gov.au/clipnship.html>.

Other sources of information relating to vegetation, species, communities and other data are cited within the text and included in the reference list at Section 8.

1.5 Legislative Context

1.5.1 *Environmental Planning and Assessment Act 1979 (NSW)*

The *Environmental Planning and Assessment Act 1979* (EP&A Act) (NSW) is the core legislation relating to planning and development activities in NSW. It is the principal law overseeing the assessment and determination of development proposals, and all development in NSW is assessed in accordance with the provisions of the EP&A Act.

Part 4 of the EP&A Act

Part 4 of the EP&A Act provides for the control of development that requires development consent from a consent authority. Depending on the circumstances of the proposal, the consent authority may be the local Council or the Minister.

Part 4, Division 4.1 of the EP&A Act establishes an approval regime for development that is declared to be state significant development (SSD) by either a State Environmental Planning Policy (SEPP) or Ministerial Order. In accordance with Section 89E of the EP&A Act, the Minister is the consent authority for SSD. Pursuant to sub-section 78A(8A) of the EP&A Act, an EIS is required to support a development application for SSDs.

The NSW biodiversity offsets policy for major projects applies to SSD and state significant infrastructure. The policy is underpinned by the BAM which provides the methodology for assessing impacts and determining biodiversity offsets for major projects.

Under the biodiversity offsets policy, the SEARs for the project require the applicant to apply the BAM to assess impacts on biodiversity values. The BAM is also to be applied to the project to identify measures and strategies that can be taken to avoid and minimise impacts on biodiversity.

1.5.2 *Biodiversity Conservation Act 2016 (NSW)*

The *Biodiversity Conservation Act 2016* (BC Act) commenced on 25 August 2017 as part of the NSW Government's new framework for the conservation of biodiversity. It supersedes the *Native Vegetation Act 2003*, *Threatened Species Conservation Act 1995*, *Nature Conservation Trust Act 2001* and sections of the *National Parks & Wildlife Act 1974*. The BC Act governs the management and conservation of biodiversity in NSW, which includes all flora, fauna and ecological communities, consistent with principles of ecologically sustainable development (as described in section 6(2) of

the *Protection of the Environment Administration Act 1991* (NSW)). The BC Act establishes (amongst others):

- A framework to avoid, minimize and offset the impacts of proposed development and land use change on biodiversity;
- A scientific method for assessing the likely impacts on biodiversity values of proposed development and land use change, for calculating measures to offset those impacts and for assessing improvements in biodiversity values; and,
- A market-based conservation mechanism through which the biodiversity impacts of development and land use change can be offset at landscape and site scales.

1.5.3 *Biodiversity Conservation Regulation 2017* (NSW)

Section 6.8 of the *Biodiversity Conservation Regulation 2017* (NSW) (the BC Regulation) requires that a BDAR for a development application must include details of offsets for impacts, including the number and classes of biodiversity credits required to be retired in accordance with the like-for-like requirements of the offset rules. The credentials of the assessors that established these offsets and the date of the assessment is also required under the BC Regulation.

1.5.4 *Environment Protection and Biodiversity Conservation Act 1999* (Cth)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the EPBC Act as Matters of National Environmental Significance (MNES).

The purpose of the EPBC Act is to ensure that actions likely to cause a significant impact on MNES undergo an assessment and approval process. Under the EPBC Act, an 'action' includes a project, undertaking, or activity. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Commonwealth Minister for the Environment.

The nine MNES to which the EPBC Act applies are:

- World heritage properties;
- National heritage places;
- Wetlands of international importance (listed under the Ramsar Convention);
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas;
- The Great Barrier Reef Marine Park;
- Nuclear actions (including uranium mining); and,
- A water resource, in relation to coal seam gas development and large coal mining development.

A detailed desktop assessment was undertaken to determine which MNES could potentially be impacted by the project. The assessment included a search of the PMST to identify MNES that have potential to occur within 10 km of the development site (a 10 km radius around a point located at 34.99423°, 146.71734°) and a review of previous records of threatened flora and fauna within and around the development site.

Subsequently, a preliminary site assessment was undertaken by Ecolink between the 17 and 19 October 2017 (Ecolink Consulting Pty Ltd 2017b; see Attachment 1) and more detailed site assessments (that identified the extent and quality of potential habitat for any MNES) was undertaken between 27 November and 1 December 2017. These surveys included targeted species specific surveys for threatened flora and fauna species that have either previously been recorded within the development site, or were considered likely to occur. The methods used for these surveys are described in Section 2.3.3.

2 Methods

2.1 Assessment Area

Preliminary assessments undertaken for scoping works for the project investigated four properties in the Sandigo area (Ecolink Consulting Pty Ltd 2017b). These assessments provided the applicant with a broad overview of ecological constraints of the properties. As a result of these assessments, the applicant has refined its proposed development site to 174 Mitchells Road, Sandigo (the wider development site). The proposed area of impact has further been refined, on the basis of the preliminary biodiversity assessment, to avoid key ecological values within this property, to derive the development site described above (Figure 1). This approach is consistent with ESCO Pacific's commitment to avoid and minimise biodiversity and in line with purpose of the Biodiversity Offsets Scheme

The current assessment assesses the 231 ha maximum project footprint (hereafter referred to as the development site). Surveys were also undertaken within a larger 608 ha area that is managed by the same land-owner, extending south of Kywong Faithfull Road, although these areas will not be impacted by the proposed development. The road reserves that will provide access to the proposed solar farm were also assessed. These road reserves included:

- Kywong Boree Creek Road, south from the Sturt Highway to Kywong Faithfull Road;
- Kywong Faithfull Road, between Kywong Boree Creek Road and west to Mitchells Road; and,
- Mitchells Road from the Sturt Highway to Kywong Faithfull Road.

2.2 Desktop Assessment

The potential ecological constraints within the development site have been identified based on the following information sources:

- Department of Environment Protected Matters Search Tool to identify Matters of National Environmental Significance under the EPBC Act;
- Existing threatened species listings under the BC Act, FM Act and EPBC Act; and,
- Existing records of threatened species observations in the development site, as recorded in the Threatened Species Database in the Atlas of NSW Wildlife (NSW Office of Environment and Heritage 2017a) and BioNet Atlas (NSW Office of Environment and Heritage 2017d).

2.3 Site Assessment

A site assessment was undertaken between 27 November and 1 December 2017, led by Principal Ecologists Dr Stuart Cooney and Simon Scott under the guidance and supervision of Steven Sass (Biodiversity Accreditor Assessor BAAS17047). The entire development site was walked and/or driven to assess the location and quality of habitats that were present. Areas adjacent to the development site that contained higher ecological values than the development site, were also assessed as reference areas to the pre-impact conditions of the development site.

Key parameters of the habitats present within each location (such as the presence/absence of shelter, foraging, and/or nesting resources) were recorded to determine the quality of the habitats present. Areas with the highest likelihood of containing native fauna, including threatened species, were inspected more closely in an attempt to inform the presence of these species based on the habitat quality. Active searches were undertaken underneath debris and leaf litter, and signs, tracks and scats were recorded to confirm the presence of particular species or fauna groups. Incidental observations of all fauna species were recorded throughout the assessment.

2.3.1 Plot Surveys

A total of 30 Plots were assessed during the site assessment to confirm plant community types (PCTs) in the wider development site. Data collected from 14 of these Plots (as shown in Figure 5) were used in accordance with the data requirements of the BAM Credit Calculator to assess site values within the development site. The remainder of the Plots have been used to determine PCT classification and as reference data to determine vegetation quality.

Each survey plot was randomly allocated within the habitat zone as identified in Table 2.1.

Table 2.1. Plots undertaken during current assessment.

Habitat Zone	Area Impacted	Minimum Required	Plots	Plots Completed
Zone 1 – Cleared land	230.62	0	7	
Zone 2 – PCT 76 (low condition)	0.00	0	7	
Total	230.62	0	14	

The Plot was established around a central 50 m transect as follows:

- One 400 m² plot (standard 20 m x 20 m) is used to assess all of the composition and structure attributes.
- One 1000 m² (standard 20 m x 50 m) plot is used to assess the function attributes: number of large trees, stem size class, tree regeneration and length of logs.
- Five 1 m² sub-plots are used to assess average litter cover (and other optional groundcover components) for the plot.

As most of the development site has been historically cleared and used for agriculture, the BAM Credit Calculator was used to assess the site values of land used for crops and grazing.

2.3.2 Patches of Native Vegetation

Although most of the vegetation within the development site is non-native, scattered trees within the paddocks were classified as extant examples of historic PCTs within the landscape. However, these trees meet the definition of a Paddock Tree, as described in section 2.3.3 below, and therefore Plot assessments were not required to identify the quality and character of the vegetation. Nonetheless, a polygon of 10 m was created around each tree within the development site, which was conservatively deemed a patch of native vegetation for the purposes of understanding the nature and quality of native vegetation within the study area.

2.3.3 Paddock Trees

An assessment of all paddock trees within the development site was undertaken. Under the BAM, vegetation meets the definition of paddock trees if:

- a) the trees located on category 2 land are surrounded by category 1 land on the regulatory maps under the Biodiversity Conservation Act, or
- b) the native vegetation that comprises the groundcover is:
 - i) less than 50% of the cover of indigenous species of vegetation, and
 - ii) not less than 10% of the area is covered with vegetation (whether dead or alive), and
 - iii) the assessment is made at the time of year when the proportion of the amount of indigenous vegetation in the area to the amount of non-indigenous vegetation in the area is likely to be at its maximum, and
- c) the foliage cover for the tree growth form group is less than 25% of the benchmark for tree cover for the most likely plant community type, or
- d) it is a tree located more than 50 m away from any living tree that is greater than 20 cm DBH and the tree is located on category 2 land that is surrounded by category 1 land; or it is in a group of three (3) or fewer living trees within a distance of 50 m of each other, that in turn, are greater than 50 m from the next living tree that is greater than 20 cm DBH and located on category 2 land that is surrounded by category 1 land (NSW Office of Environment and Heritage 2017c; p. 76).

By definition, under part C of the definition described above, and after consultation with OEH in the absence of an Operational Manual for the BAM, the trees within the development site do meet the definition under the BAM to qualify as paddock trees. This is because the foliage cover for the tree growth form is not within 25% of the benchmark for the PCT most likely to occur (PCT 76) across the entire development site.

On this basis, a streamlined paddock tree assessment based, on Appendix 1 of BAM is provided within this BDAR.

2.3.4 Threatened species surveys

All threatened species surveys were undertaken from 17 to 19 October, and 27 November to 1 December 2017. Nocturnal surveys could not be undertaken on 27 November because of storms over the development site, so were undertaken from 28 to 30 November. Weather conditions during the assessments are presented in Table 2.2 and demonstrate that conditions were generally conducive to the detection of fauna species targeted by the surveys. Surveys were conducted within the development site and surrounding paddocks, as well as areas with potentially higher ecological value, such as remnant native vegetation within 1500 m of the development site (where access was granted).

Table 2.2. Weather conditions encountered during nocturnal threatened species surveys in November 2017 (Bureau of Meteorology 2017).

Date	28 Nov	29 Nov	30 Nov
Daytime Maximum (°C)	34.3	35.6	35.4
Overnight Minimum (°C)	20.3	21.6	25.7
Humidity (%)	30	20	18
Wind Speed (km/h)	19	22	20
Wind Direction	ESE	SE	NE

Transect Surveys

Two types of transect surveys were undertaken—flora and nocturnal transects.

Flora surveys involved walking transects in all areas of suitable habitat, searching for threatened flora species. These surveys were undertaken by two ecologists from 17 to 19 October and 28 and 29 November 2017. ‘Candidate’ threatened species targeted with these surveys included:

- Spike Rush *Eleocharis obicis*;
- Mossgiel Daisy *Brachyscome papillosa*;
- Pine Donkey Orchid *Diuris tricolor*;
- Sand-hill Spider-orchid *Caladenia arenaria*;
- Silky Swainson Pea *Swainsona sericea*;
- Slender Darling Pea *Swainsona murrayana*;
- Small Purple-pea *Swainsona recta*;
- Spear Grass *Austrostipa wakoolica*; and,
- Spiny Peppercress *Lepidium aschersonii*.

Transects of approximately 5 metre intervals were assessed and the tracks recorded with a GPS. Other descriptive data about the transect was collected to describe the characteristics of the vegetation and landform in which the survey was being conducted. Following revisions to the development site boundary, these surveys all took place outside the proposed area of impact (Appendix 1) because of the highly modified vegetation that remains within the development site, which was confirmed by the Plot assessments.

Nocturnal transects are identical, except that they are undertaken at night and are designed to detect nocturnal, ground dwelling animals, specifically, in this case threatened birds. Nocturnal surveys were undertaken from 17 to 19 October and 28 and 30 November 2017 by two ecologists. Survey transects undertaken on 30 November were not recorded, as this survey was undertaken with a ‘random meander’ approach, rather than a formal search. Other transects in road reserves and when assessing the trees have not been recorded. A 12v 100W spotlight (or equivalent) was used from a slow-moving vehicle in first gear or on foot, to flush birds. These surveys were undertaken within the uncropped parts of the development site as well as the road reserves

surrounding the development site (Appendix 1). Opportunistic observations were also made when assessing hollow bearing trees for evidence of owls and when moving between transect locations.

‘Candidate’ threatened species targeted with these surveys included:

- Bush Stone-curlew *Burhinus grallarius*;
- Masked Owl *Tyto novaehollandiae novaehollandiae*;
- Grey-headed Flying-fox *Pteropus poliocephalus*.

Bird Surveys

Area searches for birds were undertaken at dawn and dusk from 17 to 19 October and 27 November and 1 December 2017, with all observed birds (seen or heard) recorded. Eleven area searches were undertaken in a 2 ha area for a period of 60 minutes to achieve a 90% detection rate of birds (Department of Environment and Conservation (NSW) 2004) (Appendix 1). Incidental observations of all birds recorded during the two assessments were also kept.

‘Candidate’ threatened species targeted with these surveys included:

- Little Eagle *Hieraaetus morphnoides*;
- Square-tailed Kite *Lophoictinia isura*;
- Major Mitchell’s Cockatoo *Lophocroa leadbeateri*;
- Glossy Black-Cockatoo *Calyptorhynchus lathamii*; and,
- Superb Parrot *Polytelis swainsonii*.

Tree Surveys

Like the Plot surveys, the tree surveys were undertaken both diurnally and nocturnally to detect the presence of different species. Diurnal surveys were undertaken between 27 November and 1 December 2017.

Diurnal tree surveys involved targeted searches of impacted trees, as well as other trees for signs of nesting activity by birds. Evidence of birds attending nests, nestlings seen or heard from nests, or nest building activity was recorded to confirm the presence of species within the development site. A short description of all nests was recorded as well as their location (See Section 4.4.2).

These searches were also used for arboreal mammals, such as the Koala *Phascolarctos cinereus*.

Nocturnal tree surveys are identical, however a spotlight is used to aid observations of nocturnal birds and mammals. The nocturnal surveys also included call playback of owl calls, of target Owl species, as well as Bush Stone-curlew. A period of quiet listening followed call playback before the call of a different species was started.

Reptile Surveys

Systematic searches were undertaken over a 100 m x 50 m quadrat in search of active or basking animals or for inactive animals under leaf litter, loose bark and fallen logs. A total of four quadrats were surveyed with an emphasis on rocky outcrops and areas of ground debris (Appendix 1). Rocky

outcrops were not located within the development site, so surveys were restricted to areas of fallen logs around the periphery of the development site.

Anabat Bat Surveys

An Anabat Bat Detector was deployed in areas identified on site as flyways, areas of potentially high activity and where target species may occur (Appendix 1). The Anabat was moved nightly to maximise coverage of the development site. The Anabat was not deployed on Monday 27 November, because of storms in the area, and was therefore used from 28 to 30 November 2017. On the night of 28 November 2017, the Anabat was positioned overlooking a dam to detect bats drinking from the waterbody.

Calls recorded by the Anabat Bat Detector were compared to reference calls provided in *Bat calls of New South Wales: Region based guide to the echolocation calls of Microchiropteran bats* (Pennay *et al.* 2004).

Camera Trap Survey

A single Scoutguard motion detecting, infrared camera was deployed in the highest quality habitat close to the development site (Appendix 1). The camera was not deployed on Monday 27 November, because of storms in the area, and was therefore used from 28 to 30 November 2017.

The camera recorded bursts of three photos at a time, when triggered.

2.4 Limitations and Qualifications

The following limitations and qualifications apply to this report:

- The results of the desktop assessment are reliant on data obtained from various databases. The accuracy of these historical data has not been verified in this report.
- As with all ecological assessments, a greater survey effort is likely to yield additional flora and fauna records. Where these additional flora and fauna records may alter the recommendations made within this report (e.g. where additional threatened species may utilise habitats within the development site, or where threatened species may be impacted by the proposed development), further assessment may be recommended, depending on the implications of relevant policies and legislation.

Despite these limitations to the assessment, the results gained by both a desktop and a field assessments are adequate to address the purpose of this report and the requirements of preparing biodiversity assessments and the streamlined assessment module of the BAM.

3 Landscape and Site Context

For all analyses of landscape features within this report, a 1.5 km (1,912 ha) assessment circle around the development site has been used in accordance with Section 4.2 of the BAM (NSW Office of Environment and Heritage 2017c), using the GIS layers and aerial imagery referred to in Section 1.4.

3.1 IBRA bioregions and Subregions and NSW Landscape Regions

3.1.1 Bioregion

The development site and assessment circle occur wholly within the South Western Slopes Bioregion (Figure 2). The South Western Slopes Bioregion lies in the foothills and isolated ranges comprising the lower inland slopes of the Great Dividing Range, extending into western Victoria, and is approximately 8,657,426 ha, with 8,070,608 ha (or 93%) of it within NSW (NSW Office of Environment and Heritage 2017q).

The South Western Slopes Bioregion extends from Albury in the south to Dunedoo in the northeast. Towns located in the bioregion include Wagga Wagga, Mudgee, Cootamundra, Narrandera, Parkes, Gundagai and Young (NSW Office of Environment and Heritage 2017q).

The bioregion includes parts of the Murray, Murrumbidgee, Lachlan and Macquarie River catchments (NSW Office of Environment and Heritage 2017q).

3.1.2 Subregions

The development site and assessment circle occur wholly within the Lower Slopes Subregion (NSS02), which is broadly described in Table 3.1.

Table 3.1. Lower Slopes Subregion description

Geology	Ordovician to Devonian folded and faulted sedimentary sequences with inter-bedded volcanic rocks and large areas of intrusive granites. Areas of Tertiary and Quaternary alluvium.
Characteristic landforms	Undulating and hilly ranges and isolated peaks set in wide valleys at the apices of the Riverina alluvial fans.
Typical soils	Shallow stony soils on steep slopes, texture contrast soils grading from red subsoils on upper slopes to yellow subsoils on lower slopes. Alluvial sands, loams and clays, including red-brown earths on undulating plains and extensive grey clays on alluvium.
Vegetation	Dwyer's Gum <i>Eucalyptus dwyeri</i> on granite, Red Ironbark <i>Eucalyptus sideroxylon</i> on sedimentary rocks. Hill Red Gum <i>Eucalyptus dealbata</i> , White Cypress Pine and Red Stringybark <i>Eucalyptus macrorhyncha</i> in the ranges. Grey Box woodlands with Yellow Box <i>Eucalyptus melliodora</i> , White Cypress Pine and Belah <i>Casuarina cristata</i> on lower areas. Poplar Box <i>Eucalyptus populnea</i> , Kurrajong <i>Brachychiton</i> sp., Wilga <i>Geijera parviflora</i> and Red Box <i>Eucalyptus polyanthemus</i> in the north, limited areas of Bull Mallee <i>Eucalyptus behriana</i> , Blue Mallee <i>Eucalyptus polybractea</i> , Green Mallee <i>Eucalyptus viridis</i> and Congoo Mallee <i>Eucalyptus dumosa</i> in the central west. Myall <i>Acacia papyrocarpa</i> , Rosewood <i>Dysoxylum pachyphyllum</i> and Yarran <i>Acacia homalophylla</i> on grey clays, Yellow Box, Poplar Box <i>Eucalyptus populnea</i> , and Belah on alluvial loams. River Red Gum on all streams with black box in the west with some lignum and river cooba.
Area	3,938,809 ha

3.1.3 NSW (Mitchell) Landscape Regions

Three Mitchell Landscapes occur within the 1.5 km assessment circle: the Lockhart Hills and Foothills; the Murrumbidgee – Tarcutta Channels and Floodplains; and the Murrumbidgee – Tarcutta Source-bordering Dunes (Figure 2). The development site straddles each of these landscapes (Table 3.2).

Table 3.2. NSW (Mitchell) Landscapes within the development site and assessment circle.

Mitchell Landscape	Description	Percent of development site	Percent of assessment circle	Percent cleared within CMA
Lockhart Hills and Foothills (LKH)	Isolated steep rocky ridges on Devonian conglomerate, quartz sandstone and limited siltstone standing as prominent peaks and ridges above the plain. General elevation 250 to 550 m, local relief 80 to 200 m. Crests with thin stony sands and rock outcrop, benched slopes with alternating rock outcrop and low cliffs and benches with gradational or occasional red-brown texture-contrast soils. Wide foot slopes with layered colluvium, sandstone boulders and stony brown harsh texture-contrast soils.	87	30	95
Murrumbidgee – Tarcutta Channels and Floodplains (MTD)	Channels, floodplain and terraces of Murrumbidgee tributaries on Quaternary alluvium, general elevation 200 to 400 m, local relief 25 m. Undifferentiated organic sand and loam on the floodplain, brown gradational loam and yellow texture-contrast soils on higher terraces. River Red-gum gallery woodland on banks, Yellow Box and Grey Box open woodland on floodplain and terraces.	6	64	91
Murrumbidgee – Tarcutta Source-bordering Dunes (MTC)	Low sandy rises on Quaternary sand blow from adjacent river channels, general elevation 150 m, local relief <5 m. Red-brown gradational profile of loamy sand, White Cypress Pine and grasses	7	5	97

Table Note: Descriptions sourced from Descriptions for NSW (Mitchell) Landscapes Version 2 (Mitchell 2002).

3.2 Native vegetation and cleared areas in the landscape

Mapping of vegetation within the assessment circle was undertaken using aerial photographic interpretation and CentralSouthernNSW_ADS40_E_3_shapefile and site assessments (within the development site).

Regional mapping identifies 225.55ha of native vegetation within the assessment circle (Table 3.3, Figure 3). Therefore native vegetation cover of the assessment circle is assigned to the >10–30%

class for the proposed development. The regional mapping coincides with aerial photography of the assessment circle provided in Figure 3. Site surveys within the development site, and more broadly from publically accessible areas within the assessment circle, confirmed the location and character of this vegetation. Ten PCTs were identified within the assessment circle (Table 3.3). The remainder of the assessment circle is cleared land or non-native vegetation that is predominantly used for cropping and grazing as described above (Section 1.2). Scattered paddock trees (trees that are isolated by more than 50 m from the nearest patch of vegetation) also occur within the assessment circle.

Vegetation within the development site is discussed in detail in Section 4.

Table 3.3. Vegetation in the 1.5 km assessment circle

Vegetation communities in the assessment circle	Sum of area (ha)	% of cover in assessment circle
Native vegetation		
River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (PCT 5)	65.05	3.40%
River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion (PCT 9)	20.54	1.07%
Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion) (PCT 17)	1.65	0.09%
White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone (PCT 28)	3.61	0.19%
White Cypress Pine woodland on sandy loams in central NSW wheatbelt (PCT 70)	3.58	0.19%
Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (PCT 80)	20.23	1.06%
Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion (PCT 74)	35.71	1.87%
Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (PCT 76)	46.61	2.44%
Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone (PCT 237)	24.16	1.26%
Native grassland complex (PCT 999)	4.42	0.23%

Vegetation communities in the assessment circle	Sum of area (ha)	% of cover in assessment circle
Total	225.55	11.79%
Not native (exotic or cleared land)		
Not Native (from regional mapping)	1,687.20	88.21%
Grand Total	1,912.75	100%

3.3 Rivers and streams

Sandy Creek, a tributary to the Murrumbidgee River, is located within the assessment circle, approximately 500 m north of the development site. Impacts to this Creek will be mitigated through the implementation of a Construction Environmental Management Plan (or similar) that ensures that off-site impacts do not occur. This will be ensured through managing any silt and sediment that may be generated during construction through retention and treatment on-site and remediation of disturbed areas as soon as practicable after construction concludes.

There are no rivers or streams within the development site (Figure 4).

3.4 Wetlands

No important local wetlands, national wetlands (i.e. as listed in The Directory of Important Wetlands of Australia (Environment Australia 2001)) or international wetlands (e.g. Ramsar listed) are located within the vicinity of the development site.

Significant wetlands nearest to the development site are Ramsar wetlands and include:

- Hattah-Kulkyne lakes – 300-400 km upstream;
- Banrock Station Wetland Complex – 500-600 km upstream;
- Riverland – 500-600 km upstream; and,
- The Coorong and Lakes Alexandrina and Albert Wetland – 600-700 km upstream. (Department of the Environment and Energy 2018).

The applicant is committed to implementing appropriate sediment and erosion control measures to ensure that there are no downstream impacts from the construction of the site.

3.5 Connectivity

Vegetation within the road reserve of Mitchells Road provides some connectivity to longer habitat corridors associated with the riparian vegetation along Sandy Creek, north of the development site, as well as roadside vegetation along the Sturt Highway. Additional strips of vegetation along the eastern boundary of the development site, also provide connections to this vegetation.

Connectivity to larger blocks of native vegetation at Gillenbah and Buckinbong (approximately 7 kms west of the development site) is limited, with a highly fragmented and intensively altered landscape between the development site and these reserves. Scattered paddock trees provide stepping stones

between these locations, however corridors are limited in number, patchy and have gaps between them.

Three threatened fauna species have been identified within the development site: Superb Parrot *Polytelis swainsonii*; Grey-crowned Babbler *Pomatostomus temporalis temporalis* and White-fronted Chat *Epthianura albifrons*. Each of these three species may use the remnant vegetation to facilitate movement within the landscape for feeding or juvenile dispersal. Despite this, as the vegetation will not be impacted by the proposed development, the proposed development is unlikely to impact these species ability to navigate the landscape.

3.6 Areas of Geological Significance and Soil Hazards

No karsts, caves, crevices or cliffs are present within the development site. No soil hazards have been identified within the development site.

4 Native Vegetation

4.1 Vegetation Description

The majority of the development site is currently used for cropping and grazing, with any remaining native vegetation substantially modified through past disturbances. The proposed development has deliberately avoided impacts to areas that retain patches of native vegetation. Within the development site, native vegetation occurs as small isolated patches within land used for grazing and cropping. Additional native trees and remnant vegetation occurs within the road reserves adjacent to the development site.

4.2 Plant Community Types

Native vegetation within the development site is limited to small patches of remnant vegetation. For the purposes of this report, we assessed the benchmarks for each of four PCTs most likely to have occurred pre-clearing, based on their extant proximity to the development site, against the remaining native vegetation observed within the development site. The results of this assessment is summarised in Table 4.1

Of the four PCTs listed in Table 4.1, PCT 76 is the most similar to vegetation present on the development site, based on limited floristic data, soil profile and landform. Fourteen Plot surveys were undertaken within the development site (Appendix 2). Eleven native species were recorded in these surveys, including seven species listed as either understorey or overstorey species for PCT 76. This is three more native species that are characteristic of PCT 76 than for any of the four other candidate PCTs. The vegetation is located within the floodplain of the Sandy Creek, which meets the landform characteristics of this PCT.

All areas within the development site are regionally mapped as non-native. The benchmark data for PCT 76 was therefore used to assess the paddock tree data for the development site.

4.3 Threatened Ecological Communities

Vegetation identified as PCT 76 is the endangered Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt Bioregions community which is listed under the BC Act. The PCT is 92% cleared within the Murray Catchment.

This vegetation is often also classified as the nationally significant Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia community. This community is listed as Endangered under the EPBC Act.

When compared to the thresholds required to classify the remnant vegetation within the development site as the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia community (SEWPaC 2012), it is concluded that this extant vegetation does not qualify on the basis that:

- Less than 50% of the plant cover in the ground layer made up of perennial native species and less than 10% of plant cover in ground layer made up of perennial native grass species;
- Each of the patches are less than 0.5 ha in size; and,

- The mid and ground layers lack the requisite species diversity of perennial native species.

Table 4.1. Candidate PCTs near the development site to determine likely historic PCT of small isolated patches within the development site, based on OEH PCT Descriptions. Species shown in bold match species found within the development site.

PCT	Formation	Class	Vegetation	Description	No. of matches
76	Grassy Woodlands	Floodplain Transition Woodlands	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	<u>Landscape position:</u> On undulating alluvial plains of south-central western NSW. Mainly restricted to the eastern section of the Riverina Bioregion and the western section of the NSW South Western Slopes Bioregion. <u>Landform patterns:</u> Floodplain, alluvial plain. <u>Landform elements:</u> Levee, valley flat, plain. Substrate mass: Alluvium. <u>Lithology:</u> Shale, alluvial loams and clays. <u>Great soil group:</u> Grey clay, red-brown earth, red clay. <u>Soil texture:</u> Clay loam, clay loam-sandy, loam. <u>Upper stratum:</u> Western Grey Box <i>Eucalyptus microcarpa</i>, White Cypress Pine <i>Callitris glaucophylla</i>, Bulloak <i>Allocasuarina luehmannii</i>. <u>Ground stratum:</u> Sprawling Bluebell <i>Wahlenbergia gracilis</i>, Corrugated Sida <i>Sida corrugata</i>, Rough Spear-grass <i>Austrostipa scabra</i> subsp. <i>falcata</i>, Plains Grass <i>Austrostipa aristiglumis</i>, Windmill Grass <i>Chloris truncata</i>.	7
28	Semi-arid Woodlands	Riverine Sandhill Woodlands	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	<u>Landscape position:</u> Sandy loam soils on prior streams, source bordering sand dunes and sand plains in south-western NSW. <u>Landform patterns:</u> Alluvial plain, Sand plain, Stagnant alluvial plain. <u>Landform elements:</u> Dune, Lunette, Plain, Prior stream. Substrate mass: Alluvium. <u>Lithology:</u> Eolian sand or loam. <u>Upper stratum:</u> Bulloak <i>Allocasuarina luehmannii</i>, White Cypress Pine <i>Callitris</i>	4

PCT	Formation	Class	Vegetation	Description	No. of matches
				<i>glaucophylla</i>, Hooked Needlewood <i>Hakea tephrosperma</i>, Sugarwood <i>Myoporum platycarpum</i> subsp. <i>platycarpum</i>, Western Rosewood <i>Alectryon oleifolius</i> subsp. <i>canescens</i>. <u>Ground stratum:</u> Corrugated Sida <i>Sida corrugata</i>, Caltrop <i>Tribulus terrestris</i>.	
80	Grassy Woodlands	Floodplain Transition Woodlands	Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	<u>Landscape position:</u> On alluvial or stagnant alluvial plains in the predominantly winter rainfall belt of southern-central NSW. Mainly restricted to the eastern section of the Riverina Bioregion and the western section of the NSW South Western Slopes Bioregions. <u>Landform patterns:</u> Stagnant alluvial plain, alluvial plain. Landform elements: Plain. <u>Substrate mass:</u> Plutonic rocks, colluvium, alluvium. <u>Lithology:</u> Sandstone, granite, alluvial sand, alluvial loams and clays, Eolian sand or loam. <u>Great soil group:</u> Grey-brown podzolic soil, red-brown earth. <u>Soil texture:</u> Clay loam, sandy, sandy clay loam. <u>Upper stratum:</u> Western Grey Box <i>Eucalyptus microcarpa</i>, White Cypress Pine <i>Callitris glaucophylla</i>, Yellow Box <i>Eucalyptus melliodora</i>, Bulloak <i>Allocasuarina luehmannii</i>, Butterbush <i>Pittosporum angustifolium</i>, Kurrajong <i>Brachychiton populneus</i> subsp. <i>populneus</i>. <u>Ground stratum:</u> Rough Spear-grass <i>Austrostipa scabra</i> subsp. <i>falcata</i>, Corrugated Sida <i>Sida corrugata</i>.	4
237	Grassy Woodlands	Floodplain Transition Woodlands	Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone	<u>Landscape position:</u> On terrace flats on the floodplain. Landform patterns: Floodplain. <u>Landform elements:</u> Terrace plain, plain.	4

PCT	Formation	Class	Vegetation	Description	No. of matches
				Substrate mass: Alluvium. Lithology: Clay. <u>Great soil group:</u> Grey clay, grey earth. <u>Soil texture:</u> Clay loam, heavy clay, medium clay. <u>Upper stratum:</u> Western Grey Box <i>Eucalyptus microcarpa</i>, River Red-gum <i>Eucalyptus camaldulensis</i>, Black Box <i>Eucalyptus largiflorens</i>, Bulloak <i>Allocasuarina luehmannii</i>. <u>Ground stratum:</u> Windmill Grass <i>Chloris truncata</i>, Rough Spear-grass <i>Austrostipa scabra</i> subsp. <i>falcata</i>, Corrugated Sida <i>Sida corrugata</i>.	

4.4 Vegetation Zones and Site Value (Condition)

Vegetation zones identified within the development site are summarised in Table 4.2 and shown in Figure 5. The land use was accurate at the time the assessment, however all paddocks within the development site are on a five year cycle of cropping and grazing (year 1: Wheat; year 2: Barley; year 3 Canola; years 4 and 5 grazed by sheep).

Access to the development site will be via the southern section of Mitchells Road and Kywong Faithfull Road, as well as Kywong Boree Creek Road, to the east of the development site. Vegetation within these road reserves was dominated by exotic species in a similar mix to the surrounding paddocks. An additional Plot survey was undertaken in the road reserve of Kywong-Faithfull Road in an area of vegetation that appeared to have the highest quality vegetation (Plot 28). This vegetation was dominated by Oats and Rye-grass, although up to 5% cover abundance of the spear-grasses *Austrostipa aristiglumis*, *Austrostipa elegantissima*, and *Austrostipa scabra* subsp. *falcata*, persisted within the understorey. A single Western Grey Box was also recorded within this plot, however this tree will not be impacted by the proposed development.

Table 4.2. Vegetation zones within the development site

Zone	Name	Total Area (ha)
1	Cleared Land	230.62
2	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (low condition)	0.00 (paddock trees only)
Total		230.62

4.4.1 Zone 1 – Cleared Land

Zone 1 includes crops of Wheat, Barley and Canola, within two paddocks in the north (Canola) and south (Wheat and Barley) of the development site and grazed, predominantly exotic, land in the middle of the development site (Figure 5).

The crops had been harvested at the time of the assessment (Plates 4.1-4.7). Dominant species within these paddocks were the crops that were planted in them: Wheat; Barley and Canola. Other species recorded in these paddocks included Perennial Rye-grass *Lolium perenne*, the high-threat weed African Lovegrass *Eragrostis curvula*, Prickly Lettuce *Lactuca serriola* and Lucerne *Medicago sativa*.

The grazed paddock was being grazed by sheep at the time of the assessment, although in other years it is ploughed and used for cropping, as evidenced in the aerial photography used for this report. Generally the biomass of these paddocks was very low (Plates 4.8-4.14). Dominant species in this paddock included exotic pasture grasses such as Perennial Rye-grass and Lucerne; weeds such as Common Sowthistle *Sonchus oleraceus*, Prickly Lettuce and the high-threat weed African Lovegrass; as well as remnants of previous crops such as Wheat, Barley and Canola. Few native species were recorded, and were never recorded in greater than 6% cover abundance, however Windmill Grass *Chloris truncata*, Common Blown-grass *Lachnagrostis filiformis*; and Lesser

Loosestrife *Lythrum hyssopifolia*, were the most dominant native species, recorded in up to 5% cover abundance in some areas.

Road reserves that are proposed to provide access to the development site, generally contained the same mix of species, however these areas appear to be managed less frequently resulting in a greater amount of biomass.

Site value

There are no requirements for an assessment in cleared land, therefore the calculation of the site value was not undertaken.



Plate 4.1. Plot 21 in Zone 1 (looking south-west and north-east)



Plate 4.2. Plot 22 in Zone 1 (looking south and north)



Plate 4.3. Plot 23 in Zone 1 (looking east and west)



Plate 4.4. Plot 24 in Zone 1 (looking east and west)



Plate 4.5. Plot 25 in Zone 1 (looking east and west)



Plate 4.6. Plot 26 in Zone 1 (looking west and east)



Plate 4.7. Plot 27 in Zone 1 (looking west and east)

4.4.2 Zone 2 – PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (low condition)

Zone 2 comprises 54 paddock trees that previously belonged to the PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Figure 5; Table 4.3; Plates 4.8–4.14). In the majority of the patches, a remnant tree is the only native species present, with the remainder of the patch dominated by exotic species described above for Zone 1.

A vegetation integrity assessment was undertaken for Zone 2. The Patch Size Area classification of the vegetation recorded within the development site is <5ha. Using the data gathered from the seven Plots completed within this zone, the overall Vegetation Integrity Score, prior to development was calculated to be 2.5, on the following basis:

- **Composition Condition Score** – 1.2 due to the low recorded native species richness, by growth form, versus the benchmark species richness for PCT 76;
- **Structure Condition Score** – 0.8 due to the low recorded native species cover abundance, by growth form, versus the benchmark species richness for PCT 76;

- **Function Condition Score** – 14.9 due to the lack of large trees, the low cumulative length of logs; relatively low litter cover, lack of tree regeneration and relatively few stem size classes that were recorded within the Plots.

The future Vegetation Integrity Score, once development of the solar farm is completed, is expected to be 0 as a result of the clearing of native vegetation within Zone 2.

Vegetation within this Zone is the endangered Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt Bioregions community under the BC Act, but does not qualify as the nationally significant Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia community (see Section 4.3).

Hollows were recorded in 15 of the remnant trees, and stick nests were recorded in 12 trees (Five Corvid, four old roosting nests of a Grey-crowned Babbler and two unidentified small, stick nests). All of the nests were empty at the time of the assessment.

Table 4.3. Inventory of paddock trees proposed to be impacted

No.	Species	DBH (cm)	Foliage Area (M ²)	Hollows	Assessment Class	Nests	Easting	Northing
2	Grey Box	95	298.09	Y	Class 3	-	6129864.166	473573.907
3	White Cypress Pine	41	64.77	N	Class 2	-	6129793.283	473706.527
4	White Cypress Pine	74	30.07	N	Class 3	-	6129793.300	473712.764
5	Grey Box	95	97.02	Y	Class 3	-	6129700.460	474439.203
6	Grey Box	74	129.92	Y	Class 3	Babbler	6129598.586	474457.141
7	White Cypress Pine	50	73.84	N	Class 3	-	6129570.613	474508.412
8	Grey Box	90	127.00	N	Class 3	Corvid	6129450.806	474694.904
9	Grey Box	72	204.90	Y	Class 3	-	6129504.540	475000.261
10	White Cypress Pine	28	33.01	N	Class 2	-	6129342.664	474990.536
11	White Cypress Pine	45	39.94	N	Class 2	-	6128872.369	473369.395
12	White Cypress Pine	47	41.19	N	Class 2	-	6128884.248	473373.617
13	White Cypress Pine	66	124.50	N	Class 3	-	6128939.373	473384.525
14	White Cypress Pine	53	83.74	N	Class 3	-	6128905.666	473451.886
15	White Cypress Pine	55	115.36	N	Class 3	-	6129181.214	473478.331
16	Yellow Box	56	75.73	N	Class 3	-	6129234.742	473522.451
17	White Cypress Pine	49	17.23	N	Class 2	-	6129478.225	473595.823
18	White Cypress Pine	49	31.71	N	Class 2	-	6129486.763	473617.085
19	Grey Box	130	248.19	N	Class 3	Corvid	6129289.534	473710.465
20	White Cypress Pine	46	64.15	N	Class 2	-	6129462.176	474208.081
21	Grey Box	98	119.16	Y	Class 3	-	6129340.238	474250.999
22	Grey Box	67	154.04	Y	Class 3	-	6129364.408	474405.898
23	White Cypress Pine	43	39.38	N	Class 2	-	6129399.179	474412.612
24	Grey Box	98	321.41	Y	Class 3	Babbler	6129285.077	474529.583
25	Grey Box	61	125.74	N	Class 3	Small stick	6129352.989	474566.006
26	White Cypress Pine	57	52.06	N	Class 3	-	6129258.287	474649.713
27	White Cypress Pine	44	98.97	N	Class 2	-	6129294.458	474855.666
28	Grey Box	79	39.18	N	Class 3	-	6129298.759	474878.643
29	Grey Box	98	130.61	Y	Class 3	Small stick	6129099.773	474645.896
30	White Cypress Pine	50	92.62	N	Class 3	-	6128817.976	474809.300
31	White Cypress Pine	54	72.04	N	Class 3	-	6128846.869	474732.160
32	White Cypress Pine	52	62.09	N	Class 3	-	6128833.780	474591.502
33	Grey Box	101	245.30	N	Class 3	-	6129073.037	474402.489

No.	Species	DBH (cm)	Foliage Area (M ²)	Hollows	Assessment Class	Nests	Easting	Northing
34	Grey Box	67	124.32	Y	Class 3	Babbler	6128998.714	474403.823
35	White Cypress Pine	53	80.53	N	Class 3	-	6128926.148	474365.757
36	White Cypress Pine	61	44.63	N	Class 3	-	6128941.971	474003.695
37	Hooked Needlewood	38	27.16	Y	Class 2	-	6128946.621	473990.734
38	Grey Box	150	408.67	Y	Class 3	Babbler	6128934.607	473887.186
39	Grey Box	72	111.96	N	Class 3	-	6128975.600	473680.858
40	White Cypress Pine	60	64.35	N	Class 3	-	6129015.595	473601.355
41	White Cypress Pine	42	72.18	N	Class 2	-	6128863.559	473720.161
42	White Cypress Pine	58	52.57	N	Class 3	-	6128839.104	473772.997
43	White Cypress Pine	49	28.06	N	Class 2	-	6128720.621	473876.014
44	White Cypress Pine	59	82.36	N	Class 3	-	6128773.848	473717.501
45	White Cypress Pine	69	76.97	N	Class 3	-	6128843.221	473681.363
46	Grey Box	114	58.91	Y	Class 3	-	6128698.053	473327.100
47	Grey Box	69	102.54	Y	Class 3	-	6128683.703	473384.432
48	Grey Box	63	100.19	Y	Class 3	Corvid	6128685.288	473394.324
49	Grey Box	57	113.09	N	Class 3	Corvid	6128671.061	473494.363
50	Grey Box	143	351.87	N	Class 3	Small stick	6128672.295	473562.067
51	Grey Box	92	60.24	Y	Class 3	-	6128641.530	473680.904
52	Grey Box	79	121.08	N	Class 3	-	6128638.983	473696.536
53	Grey Box	92	147.18	N	Class 3	Corvid	6128639.537	473709.034
54	Grey Box	59	66.14	N	Class 3	-	6128651.594	473754.832
55	Grey Box	59	56.10	N	Class 3	-	6128621.612	473786.167



Plate 4.8. Plot 15 in Zone 2 (looking east and west)



Plate 4.9. Plot 16 in Zone 2 (looking east and west)



Plate 4.10. Plot 17 in Zone 2 (looking west and east)



Plate 4.11. Plot 18 in Zone 2 (looking south and north)



Plate 4.12. Plot 19 in Zone 2 (looking south and north)



Plate 4.13. Plot 20 in Zone 2 (looking south and north)



Plate 4.14. Plot 21 in Zone 2 (looking south and north)

5 Threatened species

5.1 Assessment Requirements

The Calculator returns species that are predicted to occur in the development site based on geographical and habitat features, and PCTs present. The biodiversity values of threatened species returned by the Calculator must be assessed using information from the Threatened Species Profile Database.

Project specific assessment requirements (OEH SEARs) are listed in Table 5.1 along with the relevant section of this report in which they are assessed.

Table 5.1. Project specific assessment requirements

Common name	Comment / Section reference
Vegetation communities	
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt Bioregions	Native vegetation within the development site is limited to small patches of PCT 76 around paddock trees. Vegetation classified as PCT 76 is considered to be the Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt Bioregions community. See section 4.3.
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions is not considered to occur within the development site due to the PCT identified during the Plot surveys.
Threatened fauna	
Plains Wanderer <i>Pedionomus torquatus</i>	Section 5.3. Other threatened species

5.2 Ecosystem Credit Species

This Section and Section 3 present all threatened species identified through the BAM calculator and recorded during targeted threatened species surveys. See Section 2.3.4 for details of targeted threatened species survey methods.

5.2.1 Birds

Bush Stone-curlew *Burhinus grallarius*

BC Act Status	Endangered	EPBC Act Status	Not listed
Survey Period	Year round	Detection Method	Targeted nocturnal survey

Bush Stone-curlews live in open woodlands and forests, including partially cleared farmland, with an open understorey (Marchant and Higgins 1993). They roost and nest on the ground, often near fallen timber, adjacent to more open areas (Marchant and Higgins 1993). At night they feed on invertebrates and small reptiles (Marchant and Higgins 1993). There are no historical records of this

species within 10 kms of the development site (NSW Office of Environment and Heritage 2017a). Bush Stone-curlews are threatened by predation from cats and foxes, trampling of habitat by cattle and loss of habitat for agricultural and residential development (NSW Office of Environment and Heritage 2017e).

Targeted nocturnal surveys for this species were undertaken throughout the development site as well as adjoining woodland areas. Call playback was used to elicit a response from any birds that might have been present. No individuals were detected during these surveys.

It is concluded that based on the limited habitat available within the development site and the surrounding landscape, the lack of historical records and the results of the targeted surveys, this species is not likely to be present and therefore not likely to be impacted by the proposed development.

Presence: No (Surveyed)

Masked Owl *Tyto novaehollandiae novaehollandiae*

BC Act Status	Vulnerable	EPBC Act Status	Not listed
Survey Period	May – August	Detection Method	Targeted nocturnal survey

Masked Owls generally occur within forests and woodlands, however they are often located close to cleared areas, such as pasture (rather than crops), grasslands or wetlands (Higgins 1999). Masked Owls predominantly prey upon ground dwelling mammals, such as mice and Antechinus, but they also eat arboreal mammals and birds as well (Higgins 1999). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2017a). The key threat to Masked Owls is the loss of hollow bearing trees and lack of recruitment of potentially new hollows in the future (NSW Office of Environment and Heritage 2017b; NSW Office of Environment and Heritage 2017i).

Targeted nocturnal surveys for this species were undertaken throughout the development site as well as adjoining woodland areas. Call playback was used to elicit a response from any birds that might have been present. Observations of hollow bearing trees were made at dusk to detect nesting or roosting Owls. No Masked Owls were detected during these surveys. Barn Owls *Tyto alba* were detected during these surveys on response to call playback of Masked Owl recordings. The identity of this bird was confirmed by the stronger response that was elicited when, subsequent to the Masked Owl call, a Barn Owl call was broadcast.

It is concluded that, despite surveys being taken slightly outside the survey window, based on the limited habitat available within the development site and the surrounding landscape, the lack of historical records and the results of the targeted surveys, this species is not likely to be present and therefore not likely to be impacted by the proposed development.

Presence: No (Surveyed)

Little Eagle *Hieraaetus morphnoides*

BC Act Status	Vulnerable	EPBC Act Status	Not listed
Survey Period	August – October	Detection Method	Tree nest survey, bird surveys

Little Eagles range over large territories in search of food such as rabbits and birds (Marchant and Higgins 1993). They build large stick nests in large trees (Marchant and Higgins 1993). Little Eagles incubate from approximately August to October (Marchant and Higgins 1993). There are no previous records of Little Eagles within 10 kms of the development site

The current assessment searched the scattered paddock trees for evidence of Little Eagle nests, however none were found. Nests that were observed were either too small to support Little Eagles (and likely to be Corvid nests), not characteristic of Little Eagle nests in structure (Grey-crowned Babbler nests) or occupied by Wedge-tailed Eagles *Aquila audax* (Plate 5.1). Although not conclusive, it has been postulated that Wedge-tailed Eagles may exclude Little Eagles from their territories through competitive exclusion (Debus 2005; Olsen *et al.* 2006). Therefore the presence of a nesting Wedge-tailed Eagle is likely to reduce the likelihood that the development site provides nesting habitat for Little Eagles.



Plate 5.1. Wedge-tailed Eagle chick on a nest (October 2017)

It is concluded that based on the limited habitat available within the development site and the surrounding landscape, the lack of historical records and the results of the targeted surveys, Little Eagles are unlikely to nest within the development site and are unlikely to be present on a regular basis. It is therefore unlikely that Little Eagles will be significantly impacted by the development.

Presence: No (Surveyed)

Square-tailed Kite *Lophoictinia isura*

BC Act Status	Vulnerable	EPBC Act Status	Not listed
Survey Period	September – January	Detection Method	Tree nest survey, bird surveys

Square-tailed Kites are a solitary species of raptor that inhabits forests, woodlands and scrubs, generally in coastal and sub-coastal areas of Australia, as well as mallee and riverine trees in inland areas (Marchant and Higgins 1993). Within NSW they are rarely recorded in the south-west and west (Marchant and Higgins 1993), such as the development site. Square-tailed Kites build large stick nests in large trees, usually within 100 m or watercourses, in forests or woodlands (Marchant and Higgins 1993). Square-tailed Kites incubate from approximately August to November (Marchant and Higgins 1993). There are no previous records of Square-tailed Kites within 10 kms of the development site.

The current assessment searched the scattered paddock trees for evidence of Square-tailed Kites nests, however none were found. Nests that were observed were either too small to support Little Eagles (and likely to be Corvid nests), not characteristic of Square-tailed Kites nests in structure (Grey-crowned Babbler nests) or occupied by Wedge-tailed Eagles *Aquila audax* (Plate 5.1).

It is concluded that based on the limited habitat available within the development site and the surrounding landscape, the lack of historical records and the results of the targeted surveys, Square-tailed Kites are unlikely to nest within the development site and are unlikely to be present on a regular basis. It is therefore unlikely that Square-tailed Kites will be significantly impacted by the proposed development.

Presence: No (Surveyed)

Major Mitchell's Cockatoo *Lophocroa leadbeateri*

BC Act Status	Vulnerable	EPBC Act Status	Not listed
Survey Period	September – December	Detection Method	Tree nest survey, bird surveys

Major Mitchell's Cockatoos are large, pink cockatoos of arid and semi-arid regions in Australia. Habitat for this species are dry woodlands, including *Eucalyptus-Callitris-casuarina* assemblages, such as those recorded within, and around, the development site (Higgins 1999). They breed in hollows, usually, in *Eucalyptus* trees, and often close to water (Higgins 1999). Major Mitchell's Cockatoos feed mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and Cypress Pines. There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2017a). The key threat to this species is the loss of hollow bearing trees and lack of recruitment of potentially new hollows in the future (NSW Office of Environment and Heritage 2017h).

Bird surveys and tree hollow surveys were undertaken to detect the presence of Major Mitchell's Cockatoos. Despite these targeted surveys, as well as the high probability of detecting these birds, if they were present incidentally, while undertaking other assessments within the development site, this species was not recorded.

It is concluded that based on the limited habitat available within the development site and the surrounding landscape, the lack of historical records and the results of the targeted surveys, Major Mitchell's Cockatoos are unlikely to nest within the development site and are unlikely to be present on a regular basis. It is therefore unlikely that Major Mitchell's Cockatoo will be significantly impacted by the proposed development.

Presence: No (Surveyed)

Glossy Black-Cockatoo *Calyptorhynchus lathami*

BC Act Status	Endangered	EPBC Act Status	Not listed
Survey Period	Year round	Detection Method	Tree nest survey, bird surveys

Glossy Black Cockatoos are the smallest of the Black Cockatoos. They are dependent on *Allocasuarina* trees, on which they feed (Higgins 1999). They inhabit woodlands that are dominated by *Allocasuarina*, or open sclerophyll forests or woodlands with a mid-storey of *Allocasuarina* in eastern Australia (Higgins 1999). The Riverina population is a disjunct population in the Cocoparra and Lachlan Ranges, which is largely restricted to hills and low ridges where suitable stands of its food plant, Drooping She-Oak *Allocasuarina verticillata*, persist. They breed in hollows, usually, in *Eucalyptus* trees, although there are few records of nest sites of wild birds (Higgins 1999). Glossy Black Cockatoos feed quietly on the seeds of *Allocasuarina*, although they also eat wood-boring insect larvae (Higgins 1999). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2017a). The key threat to this species is the loss of hollow bearing trees and lack of recruitment of potentially new hollows in the future (NSW Office of Environment and Heritage 2017h).

Bird surveys and tree hollow surveys were undertaken to detect the presence of Glossy Black Cockatoos. Despite these targeted surveys, as well as the high probability of detecting these birds, if they were present incidentally, while undertaking other assessments within the development site, this species was not recorded.

It is concluded that based on the limited habitat available within the development site and the surrounding landscape, the lack of historical records and the results of the targeted surveys, Glossy Black Cockatoos are unlikely to nest within the development site and are unlikely to be present on a regular basis. It is therefore unlikely that Glossy Black Cockatoo will be significantly impacted by the proposed development.

Presence: No (Surveyed)

Superb Parrot *Polytelis swainsonii*

BC Act Status	Vulnerable	EPBC Act Status	Vulnerable
Survey Period	September – November	Detection Method	Tree nest survey, bird surveys

The core range of the Superb Parrot is the riparian woodlands and forests of the Murrumbidgee and Murray Rivers (Higgins 1999). Although they are usually located near water, they disperse into the open woodlands of the surrounding plains (Higgins 1999). They are regularly found in crops,

including cereal crops, as well as grazing land where scattered trees persist (Higgins 1999). Superb Parrots nest in the hollow spouts of large *Eucalyptus* trees—predominantly River Red-gums, but also Grey Boxes (Higgins 1999). Threats to the species are poorly known, however loss of habitat and persecution by humans are key threats that have been identified (NSW Office of Environment and Heritage 2017u).

There are no historical records of this species from within 10 kms of the development site (NSW Office of Environment and Heritage 2017a). Despite this, this species was observed on four occasions along Mitchell’s Road on the western boundary of the development site (Plate 1; Figure 6). Each of these observations was of two birds, except for one observation of four birds. A subsequent observation of two birds, from a different location means that there are between four and six birds using this location for feeding. One of the pairs of birds was disturbed by the observers’ presence and they flew to the east, across the development site. The birds seemed loyal to that particular location in which they were observed, which may or may not indicate nesting. Potentially suitable nesting trees were observed, but none are proposed to be impacted by the proposed development. A small area of native vegetation is currently proposed for removal at this location, which contains Western Grey Box that contain hollows. The birds were not observed interacting with any tree hollows nor were any of the hollows observed within the development site seen to contain Superb Parrots.



Plate 5.2. One of the Superb Parrots recorded during the current assessment

Other birds were recorded commuting to and from Narrandera to the development site. The road reserve, as well as vegetation north of the Sturt Highway, provides a corridor within the landscape that connects to the Murrumbidgee River, and the riparian vegetation of that location. Within this corridor larger patches of native vegetation at the Sandigo Rest Area (approximately 8kms north-west of the development site) and on private property are likely to provide moderate to high quality habitat for the species, including both foraging and breeding resources.

The presence of up to six Superb Parrots is unlikely to represent an important population of this threatened species. However these birds are likely to represent part of a larger population, that occupies the riverine vegetation associated with the Murrumbidgee River and associated tributaries, which is likely to be considered an important population. Breeding opportunities are likely to be available for the species in the Inland Grey Box trees that remain within the landscape, as well as the River Red-gums *Eucalyptus camaldulensis* that were observed on the north-eastern side of the Sturt Highway, in association with Sandy Creek. Nonetheless, the highly fragmented landscape in which the current sightings took place does not represent high quality habitat for the species, despite higher quality habitat located nearby (i.e. the riparian strip along Sandy Creek).

Presence: Yes (Surveyed)

5.2.2 Mammals

Grey-headed Flying-fox *Pteropus poliocephalus*

BC Act Status	Vulnerable	EPBC Act Status	Vulnerable
Survey Period	October – December	Detection Method	Nocturnal surveys

Grey-headed Flying-foxes are a highly mobile species that disperses over wide distances for suitable foraging trees, which include pollens in Eucalypts, fruiting trees and gully roosting areas (Menkhorst 2001). They are found in in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops (NSW Office of Environment and Heritage 2017g). Roost sites commonly occur in gullies, in vegetation with dense canopy cover and close to water (Menkhorst 2001). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2017a). A key threat to this species is the loss of hollow bearing trees and lack of recruitment of potentially new hollows in the future (NSW Office of Environment and Heritage 2017g).

Nocturnal surveys were undertaken throughout the development site and the surrounding woodlands. No Grey-headed Flying-foxes were observed during these surveys.

Although foraging may occur over wide distances and may include the development site, there is unlikely to be a significant impact on this species because of its wide range and mobility, the general lack of suitable foraging trees, the lack of historic records within the landscape, and the results of the current assessment.

Presence: No (Surveyed)

5.2.3 Amphibians

Sloane's Froglet *Crinia sloanei*

BC Act Status	Vulnerable	EPBC Act Status	Not listed
Survey Period	July – August	Detection Method	Nocturnal frog surveys

Sloane's Froglet is a small, ground dwelling frog that is typically associated with periodically inundated (NSW Office of Environment and Heritage 2017o) areas in grassland, woodland and disturbed habitats (NSW Office of Environment and Heritage 2017o). Similar in appearance to other species in the genus *Crinia*, it is only reliably identified by its call (Tyler and Knight 2011). Sloane's

Froglet is confined to central NSW, extending to the Victorian border (Tyler and Knight 2011), with most recent observations of this species coming from the south of its range (NSW Office of Environment and Heritage 2017o). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2017a). A key threat to this species is the loss of habitat through clearing and changes to water regimes and water quality (NSW Office of Environment and Heritage 2017o). These threats are manifest through urbanisation and development, as well as inappropriate cattle grazing (NSW Office of Environment and Heritage 2017o).

Surveys for this species were not undertaken for two reasons:

- There were no suitable locations for the surveys to be undertaken; and,
- The survey period available for the current surveys was outside the recommended survey period to detect this species.

Despite not recording this species during recent assessments, the lack of suitable habitat and observations of the species near the development site, because surveys could not be undertaken at an appropriate time of year, to expedite the approvals process, it is assumed that Sloane's Froglet is present within the development site.

Presence: Yes (Assumed)

5.2.4 Flora

Spike Rush *Eleocharis obicis*

BC Act Status Survey Period	Vulnerable Year round	EPBC Act Status Detection Method	Vulnerable Targeted flora surveys
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Spike Rush is a small sedge is a tufted perennial with very short underground stem (NSW Office of Environment and Heritage 2017s). It grows in ephemeral wet situations such as roadside mitre drains and depressions, usually in low-lying grasslands (NSW Office of Environment and Heritage 2017s). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2017a).

There is no suitable habitat for this species within the development site. Targeted flora surveys for the species, undertaken during the flowering, and therefore most conspicuous time for this species, did not identify any of these plants either within the degraded native vegetation that comprises Zone 2 of the development site, or in the higher quality native vegetation near the development site, that has been excluded to minimise impacts on native vegetation. There is therefore not likely to be any impact on this species.

Presence: No (Surveyed)

Mossgiel Daisy *Brachyscome papillosa*

BC Act Status Survey Period	Vulnerable September – November	EPBC Act Status Detection Method	Vulnerable Targeted flora surveys
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Mossgiel Daisy is a multi-stemmed, perennial herb that grows to 40 centimetres tall with mauve flower-heads with a yellow centre (NSW Office of Environment and Heritage 2017j). It is predominantly found in Saltbush and Bluebush shrublands, it also occurs in Cypress Pine woodlands (NSW Office of Environment and Heritage 2017j). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2017a).

There is no suitable habitat for this species within the development site. Targeted flora surveys for the species, undertaken during the flowering, and therefore most conspicuous time for this species, did not identify any of these plants either within the degraded native vegetation that comprises Zone 2 of the development site, or in the higher quality native vegetation near the development site, that has been excluded to minimise impacts on native vegetation. There is therefore not likely to be any impact on this species.

Presence: No (Surveyed)

Pine Donkey Orchid *Diuris tricolor*

BC Act Status	Vulnerable	EPBC Act Status	Not listed
Survey Period	September – October	Detection Method	Targeted flora surveys

Pine Donkey Orchids grow in sclerophyll forest among grass, often with native Cypress Pines (NSW Office of Environment and Heritage 2017k). They grow to 40-60 cm in height, and bear 6-8 yellow to orange flowers speckled with red to purple and white markings (NSW Office of Environment and Heritage 2017k). It is found in sandy soils, either on flats or small rises (NSW Office of Environment and Heritage 2017k). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2017a).

There is no suitable habitat for this species within the development site. Targeted flora surveys for the species, undertaken during the flowering, and therefore most conspicuous time for this species, did not identify any of these plants either within the degraded native vegetation that comprises Zone 2 of the development site, or in the higher quality native vegetation near the development site, that has been excluded to minimise impacts on native vegetation. There is therefore not likely to be any impact on this species.

Presence: No (Surveyed)

Sand-hill Spider Orchid *Caladenia arenaria*

BC Act Status	Endangered	EPBC Act Status	Endangered
Survey Period	August – October	Detection Method	Targeted flora surveys

Sand-hill Spider Orchid occurs in woodland with sandy soil, especially that dominated by White Cypress Pine (NSW Office of Environment and Heritage 2017l). It is currently only known to occur in the Riverina between Urana and Narranderra (NSW Office of Environment and Heritage 2017l). Sand-hill Spider Orchids grow to 40 cm in height, and bear one or two pale yellow flowers (NSW Office of Environment and Heritage 2017l). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2017a).

There is no suitable habitat for this species within the development site. Targeted flora surveys for the species, undertaken during the flowering, and therefore most conspicuous time for this species, did not identify any of these plants either within the degraded native vegetation that comprises Zone 2 of the development site, or in the higher quality native vegetation near the development site, that has been excluded to minimise impacts on native vegetation. There is therefore not likely to be any impact on this species.

Presence: No (Surveyed)

Silky Swainson Pea *Swainsona sericea*

BC Act Status	Vulnerable	EPBC Act Status	Not listed
Survey Period	September – February	Detection Method	Targeted flora surveys

Silky Swainson Pea is found in Box-Gum Woodland in the Southern Tablelands and South West Slopes of NSW (NSW Office of Environment and Heritage 2017m). It is sometimes found in association with cypress-pines *Callitris* spp., but more usually found in association with Box-Gum Woodlands (NSW Office of Environment and Heritage 2017m). The plant is a prostrate, spring flowering perennial, with purple flowers (NSW Office of Environment and Heritage 2017m). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2017a).

There is no suitable habitat for this species within the development site. Targeted flora surveys for the species, undertaken during the flowering, and therefore most conspicuous time for this species, did not identify any of these plants either within the degraded native vegetation that comprises Zone 2 of the development site, or in the higher quality native vegetation near the development site, that has been excluded to minimise impacts on native vegetation. There is therefore not likely to be any impact on this species.

Presence: No (Surveyed)

Slender Darling Pea *Swainsona murrayana*

BC Act Status	Vulnerable	EPBC Act Status	Vulnerable
Survey Period	September – February	Detection Method	Targeted flora surveys

Slender Darling Pea is a small, purple flowered forb. It is found throughout NSW in a variety of vegetation communities, most of which are grassland communities, and often in areas with historical disturbance, including some degree of grazing (NSW Office of Environment and Heritage 2017n). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2017a).

There is no suitable habitat for this species within the development site. Targeted flora surveys for the species, undertaken during the flowering, and therefore most conspicuous time for this species, did not identify any of these plants either within the degraded native vegetation that comprises Zone 2 of the development site, or in the higher quality native vegetation near the development site, that has been excluded to minimise impacts on native vegetation. There is therefore not likely to be any impact on this species.

Presence: No (Surveyed)

Small Purple-pea *Swainsona recta*

BC Act Status	Endangered	EPBC Act Status	Endangered
Survey Period	September – November	Detection Method	Targeted flora surveys

Small Purple-pea is a slender, erect perennial herb growing to 30 cm tall with sprays of between 10 and 20 purple, pea-shaped flowers, between late September and early December (NSW Office of Environment and Heritage 2017p). Habitat for this species included open *Eucalyptus* woodlands, although the species is now largely confined to grasslands associated with railway easements near Queanbeyan (NSW Office of Environment and Heritage 2017p).

There is no suitable habitat for this species within the development site. Targeted flora surveys for the species, undertaken during the flowering, and therefore most conspicuous time for this species, did not identify any of these plants either within the degraded native vegetation that comprises Zone 2 of the development site, or in the higher quality native vegetation near the development site, that has been excluded to minimise impacts on native vegetation. There is therefore not likely to be any impact on this species.

Presence: No (Surveyed)

Spear Grass *Austrostipa wakoolica*

BC Act Status	Endangered	EPBC Act Status	Endangered
Survey Period	September – December	Detection Method	Targeted flora surveys

A Spear Grass *Austrostipa wakoolica* grows in a range of habitats on a range of soils, including sandy Cypress Pine woodlands (NSW Office of Environment and Heritage 2017r). It grows in association with species such as White Cypress-pine *Callitris glaucophylla* and Western Grey Box *Eucalyptus microcarpa*, which are the dominant overstorey species within the development site. *Austrostipa wakoolica* flowers in October to December (encompassing the period of the current surveys), then spreads its seeds through the vectors of wind and sometimes flood waters (NSW Office of Environment and Heritage 2017r). The seed is believed to be viable for three to five years (NSW Office of Environment and Heritage 2017r). A long-lived seed bank is considered unlikely for this species, and it is unlikely to persist within the development site because of the three year cropping rotation across the entire development site, except for the road reserves (Mark Geppart, Land Owner, pers comm. 18 October 2017). *Austrostipa wakoolica* is threatened by habitat reduction and modification from pastoral development, irrigation and altered flooding regimes, as well as increases in grazing pressure from exotic and native species (NSW Office of Environment and Heritage 2017r).

There are two historical records of *Austrostipa wakoolica* from within 10 kms of the development site, located north of the development site on the Sturt Highway (Figure 6; NSW Office of Environment and Heritage 2017d). The records come from the south-western side of Sturt Highway at a stockpile site approximately 25 kms south-east of Narrandera (NSW Office of Environment and Heritage 2017d). Although separate entries in the Bionet Database, the observations are duplicates of the same record, as both are dated 18 November 2000 and the location coordinates are almost

identical (NSW Office of Environment and Heritage 2017d). However, despite transect surveys being undertaken in the least disturbed habitats within the area of impact and nearby patches of native vegetation, *Austrostipa wakoolica*, was not recorded.

There is no suitable habitat for this species within the development site. Targeted flora surveys for the species, undertaken during the flowering, and therefore most conspicuous time for this species, did not identify any of these plants either within the degraded native vegetation that comprises Zone 2 of the development site, or in the higher quality native vegetation near the development site, that has been excluded to minimise impacts on native vegetation. There is therefore not likely to be any impact on this species.

Presence: No (Surveyed)

Spiny Peppercross *Lepidium aschersonii*

BC Act Status	Vulnerable	EPBC Act Status	Not listed
Survey Period	September – May	Detection Method	Targeted flora surveys

Spiny Peppercross is found on ridges of gilgai clays dominated by Brigalow *Acacia harpophylla*, Belah *Casuarina cristata*, Buloke *Allocasuarina luehmanii* and Grey Box *Eucalyptus microcarpa*, often the understorey is dominated by exotic species (NSW Office of Environment and Heritage 2017t). It is an erect perennial herb to 30 cm high, hairy and intricately branched, with the smaller branches spinescent (NSW Office of Environment and Heritage 2017t). Plants become woody and more spinose in dry conditions (NSW Office of Environment and Heritage 2017t).

There is no suitable habitat for this species within the development site. Targeted flora surveys for the species, undertaken during the flowering, and therefore most conspicuous time for this species, did not identify any of these plants either within the degraded native vegetation that comprises Zone 2 of the development site, or in the higher quality native vegetation near the development site, that has been excluded to minimise impacts on native vegetation. There is therefore not likely to be any impact on this species.

Presence: No (Surveyed)

5.3 Other threatened species

Plains-wanderer *Pedionomus torquatus*

BC Act Status	Vulnerable	EPBC Act Status	Critically Endangered
Survey Period	Year round	Detection Method	Nocturnal surveys

Plains-wanderers are small quail-like birds of open plains and grasslands. Habitat for the species includes 'treeless, species-rich, lowland native grasslands with approximately 50% bare ground, 40% herbs and grasses and 10% fallen litter, with grass tussocks spaced around 10-20 cm apart and most vegetation less than 5 cm in height' (Commonwealth of Australia 2016, p. 13). At the time of the current assessment there was none of this habitat present within the development site and the farming practices within the development site generally preclude the development of this type of habitat. Plains-wanderers are also occasionally found in cereal crops and cereal stubble (Commonwealth of Australia 2016), which the development site, at certain times of the year,

provides in abundance. However it is not known if these types of habitats can support a population of Plains-wanderers, if these birds are moving through this habitat to more suitable habitat, or if they are forced into these conditions because of the loss and lack of habitat within the landscape (Commonwealth of Australia 2016).

Critical habitat identified for the Plains-wanderer includes large parts of the Riverina, including near Narrandera, however, neither primary nor secondary habitat for this species is identified within 45 kms of the development site (Appendix 3). Furthermore, there has been a 84% decline in the population size of the Plains-wanderer to 2014, with fewer than 1000 birds left in the wild (Commonwealth of Australia 2016). This is due to the modification and loss of habitat, with secondary threats from the size of the population and predation by cats and foxes (Commonwealth of Australia 2016).

Plains-wanderers were not recorded during the recent detailed assessments, despite intensive searches for them over the course of three nights. Survey transects were driven throughout the development site, with spotlights to try to detect the species. Additional time was spent within the development site at night investigating hollow bearing trees for other threatened species. In total more than 30 person hours were spent looking for the species, but it was not recorded (Ecolink Consulting Pty Ltd 2017a). However, there is one historical records of this species from within 10 kms of the development site, located south of the development site, although this was from 1967, prior to the crash in the population of Plains-wanderers (NSW Office of Environment and Heritage 2017a; Figure 6).

On the basis of the surveys completed to date, the lack of recent historical records, the generally low quality habitat for the species and that the development site falls outside the known core habitat for the species, there is only a low likelihood that Plains-wanderer persist within the development site. Any impact associated with the loss of habitat, posed by the proposed development, is considered minor given that there are vast amounts of similar potential habitats, as well as higher quality habitats, elsewhere within the local area, and region. It is therefore extremely unlikely that the proposed development will impact Plains-wanderer habitat, or result in a 'serious and irreversible impact' to Plains-wanderers.

Presence: No (Surveyed)

Grey-crowned Babbler *Pomatostomus temporalis temporalis*

BC Act Status	Vulnerable	EPBC Act Status	Not listed
Survey Period	Year round	Detection Method	Bird surveys

Grey-crowned Babblers occur in woodlands, open forests and farmlands (Pizzey and Knight 2012). They require a sparse ground cover, with logs and leaf litter (Higgins and Peter 2002). The species is a co-operative breeder that retains territories throughout the year, with few movements recorded (Higgins and Peter 2002). A breeding group typically consist of a breeding pair and three to four non-breeding helpers (Higgins and Peter 2002).

A number of roosting nests were observed within the development site. Nests were recorded in tree numbers 6, 24, 34, and 38 within the development site (Figure 5), with other nests recorded outside the development site in trees that are not proposed to be impacted by the proposed

development. These nests appeared to represent the territories of two groups of babblers—one that is predominantly located in the south-east and one that is predominantly located in the north-west of the development site (Figure 6). These birds were seen regularly during the current assessments, with up to eight individuals counted in the north-western group and six individuals in the south-eastern group.

During assessments for the larger solar farm investigation, Grey-crowned Babblers were observed at all four properties that were visited (Ecolink Consulting Pty Ltd 2017b). Historic records also exist from the vicinity of the development site (NSW Office of Environment and Heritage 2017a). This suggests that although threatening processes exist, the species is not uncommon in the landscape around the development site.

Key threatening processes for this species that are applicable to the development site are:

- *Loss, degradation and fragmentation of woodland habitat on high fertility soils.*
- *Excessive total grazing pressure and loss of coarse woody debris is resulting in degradation and loss of important habitat components.*
- *Infestation of habitat by invasive weeds including exotic perennial grasses. These weeds are very aggressive and form dense grass swards covering inter-tussock spaces preventing access to leaf and stick litter where babblers commonly forage for invertebrates (NSW Office of Environment and Heritage 2017f).*

It is likely that the proposed development will result in the loss of some low quality habitat, around higher quality habitat for Grey-crowned Babblers. The observations of Babblers during the current assessment noted that the birds generally stayed within woodland areas that will not be directly impacted by the proposed works. Indirect impacts during the construction of the solar farm, may restrict the size of the territory that is able to provide resources to the group, however these indirect impacts will be limited to the construction period and will cease once the solar farm is established. Residual impacts will be the loss of 54 scattered paddock trees, some of which have provided roosting habitat in the past.

Presence: Yes (Surveyed)

White-fronted Chat *Epthianura albifrons*

BC Act Status	Vulnerable	EPBC Act Status	Not listed
Survey Period	Year round	Detection Method	Bird surveys

White-fronted Chats are generally found in association with water and open damp habitats, often near wetlands (Higgins et al. 2001). They are regularly encountered in these open habitats on fences and at the top of bushes that emerge from the undergrowth (Pizzey and Knight 2012). Their diet consists of invertebrates, and occasionally seeds (Higgins et al. 2001).

White-fronted Chats were observed associating with fences along Kwyong Faithfull Road and Mimosa Road (Figure 6). The individuals are likely to have been foraging in the crops prior to being disturbed by the vehicle, and flown up to fences in caution. It is likely that only one group of Chats has its territory within the development site, as they were only seen in one location on any given survey day, and the numbers observed was similar each time (between approximately six and eight).

Key threatening processes for this species that are applicable to the development site are:

- *Reduction in habitat size and quality.*
- *Human disturbance (particularly in urban areas) and elevated nest-predation levels.*
- *Much of their natural habitat is prone to alteration due to modification of river flows and floodplains.*
- *Prone to predation from snakes and mammals, particularly Feral Cats, European Red Foxes and rodents, as well as birds, particularly ravens (NSW Office of Environment and Heritage 2017v).*

The impacts to this species are likely to be limited to temporary, indirect impacts associated with noise and disturbance during construction works. Habitat for this species is unlikely to be significantly impacted given the vast amounts of cropping land in and around the development site. It is therefore unlikely that the NSW population of White-fronted Chats will be significantly impacted by the proposed development.

Presence: *Yes (Surveyed)*

5.4 EPBC Act Referral Assessment

5.4.1 Overview

During the planning phase for the proposed development, the potential for impacts on MNES was a key consideration of the applicant in locating the development site. The EPBC Act Protected Matters Search Tool identified 29 threatened species, 10 listed migratory species (some of which are also threatened species), four threatened ecological communities and four Wetlands of International Importance (Ramsar) that are either known, or have the potential to occur, within a 10 km radius of the development site (refer Appendix 4) (Department of the Environment and Energy 2018).

5.4.2 Threatened Vegetation Communities

Of the four EPBC Act listed vegetation communities that may occur within the development site, two were able to be dismissed due to an absence of the required species, and/or their habitats, which are characteristic of these communities:

- Natural Grasslands of the Murray Valley Plains; and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Two other communities require further discussion:

- Weeping Myall Woodlands; and,
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia.

Weeping Myall plants were recorded within the Mimosa Road road reserve, approximately 3 kms south of the development site, however this species was not recorded in or adjacent to the development site or development footprint. Furthermore, the small size of this patch of trees would not meet benchmark thresholds to qualify as this threatened community (Department of the Environment Water Heritage and the Arts 2009).

Vegetation along Mitchells Road, adjacent to the development site, is of sufficient quality and diversity to qualify as the nationally significant Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia ecological community. These areas are not proposed to be impacted by the solar farm and access to the development will be from the south to avoid this vegetation.

Elsewhere within the development site, the matrix in which the scattered paddock trees stand is highly disturbed and subject to ongoing disturbance in a five year cycle of cropping and grazing, effectively interrupting any recruitment of woody plants, and favouring early colonising species, such as grasses. Therefore, none of the other trees or patches of native vegetation located within the development site are sufficiently intact or have the requisite mix of native species or cover abundance of native species, to meet thresholds to be considered any of the four nationally listed, threatened vegetation communities identified by the Protected Matters Search Tool.

5.4.3 Threatened and Migratory Species

Of the 39 species that were identified as having the potential to occur within the development site, only five have at least a moderate likelihood of occurrence within the development site based on their biology, behaviour, habitat preferences compared with the habitats available within the development site. None have previously been recorded within the development site, however, one species was recorded during the recent assessments: Superb Parrot *Polytelis swainsonii* (Figure 6). In addition, two other species have previously been recorded within 10 kms of the development site: Plains-wanderer *Pedionomus torquatus* and a Spear Grass *Austrostipa wakoolica* (Figure 6). These species are also threatened in NSW and considered in Section 5.3.

Two migratory bird species, Fork-tailed Swift *Apus pacificus* and White-throated Needletail *Hirundapus caudacutus*, are also likely to occur within the boundary of the development site on occasion. Fork-tailed Swifts and White-throated Needletails are aerial insectivores that are likely to forage above the development site, in advance of low-pressure fronts. Both of these species spend the summer months in southern Australia and may pass through the landscape during their migration (Higgins 1999). Despite this, the development site does not provide important or limiting habitat for any of these species. The development of the development site is unlikely to have any impact on these movements and therefore there are unlikely to be any significant impacts to either species.

5.4.4 Wetlands

The four Wetlands of International Importance (Ramsar) that are upstream of the development site are more than 300 km from the development site (Department of the Environment and Energy 2018). The proposed development is not likely to have any impacts to the hydrology of the local area once operational, and the applicant is committed to implementing appropriate sediment and erosion control measures to ensure that there are no downstream impacts from the construction of the site.

5.4.5 Potential for Significant Impact on an MNES

Superb Parrots were observed during the current assessment, and showed site loyalty to an area of road reserve along Mitchells Road, just outside the north-western boundary of the development site. This area contains relatively high quality vegetation, however, none of which is currently proposed to be impacted by the solar farm. It is therefore unlikely that the proposed development will have a significant impact on Superb Parrots.

6 Impact Assessment

6.1 Avoid and Minimise Impacts

Initial ecological assessments for the Sandigo Solar Farm included four locations within 10 kms of the development site. Site investigations were undertaken for three of these properties, while a desktop assessment and 'over the fence' assessment was undertaken for the fourth (Ecolink Consulting Pty Ltd 2017b). These assessments found that each of the properties contained some ecological values, but concluded that the locations which had the least number and lowest quality ecological constraints was the eastern-most property, at Sandigo (Ecolink Consulting Pty Ltd 2017b).

The preliminary investigations of the development site identified a number of ecological constraints within the currently proposed development site and the surrounding paddocks that comprised the development site for that earlier assessment (Ecolink Consulting Pty Ltd 2017b). This included patches of remnant vegetation and scattered trees, as well as habitat for threatened flora and fauna species (Ecolink Consulting Pty Ltd 2017b). It was also noted that parts of the Narrandera Local Environment Plan 2013 (LEP) identified some of the vegetation within the development site, including two patches of remnant vegetation and an area of scattered trees as areas of 'terrestrial biodiversity'.

On the basis of these preliminary investigations, a development footprint has been proposed, within the larger area assessed. Consistent with Chapter 8 of the BAM, the areas with the highest quality habitat (i.e. patches of remnant vegetation, threatened species habitat, concentrations of scattered paddock trees) have been avoided by the applicant in the development of the current development site.

54 paddock trees are likely to require removal, which includes 15 hollow bearing trees (see Figure 5). The remainder of the development site (229 hectares) is generally degraded, lacking natural vegetation and of low ecological value to most native species.

6.2 Potential Impacts

The proposed development of the Sandigo Solar Farm may result in both direct and indirect impacts on biodiversity. The direct impacts of the project are expected to comprise:

- The removal of 54 paddock trees within the development site; and,
- The removal of up to 15 hollow-bearing trees (included within the 54 paddock trees mentioned above).

The potential indirect impacts of the project may include:

- Introduction and spread of weeds due to import of construction vehicles and materials;
- Potential impact of inappropriate species being used in site rehabilitation and landscaping;
- Erosion of disturbed areas leading to sedimentation affecting any downgradient habitat;

- Water quality impacts (e.g. increased turbidity and suspended solids) affecting any downgradient habitat; and,
- Short-term disturbance of fauna during construction due to noise generated by vehicles, equipment and construction activities.

6.3 Recommendations to Avoid, Minimise and Mitigate impacts

The applicant has sought to reduce impacts on biodiversity values within the development site by avoiding and minimising the removal of native vegetation and disturbance of fauna habitat. The site has been selected in part due to its high level of disturbance from a long history of primary production and its distance from areas of high environmental sensitivity. However, to mitigate residual impacts after initial avoidance and minimisation has been implemented, a number of management measures are proposed.

6.3.1 Site Selection and Planning

Site access for construction and operation will be from the south via Kywong Boree Creek Road, Kywong Faithfull Road, and then north along Mitchells Road, where the road reserve is of low ecological value, to minimise vegetation removal and impacts to threatened fauna species.

6.3.2 Construction

No direct impacts are expected to occur as a result of the construction phase other than the removal of scattered paddock trees described in Section 6.2.

Mitigation measures to avoid and minimise impacts should be outlined in a Construction Environmental Management Plan (CEMP). The CEMP will be prepared prior to the beginning of construction, be approved by the appropriate regulators and for each required task include:

- Details of who will be responsible for individual actions (including the position title of the officer responsible);
- The required outcome or measure of success;
- Triggers for an alternative action, should the task not proceed as required;
- Measures of success for each task; and,
- Timelines for when the action will be completed.

Sections of the CEMP will include, but not be limited to the following management actions:

- Unless otherwise agreed by the Responsible Authority, the removal of hollow-bearing trees will not be undertaken during the late winter to spring period to avoid the main breeding period for hollow-dependent fauna, such as owls and possums.
- Pre-clearance surveys will be undertaken to ensure that nests and hollows identified in paddock trees are inactive.

- Where an active hollow is identified, a licenced wildlife salvage team will be on-site during vegetation removal to catch and relocate (if appropriate) any wildlife encountered in vegetation or hollow-bearing trees.
- Demarcation and exclusion fencing should be installed around trees and vegetation to be retained in, or directly adjacent to, the development site, as follows:
 - tree protection zones (TPZs) should be clearly defined;
 - the radius of the TPZ should be calculated for each tree by multiplying its diameter at breast height (DBH) by 12 (i.e. $TPZ = DBH \times 12$) in accordance with the Australian Standard – Protection of trees on development sites AS 4970-2009 (Standards Australia 2009);
 - a TPZ should not be less than 2 m or greater than 15 m, except where crown protection is required (Standards Australia Committee 2009);
 - appropriate signage such as 'No Go Zone' or 'Environmental Protection Area' should be installed around retained trees and vegetation;
 - the location of any 'No Go Zones' should be identified in site inductions;
 - fencing should comprise star pickets with high visibility bunting.
- All material stockpiles, vehicle parking and machinery storage will be located within cleared areas or areas proposed for clearing, and not in areas of retained native vegetation;
- Where practical, all paddock and hollow-bearing trees to be removed should be placed in areas of retained vegetation to provide additional fauna habitat;
- Where appropriate native vegetation cleared from the development site should be mulched for re-use on the site, to stabilise bare ground;
- Sediment and erosion control measures (e.g. silt fences, sediment traps) should be implemented prior to construction works commencing, to protect drainage channels and any downgradient habitat. These should conform to relevant guidelines, such as outlined in Managing Urban Stormwater: Soils & Construction (Landcom 2004);
- Standard noise controls should be implemented during construction to minimise disturbance to fauna, including:
 - using well-maintained vehicles and equipment;
 - using and maintaining noise-suppression devices (such as mufflers) on vehicles and equipment.

6.3.3 Operation

The impacts arising from the operation of the project are expected to be negligible due to the inherently low impact nature of solar farm operation.

6.4 Impact Summary

As outlined in Section 6.2, the Sandigo Solar Farm is expected to result in the removal of a total of 54 paddock trees. These paddock trees are identified as a threatened vegetation community. Further

impacts to Superb Parrot and Sloane's Toadlet were identified by the BAM Calculator (Appendix 9.5), while impacts to Grey-crowned Babbler and White-fronted Chat, which were recorded during the site assessments, are also likely.

The thresholds for assessment and offsetting of unavoidable impacts of development in accordance with Section 9 of the BAM are considered below.

6.4.1 Impacts Requiring Offsets

Impacts of the proposed development are calculated using Appendix 1 of the BAM – Streamlined Paddock Trees, not covered by the self-assessable code.

Landscape Features

The development site does not support any 4th, 5th or 6th order streams, estuarine areas, important wetlands, or state or regional biodiversity links. The development site does not support any important wetlands.

There are no impacts to landscape features requiring further consideration.

Native Vegetation

The following Table 6.1, provides a summary of the number of ecosystem credits required for clearing paddock trees in Class 2 and 3 in accordance with Appendix 1 of the BAM.

Table 6.1. Number of ecosystem credits required for each paddock tree.

No.	Species	DBH (cms)	Hollows	Nests	Assessment Class	Credit Requirement	PCT
2	Grey Box	95	Y	-	Class 3	1	76
3	White Cypress Pine	41	N	-	Class 2	0.5	76
4	White Cypress Pine	74	N	-	Class 3	0.75	76
5	Grey Box	95	Y	-	Class 3	1	76
6	Grey Box	74	Y	Babbler	Class 3	1	76
7	White Cypress Pine	50	N	-	Class 3	0.75	76
8	Grey Box	90	N	Corvid	Class 3	0.75	76
9	Grey Box	72	Y	-	Class 3	1	76
10	White Cypress Pine	28	N	-	Class 2	0.5	76
11	White Cypress Pine	45	N	-	Class 2	0.5	76
12	White Cypress Pine	47	N	-	Class 2	0.5	76
13	White Cypress Pine	66	N	-	Class 3	0.75	76
14	White Cypress Pine	53	N	-	Class 3	0.75	76
15	White Cypress Pine	55	N	-	Class 3	0.75	76
16	Yellow Box	56	N	-	Class 3	0.75	76
17	White Cypress Pine	49	N	-	Class 2	0.5	76
18	White Cypress Pine	49	N	-	Class 2	0.5	76
19	Grey Box	130	N	Corvid	Class 3	0.75	76
20	White Cypress Pine	46	N	-	Class 2	0.5	76
21	Grey Box	98	Y	-	Class 3	1	76
22	Grey Box	67	Y	-	Class 3	1	76
23	White Cypress Pine	43	N	-	Class 2	0.5	76
24	Grey Box	98	Y	Babbler	Class 3	1	76
25	Grey Box	61	N	Small stick	Class 3	0.75	76
26	White Cypress Pine	57	N	-	Class 3	0.75	76

No.	Species	DBH (cms)	Hollows	Nests	Assessment Class	Credit Requirement	PCT
27	White Cypress Pine	44	N	-	Class 2	0.5	76
28	Grey Box	79	N	-	Class 3	0.75	76
29	Grey Box	98	Y	Small stick	Class 3	1	76
30	White Cypress Pine	50	N	-	Class 3	0.75	76
31	White Cypress Pine	54	N	-	Class 3	0.75	76
32	White Cypress Pine	52	N	-	Class 3	0.75	76
33	Grey Box	101	N	-	Class 3	0.75	76
34	Grey Box	67	Y	Babbler	Class 3	1	76
35	White Cypress Pine	53	N	-	Class 3	0.75	76
36	White Cypress Pine	61	N	-	Class 3	0.75	76
37	Hooked Needlewood	38	Y	-	Class 2	0.75	76
38	Grey Box	150	Y	Babbler	Class 3	1	76
39	Grey Box	72	N	-	Class 3	0.75	76
40	White Cypress Pine	60	N	-	Class 3	0.75	76
41	White Cypress Pine	42	N	-	Class 2	0.5	76
42	White Cypress Pine	58	N	-	Class 3	0.75	76
43	White Cypress Pine	49	N	-	Class 2	0.5	76
44	White Cypress Pine	59	N	-	Class 3	0.75	76
45	White Cypress Pine	69	N	-	Class 3	0.75	76
46	Grey Box	114	Y	-	Class 3	1	76
47	Grey Box	69	Y	-	Class 3	1	76
48	Grey Box	63	Y	Corvid	Class 3	1	76
49	Grey Box	57	N	Corvid	Class 3	0.75	76
50	Grey Box	143	N	Small stick	Class 3	0.75	76
51	Grey Box	92	Y	-	Class 3	1	76
52	Grey Box	79	N	-	Class 3	0.75	76
53	Grey Box	92	N	Corvid	Class 3	0.75	76
54	Grey Box	59	N	-	Class 3	0.75	76
55	Grey Box	59	N	-	Class 3	0.75	76
Total						41.25	

6.4.2 Credit Profile

Table 6.2 provides a summary of offsets required for impacts to paddock trees identified within the development site based on Table 6.1.

The applicant is committed to meet the offset requirement of 41.25 ecosystem credits..

Table 6.2. Credit Profile Summary

Credit Class	Credits	Like-for-like options	IBRA Subregion	Endangered Ecological Community	Vegetation Class	Vegetation Formation	Hollow Bearing Trees
76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	41.25	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (PCT's 76, 80, 81, 82, 101, 110, 237, 248)	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee bioregions, or any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site	Inland Grey Box Woodland Endangered Ecological Community	Floodplain transition woodland	Grassy woodland	Present

7 Conclusion

The applicant has initiated a process to avoid and minimise impacts to ecological values within the landscape through the development of the proposed Sandigo Solar Farm. This began with ecological investigations of four properties within the region, and resulted in a minimal development footprint that avoids most of the ecological values identified in preliminary investigations. This avoidance of habitat, in combination with appropriate environmental safeguards during construction of the project (which would be set out in the project's Construction Environmental Management Plan), would ensure the development meets the requirements to avoid and minimise impacts on biodiversity values as set out in Chapter 8 of the BDAR.

All areas within the development site are regionally mapped as non-native vegetation. The proposed footprint is located entirely on cropped and grazed land that goes through a five-year cycle of cropping for three years and grazing for two years. Native vegetation identified in the development site is limited to 54 paddock trees, 15 of which contain hollows. This vegetation is identified as PCT 76 and is identified as the endangered Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt Bioregions community under the BC Act, but does not qualify as the nationally significant Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia community. 41.25 ecosystem credit class offsets are required for this vegetation.

The assessments identified that the proposed development is unlikely to significantly impact on any MNES.

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9 Figures

Figure 1. Site Map

Figure 2. Location Map

Figure 3. Native vegetation within the assessment circle

Figure 4. Hydrology within, and surrounding the development site

Figure 5. Vegetation Zones within the development site, scattered paddock trees and location of Plot surveys

Figure 6. Results of the threatened species assessments

10 Appendices

10.1 Location of Targeted Threatened Species Surveys



Location of Targeted Threatened Species Surveys

Legend

- Study Area

Habitat Corridors

Perennial Creeks

Plot/Transect Surveys
- Survey Points**

Anabat

Bird
- Camera

Reptile

Transect Surveys (Assessor)

Flora (EJ)

Flora (SS)
- Nocturnal Car (SC)

Nocturnal (SC)



10.2 Plot Data

Plot No.				1		2		3		4		5		6		7		8		9		10	
Date				29-Nov		29-Nov		29-Nov		29-Nov		29-Nov		29-Nov		29-Nov		29-Nov		29-Nov		29-Nov	
Recorders				SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC	
Name				Uncultivated South		Uncultivated South		Uncultivated South		PCT 76 South		Cultivated South		Cultivated South		Uncultivated South		Uncultivated South		Cultivated South		Cultivated South	
Zone				Reference		Reference		Reference		Reference		Reference		Reference		Reference		Reference		Reference		Reference	
Latitude				-35.011696		-35.008884		-35.007586		-35.002079		-34.9954186		-34.9960002		-34.982615		-34.979159		-34.983215		-34.977563	
Longitude				146.723708		146.723936		146.717536		146.714716		146.6991215		146.7242364		146.708373		146.720416		146.717941		146.711588	
Easting				6125625.07		6125755.55		6125936.94		6126141.86		6126079.203		6126386.569		6126689.26		6126905.73		6127423.65		6127252.6	
Northing				474791.473		474768.574		474811.356		474673.184		474227.0803		473283.3636		473968.011		472934.497		472542.763		474011.141	
Orientation				North		West		West		South		West		West		West		North		South		North-east	
IBRA Subregion				Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes	
PCT				76		N/A		N/A		76		N/A		N/A		N/A		N/A		N/A		N/A	
Eucalypts 80+				1 (6 hollows)		0		0		0		0		0		0		0		0		0	
50-79				0		0		0		1 (0 hollows)		0		0		0		0		0		0	
30-49				0		0		0		5 (0 hollows)		0		0		0		0		0		0	
20-29				0		0		0		0		0		0		0		0		0		0	
10-19				0		0		0		0		0		0		0		0		0		0	
5-9				0		0		0		0		0		0		0		0		0		0	
<5				0		0		0		0		0		0		0		0		0		0	
Non-Eucalypts 80+				0		0		0		0		0		0		0		0		0		0	
50-79				0		0		0		0		0		0		0		0		0		0	
30-49				0		0		0		0		0		0		0		0		0		0	
20-29				0		0		0		0		0		0		0		0		0		0	
10-19				0		0		0		0		0		0		0		0		0		0	
5-9				0		0		0		0		0		0		0		0		0		0	
<5				0		0		0		0		0		0		0		0		0		0	
Length of Logs				0		0		0		0		0		0		0		0		0		0	
Litter Cover				40		15		42		30		40		20		50		25		15		35	
Bare Ground Cover				10		25		18		8		20		30		3		5		50		10	
Cryptogram Cover				0		0		0		0		0		0		0		0		0		0	
Rock Cover				0		0		0		0		0		0		0		0		0		0	
Plant List				50		60		40		62		40		50		47		70		35		55	
GF Code	Status	Stratum	Species Name	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun
	E	US	<i>Anthosachne scabra</i>							0.1	5												
G	N	US	<i>Amphibromus nervosus</i>																				
	E	US	<i>Arctotheca calendula</i>																				
C	N	US	<i>Atriplex semibacatta</i>							0.2	20												
G	N	US	<i>Austrostipa aristiglumis</i>							0.1	10												
G	N	US	<i>Austrostipa elegantissima</i>							5	300												
G	N	US	<i>Austrostipa scabra</i> subsp. <i>falcata</i>							5	300												
	E	US	<i>Avena fatua</i>	2	80							1	100	1	20	5	200	2	50				
	E	US	<i>Brassica rapa</i> (or similar), canola																	99	5000		
	E	US	<i>Bromus catharticus</i>																				
	HTE	US	<i>Bromus diandrus</i>													70	2000	70	3000				
	E	US	<i>Bromus hordaceus</i>															10	500				
T	N	OS	<i>Callitris glaucophylla</i>																				
	E	US	<i>Centuarium tenuiflorum</i>																				
	E	US	<i>Cerastium vulgare</i>							0.2	5												
	E	US	<i>Chenopodium album</i>	1	50	1	30	1	20	5	200	0.1	10					0.1	10				
G	N	US	<i>Chloris truncata</i>	5	200	64	2000	60	3000	55	2000												
	E	US	<i>Cirsium vulgare</i>													1	2						
	E	US	<i>Citrullus lanatus</i>	14	500							0.5	20	0.1	10	1	50	0.5	10				
	E	US	<i>Conyza bonariensis</i>									0.1	10			2	50					1	50
	E	US	<i>Cucumis myriocarpus</i> subsp. <i>leptodermis</i>	10	500			0.2	10														
	E	US	<i>Disphania pumilio</i>																				
C	N	US	<i>Dissocarpus paradoxus</i>																				
	E	US	<i>Echium plantagineum</i>	4	100			0.5	20														

Plot No.				1		2		3		4		5		6		7		8		9		10	
GF Code	Status	Stratum	Species Name	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun
F	N	US	<i>Eclipta platyglossa</i>																				
	HTE	US	<i>Ehrharta erecta</i>	0.1	5																		
F	N	US	<i>Einadia nutans</i>							0.5	20												
	HTE	US	<i>Eragrostis curvula</i>	40	1000	5	200	1	20	1	30	0.1	20	5	200			2	50	0.1	10		
T	N	OS	<i>Eucalyptus melliodora</i>							20	6												
T	N	OS	<i>Eucalyptus microcarpa</i>	3	1																		
F	N	US	<i>Euchiton involucratus</i>																				
	E	US	<i>Euphorbia drummondii</i>	1	50											0.5	20						
	E	US	<i>Hordeum leporinum</i>	5	200					10	400					5	200	2	50				
	E	US	<i>Hordeum</i> sp. (Barley)																			96	7000
	E	US	<i>Hypochaeris radicata</i>																				
R	N	US	<i>Juncus subsecundus</i>													0.1	5						
R	N	US	<i>Juncus flavidus</i>																				
G	N	US	<i>Lachnagrostis filiformis</i>					1	20														
	E	US	<i>Lactuca serriolla</i>									1	100							0.5	50	2	100
	E	US	<i>Lepidium africanum</i>							1	30											0.1	10
	E	US	<i>Lolium perenne</i>									2	100	0.1	10	10	300	2	100	0.2	20	0.2	20
F	N	US	<i>Lythrum hyssopifolia</i>													0.1	10						
	E	US	<i>Malva parviflora</i>	1	50	1	30	1	20			1	50			1	50	1	20				
	E	US	<i>Marrubium vulgare</i>																				
	E	US	<i>Medicago polymorpha</i>																				
	E	US	<i>Medicago sativa</i>	5	200			30	1000			5	500	1	20							5	1000
	E	US	<i>Oxalis</i> sp.																				
	E	US	<i>Poa annua</i>	2	100					0.5	20												
	E	US	<i>Polycarpon tetraphyllum</i>	1	100																		
	E	US	<i>Polygonum aviculare</i>	1	100	20	500							2	100			1	100			1	50
F	N	US	<i>Pseudognaphalium luteoalbum</i>																				
F	N	US	<i>Rumex brownii</i>																				
	E	US	<i>Rumex crispus</i>									0.1	10	0.1	10					0.2	20		
G	N	US	<i>Rytidosperma caespitosum</i>							5	200												
G	N	US	<i>Rytidosperma racemosum</i>																				
G	N	US	<i>Rytidosperma setaceum</i>							5	200												
S	N	US	<i>Schoenus apogon</i>																				
C	N	US	<i>Sclerolaena muricata</i> var. <i>villosa</i>			1	5	2	20	3	30												
	E	US	<i>Senecio jacobea</i>									0.1	10										
F	N	US	<i>Sida corrugata</i>	5	200					5	200												
	E	US	<i>Solanum elagnifolium</i>																				
	E	US	<i>Sonchus asper</i>																				
	E	US	<i>Sonchus oleraceus</i>							10	400	1	100			2	100	0.5	20				
F	N	US	<i>Tribulus terrestris</i>																				
	E	US	<i>Trifolium glomeratum</i>			5	200	1	20														
	E	US	<i>Trifolium arvense</i>			2	50	2	50														
	E	US	<i>Trifolium fragiferum</i>													2	100	0.1	5				
	E	US	<i>Trifolium repens</i>																				
	E	US	<i>Trifolium subterraneum</i>																				
	E	US	<i>Triticum</i> sp. (Wheat)									90	10000	95	10000			2	50				
F	N	US	<i>Vittadinia gracilis</i>							0.1	5												
	E	US	<i>Vulpia bromoides</i>													3	100	5	300				
F	N	US	<i>Wahlenbergia gracilis</i>																				
G	N	US	<i>Walwhalleya proluta</i>																				

Plot No.				11		12		13		14		15		16		17		18		19		20	
Date				29-Nov		29-Nov		30-Nov		30-Nov		30-Nov		30-Nov		30-Nov		30-Nov		30-Nov		30-Nov	
Recorders				SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC	
Name				Cultivated South		Cultivated South		Uncultivated North		Uncultivated North		Uncultivated North		Uncultivated North		Uncultivated North		Uncultivated North		Uncultivated North		PCT80	
Zone				Reference		Reference		Zone 1		Zone 1		Zone 2		Zone 2		Zone 2		Zone 2		Zone 2		Zone 2	
Latitude				-34.974418		-34.975922		-34.9855181		-34.986788		-35.002015		-35.011696		-35.008884		-35.007586		-35.002079		-34.995419	
Longitude				146.71302		146.721971		146.7094491		146.724371		146.718083		146.723708		146.723936		146.717536		146.714716		146.699121	
Easting				6127365.77		6126889.3		6128846.026		6129159.38		6129232.46		6128930.75		6128781.99		6128946.44		6129407.15		6129792.64	
Northing				474834.855		474542.61		473382.9294		474031.878		474481.002		474776.196		474256.332		473998.499		473674.709		473500.704	
Orientation				South		South		North		North		West		East		West		North		North		South	
IBRA Subregion				Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes	
PCT				N/A		N/A		N/A		N/A		76		76		76		76		76		76	
Eucalypts 80+				0		0		0		0		0		0		0		0		0		1 (1 hollow)	
50-79				0		0		0		0		0		0		0		0		0		1 (2 hollows)	
30-49				0		0		0		0		0		0		0		0		0		0	
20-29				0		0		0		0		0		0		0		0		0		0	
10-19				0		0		0		0		0		0		0		0		0		0	
5-9				0		0		0		0		0		0		0		0		0		0	
<5				0		0		0		0		0		0		0		0		0		0	
Non-Eucalypts 80+				0		0		0		0		0		0		0		0		0		0	
50-79				0		0		0		0		0		0		0		1 (0 hollows)		0		0	
30-49				0		0		0		0		0		0		0		0		0		1 (0 hollows)	
20-29				0		0		0		0		0		0		0		0		0		0	
10-19				0		0		0		0		0		0		0		0		0		0	
5-9				0		0		0		0		0		0		0		0		0		0	
<5				0		0		0		0		0		0		0		0		0		0	
Length of Logs				0		0		0		0		0		0		0		1		0		35	
Litter Cover				15		20		18		60		60		50		45		70		40		33	
Bare Ground Cover				55		60		40		20		15		15		15		5		20		2	
Cryptogram Cover				0		0		0		0		0		0		0		0		0		0	
Rock Cover				0		0		0		0		0		0		0		0		0		0	
Plant List				30		20		42		20		25		35		40		25		40		65	
GF Code	Status	Stratum	Species Name	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun
	E	US	<i>Anthosachne scabra</i>																		5	500	
G	N	US	<i>Amphibromus nervosus</i>																		5	500	
	E	US	<i>Arctotheca calendula</i>							0.1	5												
C	N	US	<i>Atriplex semibacatta</i>																				
G	N	US	<i>Austrostipa aristiglumis</i>														1	20			1	10	
G	N	US	<i>Austrostipa elegantissima</i>																		1	10	
G	N	US	<i>Austrostipa scabra</i> subsp. <i>falcata</i>														1	20					
	E	US	<i>Avena fatua</i>	0.1	10					1	30	2	50				5	300	1	30	5	500	
	E	US	<i>Brassica rapa</i> (or similar), canola	99	3000	99	3000			0.1	5			1	10					10	500		
	E	US	<i>Bromus catharticus</i>																	1	30		
	HTE	US	<i>Bromus diandrus</i>					0.1	5											1	30		
	E	US	<i>Bromus hordaceus</i>																				
T	N	OS	<i>Callitris glaucophylla</i>														1	1			2	1	
	E	US	<i>Centuarium tenuiflorum</i>											1	30								
	E	US	<i>Cerastium vulgare</i>																				
	E	US	<i>Chenopodium album</i>																				
G	N	US	<i>Chloris truncata</i>					3	300	3	200	3	100	5	100	2	100	0.5	10	1	30	5	500
	E	US	<i>Cirsium vulgare</i>							1	10	2	10	0.5	10	3	20	2	15	0.5	10		
	E	US	<i>Citrullus lanatus</i>																	1	100		
	E	US	<i>Conyza bonariensis</i>							0.5	20			1	30								
	E	US	<i>Cucumis myriocarpus</i> subsp. <i>leptodermis</i>																				
	E	US	<i>Disphania pumilio</i>																				
C	N	US	<i>Dissocarpus paradoxus</i>																			0.5	20
	E	US	<i>Echium plantagineum</i>															1	5	0.5	5		
F	N	US	<i>Eclipta platyglossa</i>					0.2	10					0.2	5								
	HTE	US	<i>Ehrharta erecta</i>																				

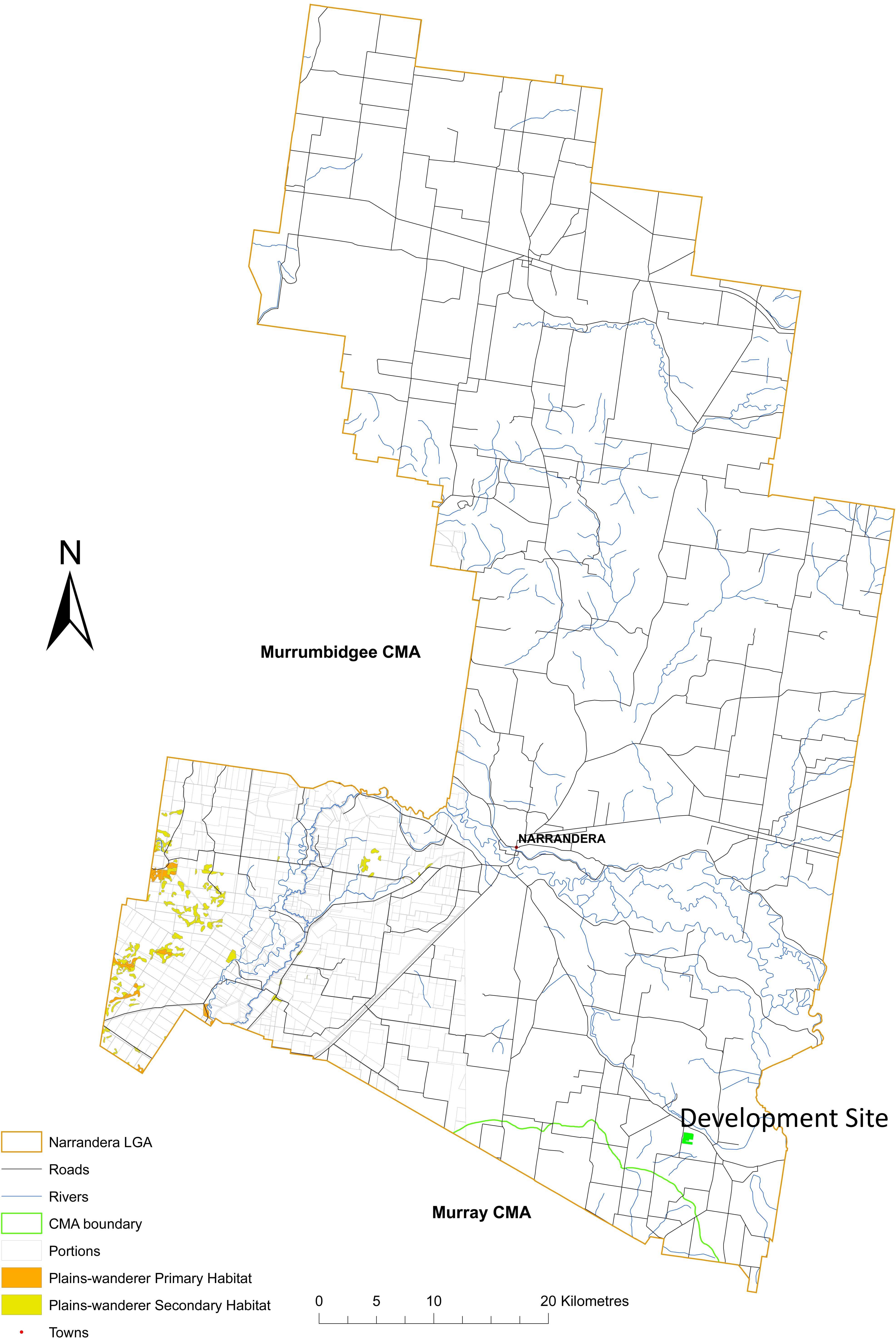
			Plot No. 11		12		13		14		15		16		17		18		19		20		
GF Code	Status	Stratum	Species Name	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun		
F	N	US	<i>Einadia nutans</i>																				
	HTE	US	<i>Eragrostis curvula</i>	0.1	10			2	200					2	50	2	300	5	200	8	300	2	200
T	N	OS	<i>Eucalyptus melliodora</i>																				
T	N	OS	<i>Eucalyptus microcarpa</i>																		2	2	
F	N	US	<i>Euchiton involucratus</i>																				
	E	US	<i>Euphorbia drummondii</i>																0.5	5	0.1	20	
	E	US	<i>Hordeum leporinum</i>					3	300	5	300	2	50	2	50			0.2	10	10	500	2	100
	E	US	<i>Hordeum</i> sp. (Barley)																				
	E	US	<i>Hypochaeris radicata</i>							1	30	1	20			1	200						
R	N	US	<i>Juncus subsecundus</i>																		1	50	
R	N	US	<i>Juncus flavidus</i>																		1	50	
G	N	US	<i>Lachnagrostis filiformis</i>	0.1	10			2	200							0.5	10			1	200		
	E	US	<i>Lactuca serriolla</i>							1	40	2	100			5	500	3	200				
	E	US	<i>Lepidium africanum</i>															0.5	5				
	E	US	<i>Lolium perenne</i>	0.1	10			86	10000	85	5000	80	5000	77	5000	78	5000	80	5000	66	5000	30	5000
F	N	US	<i>Lythrum hyssopifolia</i>					0.5	40	0.2	20	0.1	5					0.5	10	0.5	4		
	E	US	<i>Malva parviflora</i>			1	30			0.1	5					0.5	50	1	20				
	E	US	<i>Marrubium vulgare</i>					0.1	5														
	E	US	<i>Medicago polymorpha</i>							0.1	5												
	E	US	<i>Medicago sativa</i>					1	100	2	100	5	200	1	30	3	300						
	E	US	<i>Oxalis</i> sp.											0.1	5	0.1	10						
	E	US	<i>Poa annua</i>																				
	E	US	<i>Polycarpon tetraphyllum</i>																				
	E	US	<i>Polygonum aviculare</i>					1	50					0.5	20	0.1	10	1	30				
F	N	US	<i>Pseudognaphalium luteoalbum</i>																	1	30		
F	N	US	<i>Rumex brownii</i>																				
	E	US	<i>Rumex crispus</i>			0.1	5																
G	N	US	<i>Rytidosperma caespitosum</i>																			25	4000
G	N	US	<i>Rytidosperma racemosum</i>																				
G	N	US	<i>Rytidosperma setaceum</i>																			20	3000
S	N	US	<i>Schoenus apogon</i>																			1	20
C	N	US	<i>Sclerolaena muricata</i> var. <i>villosa</i>									1	3									1	20
	E	US	<i>Senecio jacobea</i>																				
F	N	US	<i>Sida corrugata</i>					0.1	5			0.2	10									1	30
	E	US	<i>Solanum elagnifolium</i>																				
	E	US	<i>Sonchus asper</i>							0.1	5	0.1	5										
	E	US	<i>Sonchus oleraceus</i>					1	100	1	100	3	100	2	50	5	500	3	200	2	200	1	20
F	N	US	<i>Tribulus terrestris</i>									0.2	5										
	E	US	<i>Trifolim glomeratum</i>																				
	E	US	<i>Trifolium arvense</i>											2	50					5	300		
	E	US	<i>Trifolium fragiferum</i>																				
	E	US	<i>Trifolium repens</i>					0.5	40														
	E	US	<i>Trifolium subterraneum</i>																				
	E	US	<i>Triticum</i> sp. (Wheat)																				
F	N	US	<i>Vittadinia gracilis</i>																				
	E	US	<i>Vulpia bromoides</i>											5	500							5	500
F	N	US	<i>Wahlenbergia gracilis</i>																	0.1	2		
G	N	US	<i>Walwhalleya proluta</i>																			5	500

Plot No.				21		22		23		24		25		26		27		28		29		30	
Date				30-Nov		30-Nov		30-Nov		30-Nov		30-Nov		30-Nov		30-Nov		30-Nov		30-Nov		30-Nov	
Recorders				SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC		SS & SC	
Name Zone				Cultivated North Zone 2		Cultivated North Zone 1		Cultivated North Zone 1		Cultivated North Zone 1		Cultivated North Zone 1		Cultivated North Zone 1		Cultivated North Zone 1		Kywong-Faithfull Rd road reserve Reference		Cultivated south Reference		PCT 80 South Reference	
Latitude				-34.996		-34.982615		-34.979159		-34.983215		-34.977563		-34.974418		-34.975922		-34.985518		-34.986788		-35.002015	
Longitude				146.724236		146.708373		146.720416		146.717941		146.711588		146.71302		146.721971		146.709449		146.724371		146.718083	
Easting				6129756.29		6129541.01		6129591.76		6128441.1		6128524.37		6128257.94		6128387.4		6127593.18		6126697.14		6126610.89	
Northing				473804.401		474187.338		474621.888		474008.274		473482.037		474335.666		474844.284		473829.27		474275.175		474639.372	
Orientation				North-east		North		West		West		West		East		East		East		South		East	
IBRA Subregion				Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes		Lower Slopes	
PCT				76		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Eucalypts 80+				0		0		0		0		0		0		0		1 (1 hollow)		0		0	
50-79				0		0		0		0		0		0		0		0		0		0	
30-49				0		0		0		0		0		0		0		0		0		0	
20-29				0		0		0		0		0		0		0		0		0		0	
10-19				0		0		0		0		0		0		0		0		0		0	
5-9				0		0		0		0		0		0		0		0		0		0	
<5				0		0		0		0		0		0		0		0		0		0	
Non-Eucalypts 80+				0		0		0		0		0		0		0		0		0		0	
50-79				0		0		0		0		0		0		0		0		0		0	
30-49				0		0		0		0		0		0		0		0		0		2 (0 hollows)	
20-29				0		0		0		0		0		0		0		0		0		0	
10-19				0		0		0		0		0		0		0		0		0		0	
5-9				0		0		0		0		0		0		0		0		0		0	
<5				0		0		0		0		0		0		0		0		0		0	
Length of Logs				0		0		0		0		0		0		0		0		0		26	
Litter Cover				30		20		25		15		25		10		8		50		8		35	
Bare Ground Cover				45		70		65		15		15		70		70		0		75		2	
Cryptogram Cover				0		0		0		0		0		0		0		0		0		0	
Rock Cover				0		0		0		0		0		0		0		0		0		0	
Plant List				25		10		10		70		60		20		22		50		17		63	
GF Code	Status	Stratum	Species Name	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun
	E	US	<i>Anthosachne scabra</i>																			1	50
G	N	US	<i>Amphibromus nervosus</i>														1	100				2	200
	E	US	<i>Arctotheca calendula</i>																				
C	N	US	<i>Atriplex semibacatta</i>														1	50					
G	N	US	<i>Austrostipa aristiglumis</i>														5	500				0.5	10
G	N	US	<i>Austrostipa elegantissima</i>														5	500				0.5	10
G	N	US	<i>Austrostipa scabra</i> subsp. <i>falcata</i>														5	500				0.5	10
	E	US	<i>Avena fatua</i>							0.1	30						60	3000					
	E	US	<i>Brassica rapa</i> (or similar), canola	99	5000	100	5000	99	5000											98	5000		
	E	US	<i>Bromus catharticus</i>																				
	HTE	US	<i>Bromus diandrus</i>														2	200					
	E	US	<i>Bromus hordaceus</i>																				
T	N	OS	<i>Callitris glaucophylla</i>																			2	2
	E	US	<i>Centuarium tenuiflorum</i>														0.2	10					
	E	US	<i>Cerastium vulgare</i>																				
	E	US	<i>Chenopodium album</i>													0.5	20	1	50			1	50
G	N	US	<i>Chloris truncata</i>														5	500				5	500
	E	US	<i>Cirsium vulgare</i>													0.3	10	1	50				
	E	US	<i>Citrullus lanatus</i>																				
	E	US	<i>Conyza bonariensis</i>															0.2	20				
	E	US	<i>Cucumis myriocarpus</i> subsp. <i>leptodermis</i>													0.3	10					0.5	10
	E	US	<i>Disphania pumilio</i>															0.2	10				
C	N	US	<i>Dissocarpus paradoxus</i>																			0.1	5
	E	US	<i>Echium plantagineum</i>																				
F	N	US	<i>Eclipta platyglossa</i>															0.2	10			0.1	5
	HTE	US	<i>Ehrharta erecta</i>															1	50				

GF Code	Status	Stratum	Species Name	Plot No.	21		22		23		24		25		26		27		28		29		30	
					Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun	Cover	Abun
F	N	US	<i>Einadia nutans</i>																0.2	10				
	HTE	US	<i>Eragrostis curvula</i>		1	5									1	300	2	300	5	500	1	50	3	300
T	N	OS	<i>Eucalyptus melliodora</i>																					
T	N	OS	<i>Eucalyptus microcarpa</i>																1	1				
F	N	US	<i>Euchiton involucratus</i>																0.1	10				
	E	US	<i>Euphorbia drummondii</i>																0.2	20				
	E	US	<i>Hordeum leporinum</i>																1	50			22	2000
	E	US	<i>Hordeum</i> sp. (Barley)								89	5000	89	5000										
	E	US	<i>Hypochaeris radicata</i>																					
R	N	US	<i>Juncus subsecundus</i>																					
R	N	US	<i>Juncus flavidus</i>																				1	50
G	N	US	<i>Lachnagrostis filiformis</i>																					
	E	US	<i>Lactuca serriolla</i>								0.1	30	0.5	30	1	300	2	200	2	100				
	E	US	<i>Lepidium africanum</i>																0.2	10				
	E	US	<i>Lolium perenne</i>						1	10	10	1000	10	500					10	1000	1	40	30	3000
F	N	US	<i>Lythrum hyssopifolia</i>																					
	E	US	<i>Malva parviflora</i>																				1	50
	E	US	<i>Marrubium vulgare</i>																0.5	20			0.5	10
	E	US	<i>Medicago polymorpha</i>																					
	E	US	<i>Medicago sativa</i>								0.5	50	1	100										
	E	US	<i>Oxalis</i> sp.																					
	E	US	<i>Poa annua</i>																					
	E	US	<i>Polycarpon tetraphyllum</i>																					
	E	US	<i>Polygonum aviculare</i>						1	5	0.5	50	0.5	20							0.5	20	0.5	10
	F	N	<i>Pseudognaphalium luteoalbum</i>																					
F	N	US	<i>Rumex brownii</i>																0.2	10				
	E	US	<i>Rumex crispus</i>																0.5	20				
G	N	US	<i>Rytidosperma caespitosum</i>																0.5	20			15	1000
G	N	US	<i>Rytidosperma racemosum</i>																				2	100
G	N	US	<i>Rytidosperma setaceum</i>																1	50			15	1000
S	N	US	<i>Schoenus apogon</i>																				0.1	10
C	N	US	<i>Sclerolaena muricata</i> var. <i>villosa</i>																0.5	10				
	E	US	<i>Senecio jacobea</i>																					
F	N	US	<i>Sida corrugata</i>																1	50			1	50
	E	US	<i>Solanum elagnifolium</i>																				2	100
	E	US	<i>Sonchus asper</i>																					
	E	US	<i>Sonchus oleraceus</i>																0.5	30			0.2	10
F	N	US	<i>Tribulus terrestris</i>																				0.1	10
	E	US	<i>Trifolium glomeratum</i>																					
	E	US	<i>Trifolium arvense</i>																					
	E	US	<i>Trifolium fragiferum</i>																					
	E	US	<i>Trifolium repens</i>																					
	E	US	<i>Trifolium subterraneum</i>																					
	E	US	<i>Triticum</i> sp. (Wheat)												98	5000	95	5000						
F	N	US	<i>Vittadinia gracilis</i>																					
	E	US	<i>Vulpia bromoides</i>																					
F	N	US	<i>Wahlenbergia gracilis</i>																					
G	N	US	<i>Walwhalleya proluta</i>																1	50			1	50

10.3 Plains-Wanderer Important Habitat Map

Plains-wanderer habitat in Narrandera LGA



10.4 Protected Matters Search Tool



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: 04/12/17 14:29:53

[Summary](#)

[Details](#)

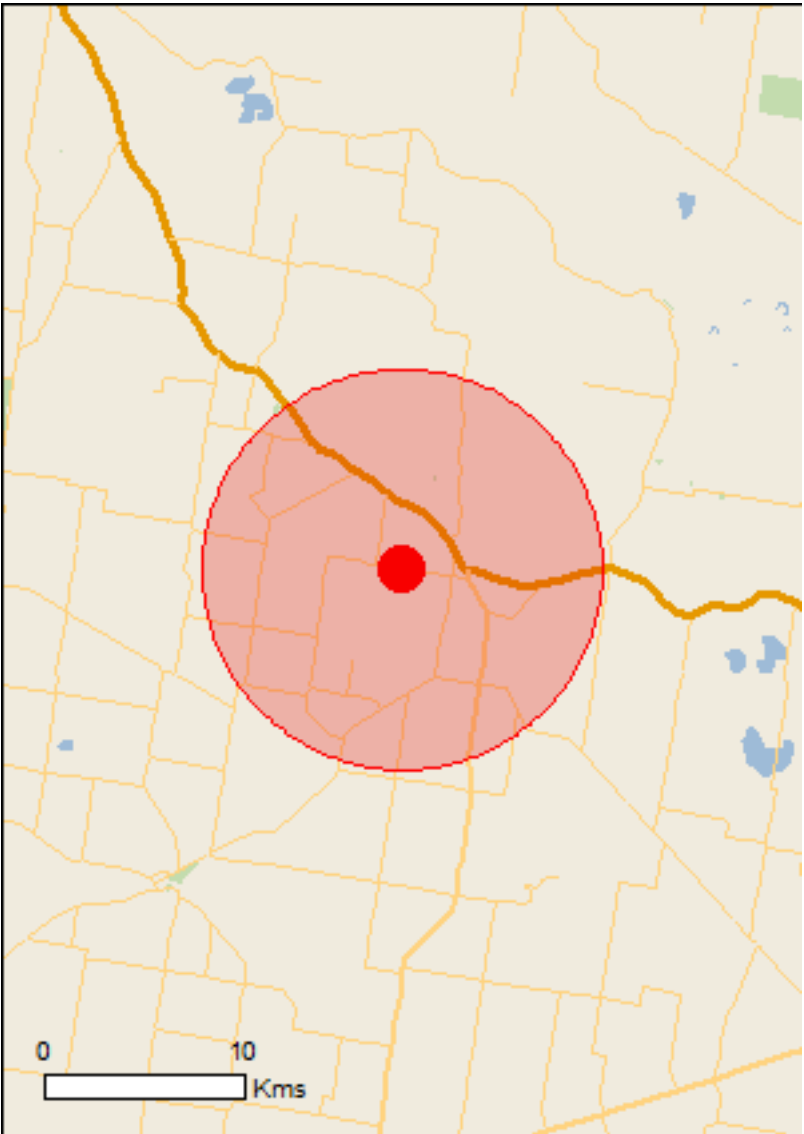
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

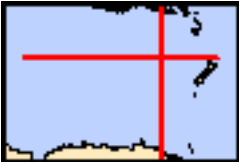
[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	21
Listed Migratory Species:	10

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:	16
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:	24
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)		[Resource Information]
Name	Proximity	
Banrock station wetland complex	500 - 600km upstream	
Hattah-kulkyne lakes	300 - 400km upstream	
Riverland	500 - 600km upstream	
The coorong, and lakes alexandrina and albert wetland	600 - 700km upstream	

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

Name	Status	Type of Presence
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Natural Grasslands of the Murray Valley Plains	Critically Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species	[Resource Information]
---------------------------	--------------------------

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat may occur within area
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
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species

Name	Status	Type of Presence
Polytelis swainsonii Superb Parrot [738]	Vulnerable	habitat likely to occur within area Foraging, feeding or related behaviour likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Fish		
Galaxias rostratus Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Frogs		
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
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 may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Austrostipa wakoolica [66623]	Endangered	Species or species habitat known to occur within area
Brachyscome muelleroides Mueller Daisy [15572]	Vulnerable	Species or species habitat likely to occur within area
Swainsona murrayana Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within

Name	Threatened	Type of Presence
Motacilla flava Yellow Wagtail [644]		area Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land	[Resource Information]
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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]
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* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
------	------------	------------------

Birds

Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
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
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may 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
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Invasive Species

[[Resource Information](#)]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		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		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur

Name	Status	Type of Presence
Nassella trichotoma		within area
Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Prosopis spp.		
Mesquite, Algaroba [68407]		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
Tamarix aphylla		
Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-34.99423 146.71734

Acknowledgements

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

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

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

Please feel free to provide feedback via the [Contact Us](#) page.

11 Attachment 1. Preliminary Biodiversity Report