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Biodiversity Development Assessment Report, Wyalong Solar Farm, NSW



Final Report

Prepared for:

ESCO Pacific

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A canola paddock within the development site.

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1 Introduction

1.1 Project Overview

The proposed Wyalong Solar Farm project is a utility-scale renewable energy development located approximately 7 kms north-east of West Wyalong, New South Wales. The solar farm will generate up to approximately 130 MW of electricity, within a 256 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. Wyalong 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	Wyalong Solar Farm
Address	1409 Newell Highway, Wyalong, New South Wales, 2671
Applicant	ESCO Pacific Pty Ltd (ESCO Pacific)
Council	Bland Shire Council
Titles	Lot 160/750615 (approximately 260ha)
Total indicative area	Secured land required for solar energy generation: up to 256 ha
Land use	Cropping
Capacity	Up to approximately 130 MW
Connection	TransGrid 132-66kV Transmission line, Temora-Lake Cowal

1.2 Site Description

The development site is surrounded by private freehold property (Figure 2). The Newell Highway passes to the south of the development site—this highway will provide access to the proposed solar farm. An un-named and undeveloped road reserve corridor, that is an extension of Spauls Lane, passes across the northern boundary of the study area.

The development site is divided into three paddocks. Each of these paddocks, at the time of the assessment, was growing either Barley *Hordeum* spp. (southern paddock) or Canola *Brassica napus* (northern two paddocks). The current land manager has rotated these crops, with other nitrogen fixing species, for the last eight years, and been managed in a similar way under previous land managers (K. Tulloch, Landowner, Pers. Comm. 14 Jun 2018). In years when cropping does not occur the paddocks are grazed by cattle (K. Tulloch, Landowner, Pers. Comm. 14 Jun 2018).

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 in the south of the development site and in the road reserves that adjoin the development site. Within the southern part of 1409 Newell Highway, this vegetation is associated with an historic school site, and consists of an overstorey of Western Grey Box *Eucalyptus microcarpa*, White Cypress Pine *Callitris glaucophylla*, and Bulloak *Allocasuarina luehmannii* (in descending order of dominance), over a grazed, but predominantly native understorey. Dominant species within the understorey included the native Rough Spear-grass *Austrostipa scabra* subsp. *falcata*, Common Wheat Grass *Elymus scaber* and Smallflower Wallaby Grass *Rytidosperma setaceum* as well as exotic species including crop species from the nearby paddocks as well as Perennial Rye-grass *Lolium perenne* and Onion Grass *Romulea rosea*. The mid-storey is largely absent, and recruitment is limited or excluded by regular grazing, and ongoing soil disturbances from cultivation and cropping. Interspersed among these native trees are planted Pepper Trees *Schoenus mollis*. Elsewhere, within the development site, there is a line of planted Red Ironbark *Eucalyptus sideroxylon* trees on the fenceline between the southern, and middle paddocks, and planted Pine *Pinus radiata* trees planted along the western fenceline on the northern paddock.

There are three dams within the development site (Figure 1). These dams generally appeared to have been lined with clay and were devoid of fringing or aquatic vegetation (Plates 1-3). There are no creeks or drains within the development site and no natural wetlands or swamps were observed during the current assessment.

The land-use within the development site is similar to that surrounding it: 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 east 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. Northern dam, lacking fringing and aquatic vegetation.



Plate 1-2. Central dam, lacking fringing and aquatic vegetation.



Plate 1-3. Southern dam, lacking fringing and aquatic vegetation. Newell Highway road reserve vegetation is in the background.

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 18 September 2018 by the Department of Planning and Environment (Application number: SSD 9564) and Local Land Services via email on 24 September 2018.

The SEARs require that an assessment of the likely biodiversity impacts of the development be conducted, having regard to section 7.9 of the *Biodiversity Conservation Act 2016* (NSW), as well as the Biodiversity Assessment Method (NSW Office of Environment and Heritage 2017b).

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.

The SEARs also include an assessment of the likely impacts of the proposal to listed aquatic threatened species, populations or ecological communities, scheduled under the *Fisheries Management Act 1994* (NSW), and measures to minimise and rehabilitate any identified impacts.

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:

- Biodiversity Assessment Method (NSW Office of Environment and Heritage 2017b);
- Threatened Species Assessment Guidelines - Assessment of Significance (Department of Environment and Climate Change 2007);
- Biosecurity Act 2015 (NSW);
- Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull and Witheridge 2003);
- Policy and Guidelines for Fish Habitat Conservation and Management (NSW Department of Primary Industries 2013); and,
- Fisheries Management Act 1994 (NSW).

Other policies and plans relevant to this biodiversity assessment include:

- State Environmental Planning Policy No. 44 – Koala Habitat Protection; and,
- Bland Local Environmental Plan 2011.

The response from Local Land Services recommends the following in relation to avoidance of native vegetation within the development site:

- Utilise existing property access points where possible to avoid impact to higher quality roadside vegetation;
- Undertake assessment of habitat value of scattered paddock trees including presence of hollows/nests; and,
- Retain native vegetation in the small area around the historic school site, if possible, due to the higher density of paddock trees and proximity to higher value roadside vegetation in this area.

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;
 - Central West/Lachlan Regional Native Vegetation PCT Map Version 1.0. VIS_ID 4468;
- NSW Land and Property Information:
 - Bland 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 central point located at (-33.88911° 147.30796°) 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 on 13 June 2018 (Ecolink Consulting Pty Ltd 2018; see Attachment 1) and more detailed site assessments (that identified the extent and quality of potential habitat for any MNES) was undertaken between 16 and 19 September 2018. 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 were undertaken in June 2018 (Ecolink Consulting Pty Ltd 2018). These assessments provided the applicant with a broad overview of ecological constraints of 1409 Newell Highway, Wyalong (Lot 160/750615) (the wider development site). As a result of these assessments, the applicant has refined its proposed development site 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 impacts to biodiversity and in line with the purpose of the Biodiversity Offsets Scheme

The current surveys assessed the 256 ha maximum project footprint (the development site), as well as other parts of the wider development site. The Newell Highway road reserve, that will provide access to the proposed solar farm, was also assessed, to the east and west of the proposed solar farm entrance.

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 MNES 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 2018a) and the BioNet Atlas (NSW Office of Environment and Heritage 2018b).

2.3 Site Assessment

A site assessment was undertaken between 16 and 19 September 2018, 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-settlement 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 Patches of Native Vegetation

Native vegetation was identified within the Newell Highway road reserve and the former school site in the south-west of the wider development site. Plots surveys were undertaken in these locations, although most of this vegetation will not be impacted by the proposed development. The remainder of the development site is dominated by crops.

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 this vegetation.

2.3.2 Plot Surveys

A total of four Plots were assessed during the site assessment to confirm PCTs in the wider development site. Data collected from one of these Plots (as shown in Figure 5), at the location of the crossover point to the development from the Newell Highway, was used in accordance with the data requirements of the BAM Credit Calculator to assess site values within this part of the development site. The remaining three 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 of potential Impact	Minimum Plots Required	Plots Completed
Zone 1 – Paddock tree area	256	0	0
Zone 2 – Road reserve impacts for site access	0.156	1	1
Total	256.156	1	1
Reference Plots	0	0	3

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 only used to assess the site values of land within the road reserve, where the proposed entrance to the solar farm will be located and was not used for parts of the development site that are used for crops and grazing.

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 BC 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 2017b; p. 76).

Under part C of the definition described above, the trees within the development site meet the definition under the BAM to qualify as paddock trees. On this basis, a streamlined paddock tree assessment based, on Appendix 1 of BAM is provided within this BDAR for this vegetation.

2.3.4 Threatened species surveys

All threatened species surveys were undertaken between 16 and 19 September 2018. 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 1,500 m of the development site (where access was granted).

Table 2.2. Weather conditions encountered during nocturnal threatened species surveys in September 2018 (Bureau of Meteorology 2018).

Date	16 Sep	17 Sep	18 Sep	19 Sep
Daytime Maximum (°C)	15	19	24.8	18.2
Overnight Minimum (°C)	2.2	-1.4	0.4	10.5
3pm Relative Humidity (%)	25	19	9	20
Wind Speed (km/h)	43	24	43	48
Wind Direction	SW	N	N	WSW

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 on 18 September 2018 within the road reserve of the Newell Highway, in the location of the proposed development entrance. ‘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.

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 16 to 18 September 2018 by two ecologists. 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*;
- Squirrel Glider *Petaurus norfolcensis*;
- Koala *Phascolarctos cinereus*; and
- Grey-headed Flying-fox *Pteropus poliocephalus*.

Bird Surveys

Area searches for birds were undertaken at dawn and dusk from dusk on 16 September to dawn on 19 September 2018, with all observed birds (seen or heard) recorded. These surveys were not formalised, replicable surveys because of the lack of high quality habitat and the low numbers and diversity of birds within the development site. Incidental observations of all birds recorded during the preliminary and detailed assessments were also kept.

‘Candidate’ threatened species targeted with these surveys included:

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

Tree Surveys

Tree surveys were undertaken both diurnally and nocturnally to detect the presence of different species. Diurnal surveys were undertaken on 17 and 18 September 2018 while recording the characteristics of Paddock Trees. Nocturnal tree surveys were undertaken in conjunction with nocturnal transect surveys from 16 to 18 September 2018.

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 to diurnal tree surveys, however a spotlight is used to aid observations of nocturnal birds and mammals. The nocturnal surveys also included call playback 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 two 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 in the Newell Highway road reserve, adjacent to 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.

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).

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 (1,952 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 2017b), 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 in area, with 8,070,608 ha (or 93%) of it within NSW (NSW Office of Environment and Heritage 2017o).

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 2017o).

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

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 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 polyanthemos</i> in the north, limited areas of Bull Mallee <i>Eucalyptus behriana</i> , Blue Mallee <i>Eucalyptus</i>

	<i>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 <i>Eucalyptus camaldulensis</i> 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

Two Mitchell Landscapes occur within the 1.5 km assessment circle: the Bimbi Plains and the Manitoba Hills and Footslopes (Figure 2). The development site straddles these two 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
Bimbi Plains (BIM)	Quaternary alluvial plains from bedrock hills and ridges of the Gobondery/Gillenbine and the Belmont/Brooklyn land systems. General elevation 200 to 250 m, local relief 30 m. Gravelly clay loams and red brown clays, red-brown texture-contrast soils on higher slopes grading to red-brown gradational and uniform profiles of clay loams and clays along creeks. Grey Box and White Cypress Pine originally dominant, sparse Bimble Box (<i>Eucalyptus populnea</i>) along creek lines. Mostly cleared and cultivated.	10.1	20.7	94
Manitoba Hills and Footslopes (Man)	Low ridges with outcrops and tors of granite with narrow, incised drainage contributing to major creeks. General elevation 200 to 310 m, local relief to 30 m. Calcareous and neutral red earths with hills of shallow loamy and sandy lithosols with abundant surface grit grading into red earths down slope. Moderate to open Dwyer's Gum, Tumbledown Gum (<i>Eucalyptus dealbata</i>), White Cypress Pine, Red Box, Kurrajongs, Bimble Box, scattered Western Golden Wattle (<i>Acacia decora</i>), Variable Spear-grass (<i>Austrostipa</i> spp.), and Wire Grass (<i>Aristida</i> spp). River	89.9	79.3	93

Mitchell Landscape	Description	Percent of development site	Percent of assessment circle	Percent cleared within CMA
	Red-gum and Bimble Box along major creeks. Also Mallee (<i>Eucalyptus</i> spp.), Sugarwood (<i>Myoporum platycarpum</i>), Grey Box, Yarran (<i>Acacia homalophylla</i>), Dean's Wattle (<i>Acacia deanei</i>), grasses and forbs.			

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 CentWestLachSVM_v1p4_PCT_E_4468 shapefile and site assessments (within the development site).

Regional mapping identifies 198.67 ha of native vegetation within the 1,952.62 ha assessment circle (10.17%: 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. Seven 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 - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion (PCT 9)	0.47	0.02
Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion (PCT 45)	1.99	0.10
Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (PCT 76)	151.2	7.74
Western Grey Box - White Cypress Pine tall woodland on loam soil	5.86	0.30

Vegetation communities in the assessment circle	Sum of area (ha)	% of cover in assessment circle
on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (PCT 80)		
Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion (PCT 217)	3.12	0.16
River Red Gum swampy woodland wetland on cowals (lakes) and associated flood channels in central NSW (PCT 249)	5.79	0.30
Derived tussock grassland of the central western plains and lower slopes of NSW (PCT 250)	30.24	1.55
Total	198.67	10.17
Not Native (from regional mapping)	1,753.94	89.83%
Grand Total	1,952.62	100%

3.3 Rivers and streams

There are no rivers or streams within the development site and no perennial waterways within the 1.5 km assessment circle (Figure 4).

Gagies Creek is an ephemeral creek that is located approximately 1 km west of the study area that was dry at the time of the current assessment. None of the mapped tributaries to this creek cross the study area (based on Bland Shire cartographical information), and many are no longer discernible due to changes to the land form as a result of agricultural development of the landscape.

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 – 400-500 kms upstream;
- Banrock Station Wetland Complex – 600-700 kms upstream;
- Riverland – 500-600 kms upstream; and,
- The Coorong and Lakes Alexandrina and Albert Wetland – 700-800 kms 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 the Newell Highway provides significant connectivity to higher quality native vegetation at Back Creek, Boxalls and Wyrra State Forests (extending east and north from approximately 4 kms east of the development site). Similarly, vegetation within the road reserve of Spauls Lane provides corridor habitat to higher quality vegetation to the north-west of the study area (South West Woodland Nature Reserve, approximately 7 kms north-west of the development site).

Native vegetation in the remaining landscape is limited, with a highly fragmented and intensively altered landscape between the development site and these State Forests. Scattered paddock trees provide stepping stones between these locations, that will be exploited by some, highly mobile species (such as medium to large birds), however, with the exception of road reserve vegetation, corridors to facilitate the movement of other species are limited in number, patchy and have gaps between them.

Two threatened fauna species have been identified within the development site Grey-crowned Babbler *Pomatostomus temporalis temporalis* and White-fronted Chat *Epthianura albifrons*. Both of these species may use the remnant vegetation to facilitate movement within the landscape for feeding or juvenile dispersal. A 15 metre wide access point is proposed to be installed in this vegetation, in an area that has already faced significant disturbance (the installation and maintenance of the powerline), therefore proposed development is unlikely to impose a new and significant impact on species' ability to navigate the already highly modified 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, interspersed with seasons of grazing, with native vegetation substantially modified through past disturbances. The proposed development has deliberately avoided impacts to areas that retain patches of higher quality native vegetation. Within the wider development site, native vegetation occurs as a small isolated patch of woodland where a school was once situated. Additional patches of native trees and remnant vegetation occur within the road reserves adjacent to the development site. Most of these areas have been avoided and road crossovers have been situated in areas where the native vegetation quality is at its lowest—where trees have been removed for the installation and maintenance of the powerline that crosses the development site.

4.2 Plant Community Types

Native vegetation within the wider development site is limited to a small patch of remnant vegetation in the south-west of the wider development site, and the Newell Highway road reserve. This vegetation is modelled as PCT 76 - Western Grey Box tall grassy woodland (Central West / Lachlan Regional Native Vegetation PCT Map Version 1.0. VIS_ID 4468). The current assessment confirmed that this vegetation possesses the floristic composition, soil profile and landform to be classified as PCT 76 (Table 4.1).

Table 4.1. OEH Description of PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.

PCT	Formation	Class	Description	Current Extent	Area and Percent Impacted
76	Grassy Woodlands	Floodplain Transition Woodlands	<p><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.</p> <p><u>Landform patterns:</u> Floodplain, alluvial plain.</p> <p><u>Landform elements:</u> Levee, valley flat, plain.</p> <p>Substrate mass: Alluvium.</p> <p><u>Lithology:</u> Shale, alluvial loams and clays.</p> <p><u>Great soil group:</u> Grey clay, red-brown earth, red clay.</p> <p><u>Soil texture:</u> Clay loam, clay loam-sandy, loam.</p>	40,000 ha	0.16 ha (0.000004%)

PCT	Formation	Class	Description	Current Extent	Area and Percent Impacted
			<u>Upper stratum:</u> Western Grey Box, White Cypress Pine, Bulloak. <u>Ground stratum:</u> Sprawling Bluebell <i>Wahlenbergia gracilis</i> , Corrugated Sida <i>Sida corrugata</i> , Rough Spear-grass, Plains Grass <i>Austrostipa aristiglumis</i> , Windmill Grass <i>Chloris truncata</i> .		

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.

In the location of the proposed impact to this vegetation, within the Newell Highway road reserve, the vegetation has been previously cleared to enable the installation and maintenance of the powerline across the study area. There is gap in the overstorey of this patch, approximately 70 m in width. An area of 15 m, within this disturbed area, is proposed to be used for the entrance to the solar farm.

When this area is 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.

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 cycle of cropping and grazing (Zone 1). Access to the development site will be via a 15 m wide entrance through the Newell Highway road reserve, in an area where the

vegetation has been previously cleared to enable the installation and maintenance of the powerline (Zone 2).

Table 4.2. Vegetation zones within the development site

Zone	Name	Total Area (ha)	Patch Size Area
1	Paddock tree area	256	>100ha
2	Road reserve	0.156	<5ha
Total		256.156	

4.4.1 Zone 1 – Cleared Land

Zone 1 included crops of Barley and Canola at the time of the current assessment, within three fenced paddocks in the north (Canola), middle (Canola) and south (Barley) of the development (Figure 5).

The crops were close to harvest at the time of the assessment, however a dry and cold winter resulted in relatively poor yields (Front cover and Plate 4.1). Dominant species within these paddocks were the crops that were planted in them: Barley and Canola.

Zone 1 also comprised 45 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). Hollows were recorded in 13 of these trees, and stick nests were recorded in eight trees (six unidentified Corvid/Magpie, one active Australasian Raven *Corvus coronoides*, and one active Australian Magpie *Gymnorhina tibicen*, stick nests: Table 4.3).



Plate 4-1. Barley crop within the study area



Plate 4-2. Scattered paddock trees in a cultivated landscape

Table 4.3. Inventory of paddock trees proposed to be impacted

No.	Species	DBH (cm) *	Foliage area (m ²)	% foliage cover	Hollows	Nests	Easting	Northing	Assessment class
1	Grey Box	71	36	80	N	N	6251046	527989.1	3
2	Grey Box	141	64	80	N	N	6250975	528213.8	3
3	Grey Box	28	9	80	N	N	6250974	528251.9	2
4	Grey Box	180	72	70	N	Unidentified Corvid/Magpie	6251077	528239.9	3
5	Grey Box	175	56	90	Y	Unidentified Corvid /Magpie	6251125	528152.4	3
6	Grey Box	83	25	80	N	Active Australasian Raven nest	6251090	528084.1	3
7	Grey Box	127	66	60	N	N	6250891	528207.8	3
8	Grey Box	115	63	85	Y	N	6251101	528610.4	3
9	Grey Box	36	36	80	N	N	6250961	528582.9	2
10	Grey Box	101	42	60	N	N	6251045	528830.6	3
11	Grey Box	90	56	85	N	Unidentified Corvid /Magpie	6251044	528815.4	3
12	Grey Box	153	80	70	N	N	6250755	528245	3
13	Grey Box	128	40	90	N	N	6250796	528341.1	3
14	Dead	67	0	0	Y	N	6250627	528639.8	3
15	Grey Box	76	9	90	N	N	6250692	528640	3
16	<i>Acacia salicina</i>	74	25	30	N	N	6250821	528645.3	3
17	Black Cypress Pine	72	4	80	N	N	6250862	528995.1	3
18	Grey Box	98	28	85	N	Unidentified Corvid /Magpie	6250884	528884.3	3
19	White Cypress Pine	73	30	70	N	N	6250868	528849.8	3
20	Black Cypress Pine	55	9	90	N	N	6250935	529175	3
21	Grey Box	92	20	75	Y	N	6251402	529105.1	3
22	Grey Box	133	28	70	Y	Unidentified Corvid /Magpie	6251180	528973.9	3
23	Yellow Gum	29	20	80	N	N	6250425	528373.3	2
24	Yellow Gum	29	25	70	N	N	6250432	528355.6	2
25	Grey Box	100	40	20	Y	N	6250439	528596.1	3
26	Dead	86	0	0	Y	N	6250283	528651.1	3
27	Dead	84	0	0	Y	N	6250203	528906.9	3
28	Grey Box	80	28	70	Y	Unidentified Corvid /Magpie	6250414	528812.7	3
29	Grey Box	86	28	40	Y	N	6250612	528789.9	3
30	White Cypress Pine	94	12	80	N	N	6250661	528819.6	3
31	Buloke	56	16	30	N	N	6250840	529406.2	3
32	Black Cypress Pine	86	36	60	N	Active Australian Magpie nest	6250645	529618.6	3
33	Grey Box	102	56	45	Y	N	6250601	529630.7	3
34	Black Cypress Pine	56	12	95	N	N	6249878	528996.9	3

No.	Species	DBH (cm) *	Foliage area (m ²)	% foliage cover	Hollows	Nests	Easting	Northing	Assessment class
35	Black Cypress Pine	60	16	90	N	N	6249415	529042.1	3
36	Grey Box	79	40	60	N	N	6249465	529268.6	3
37	Grey Box	70	36	80	Y	N	6249467	529266.3	3
38	Grey Box	65	56	60	Y	N	6249465	529261.6	3
39	White Cypress Pine	56	16	70	N	N	6249531	529219	3
40	Dead	53	0	0	N	N	6249559	529206.8	3
41	Black Cypress Pine	57	20	95	N	N	6249523	529179.8	3
42	Dead	63	0	0	N	N	6249512	529184.6	3
43	Black Cypress Pine	75	16	76	N	N	6249500	529150.8	3
44	Grey Box	138	90	60	N	N	6249469	529137.1	3
45	Grey Box	65	64	60	N	N	6249455	529232.6	3

* Diameter at breast height.

Site value

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

4.4.2 Zone 2 –Road Reserves

Zone 2 covers an area of the Newell Highway road reserve, where the vegetation has been previously cleared to enable the installation and maintenance of the powerline. This Zone forms an obvious gap between higher quality native vegetation within the road reserve to the east and west of this location. In these locations, native overstorey and mid-storey species persist, in contrast to Zone 2, where only native understorey vegetation, dominated by grass species, remains. A single Plot survey was undertaken in this vegetation zone that encompasses the area where the proposed 15 m entrance to the solar farm is to be located (Plot 1: Plate 4.3). This vegetation was dominated by Rough Spear-grass *Austrostipa scabra* subsp. *falcata*, Ringed Wallaby Grass *Rytidosperma caespitosum*, Smallflower Wallaby Grass *Rytidosperma setaceum* and Common Wheat Grass *Elymus scaber*. Other dominant species included Ruby Saltbush *Enchylaena tomentosa* and Black Rolypoly *Sclerolaena muricata* var. *villosa*. The dominant weed species in this vegetation zone were the crop species from the surrounding landscape (Barley, Canola and Perennial Rye-grass), as well as Onion Grass *Romulea rosea*.

Site value

The vegetation within Zone 2 is in relatively poor condition. The Zone has previously been cleared of overstorey and midstorey species, and this condition is likely to be maintained to ensure the safe operation of the powerline that passes through the landscape at this location. There is little chance that the condition of this vegetation will improve over time, as the upper strata of vegetation is likely to be removed as it regenerates. This gap in the vegetation contrasts with the Newell Highway road reserve vegetation that adjoins it, which has a more diverse suite of native species, complex

structure, and which provides important movement corridors within the landscape, as demonstrated by the reference Plot surveys undertaken in these locations (Plate 4.3, 4.4).



Plate 4-3. Plot 1 in Zone 2 (looking east and west). Powerlines, which are the reason for the clearing can be seen in the eastern facing photograph.



Plate 4-4. Plot 2 in in the Newell Highway road reserve (looking east and west). East of Zone 2.



Plate 4-5. Plot 3 in in the Newell Highway road reserve (looking east and west). West of Zone 2.

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.

The SEARs provided by OEH do not identify any project specific assessment requirements.

5.2 Ecosystem Credit Species

This Section presents a discussion of all “Candidate” threatened species identified through the BAM calculator (Appendix 10.3) or recorded during targeted threatened species surveys. See Section 2.3.4 for details of targeted threatened species survey methods.

Additional threatened species are identified by the BAM calculator as “Predicted” species due to the impact to PCT 76 classified vegetation (Appendix 10.3). No surveys are required for these species and Ecosystem credits apply to these species for the impact to native vegetation:

- Barking Owl *Ninox connivens*;
- Black-chinned Honeyeater (eastern subspecies) *Melithreptus gularis gularis*;
- Brown Treecreeper (eastern subspecies) *Climacteris picumnus victoriae*;
- Diamond Firetail *Stagonopleura guttata*;
- Dusky Woodswallow *Artamus cyanopterus cyanopterus*;
- Flame Robin *Petroica phoenicea*;
- Glossy Black-Cockatoo *Calyptorhynchus lathamii*;
- Grey Falcon *Falco hypoleucos*;
- Grey-crowned Babbler (eastern subspecies) *Pomatostomus temporalis temporalis*;
- Grey-headed Flying-fox *Pteropus poliocephalus*;
- Hooded Robin (south-eastern form) *Melanodryas cucullata cucullata*;
- Koala *Phascolarctos cinereus*;
- Little Eagle *Hieraaetus morphnoides*;
- Little Pied Bat *Chalinolobus picatus*;
- Major Mitchell's Cockatoo *Lophocroa leadbeateri*;
- Masked Owl *Tyto novaehollandiae*;
- Painted Honeyeater *Grantiella picta*;
- Scarlet Robin *Petroica boodang*;
- Speckled Warbler *Chthonicola sagittata*;
- Square-tailed Kite *Lophoictinia isura*;
- Superb Parrot *Polytelis swainsonii*;
- Swift Parrot *Lathamus discolor*;
- Turquoise Parrot *Neophema pulchella*;
- Varied Sittella *Daphoenositta chrysoptera*;
- White-bellied Sea-Eagle *Haliaeetus leucogaster*; and,

- Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*.

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 2018a). 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 2017c).

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 2018a). 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 2017a; NSW Office of Environment and Heritage 2017g).

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.

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 significantly impacted by the proposed development. Nonetheless, the surveys were undertaken outside the required surveys months and therefore, for the purposes of this assessment, this species is assumed present.

Presence: Yes (Assumed present)

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 is one previous record of Little Eagles within 10 kms of the development site, which was recorded in 1984 from the Boxall State Forest (NSW Office of Environment and Heritage 2018a).

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), or not characteristic of Little Eagle nests in structure (Grey-crowned Babbler nests).

It is concluded that based on the limited habitat available within the development site and the surrounding landscape, the lack of recent 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 Kite nests, however none were found. Nests that were observed were either too small to support Little

Eagles (and likely to be Corvid nests), or not characteristic of Square-tailed Kite nests in structure (Grey-crowned Babbler nests).

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)

White-bellied Sea Eagle *Haliaeetus leucogaster*

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

The White-bellied Sea Eagle is a large bird of prey which is primarily white in colour, with greyish wings and a short pale wedge-shaped tail (Marchant and Higgins 1993). It usually nests near water, in tall trees either dead or alive (Marchant and Higgins 1993). White-bellied Sea Eagles incubate from approximately August to November (Marchant and Higgins 1993). There are no previous records of White-bellied Sea Eagles within 10 kms of the development site.

The current assessment searched the scattered paddock trees for evidence of White-bellied Sea Eagles nests, however none were found. Nests that were observed were either too small to support Little Eagles (and likely to be Corvid nests), or not characteristic of White-bellied Sea Eagle nests in structure (Grey-crowned Babbler nests).

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, White-bellied Sea Eagles are unlikely to nest within the development site and are unlikely to be present on a regular basis. It is therefore unlikely that White-bellied Sea Eagles 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 two historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2018a). These records have been assigned generalised locations, with the precise location withheld, and are

of one individual in 2009 and three individuals in 2012 (NSW Office of Environment and Heritage 2018a). 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 2017f).

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 low number 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 Cockatoos will be significantly impacted by the proposed development.

Presence: No (Surveyed)

Glossy Black-Cockatoo *Calyptorhynchus lathami* (and endangered Riverina sub-population)

BC Act Status	Endangered	EPBC Act Status	Not listed
Survey Period	March – August	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 is one historical record of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2018a). Three individuals were recorded at an undisclosed location in 2006 (NSW Office of Environment and Heritage 2018a). 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 2017f).

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. Nonetheless, the surveys were undertaken outside the required surveys months and therefore, for the purposes of this assessment, this species is assumed present.

Presence: Yes (Assumed present)

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 2017s). There are no historical records of this species from within 10 kms of the development site (NSW Office of Environment and Heritage 2018a).

Bird surveys and tree hollow surveys were undertaken to detect the presence of Superb Parrots. 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 low number of historical records and the results of the targeted surveys, Superb Parrots are unlikely to nest within the development site and are unlikely to be present on a regular basis. It is therefore unlikely that Superb Parrots will be significantly impacted by the proposed development.

Presence: No (Surveyed)

Swift Parrot *Lathamus discolor*

BC Act Status	Endangered	EPBC Act Status	Critically Endangered
Survey Period	May-August	Detection Method	Bird survey

Swift Parrots are migratory birds that breed in Tasmania over summer, and then migrate to mainland Australia for winter (Higgins 1999). Whilst on migration, they opportunistically forage within flowering Gums in southern Australia throughout winter (Higgins 1999). In Box-Ironbark woodlands one study found their preferred nectar came from White Box *Eucalyptus albens* (19.5% of observations), but also included a range of other species including Yellow Gum *Eucalyptus leucoxylon*, Yellow Box *Eucalyptus melliodora* and Grey Box (Higgins 1999), the latter of which is found throughout the study area. There is one historical record of this species within 10 kms of the development site, near Boxall State Forest, of 10 individuals in 1998 (NSW Office of Environment and Heritage 2018a). Swift Parrots are threatened in NSW by loss of habitat for forestry, agricultural and residential development as well as competition for food resources (NSW Office of Environment and Heritage 2018f).

Swift Parrot surveys were undertaken in conjunction with general bird surveys to detect the species' presence in June 2018, during the preliminary assessment. Despite these surveys, as well as the high probability of detecting these birds due to their distinctive and often noisy call, 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 recent historical records and the results of the surveys, this species is not likely to be present and therefore not likely to be impacted by the proposed development. Nonetheless, the surveys were undertaken outside the required surveys months and therefore, for the purposes of this assessment, this species is assumed present.

Presence: Yes (*Assumed present*)

5.2.2 Mammals

Squirrel Glider *Petaurus norfolcensis*

BC Act Status Survey Period	Vulnerable Year round	EPBC Act Status Detection Method	Not listed Nocturnal surveys
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Squirrel Gliders are widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria (Menkhorst 2001). They inhabit mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas (NSW Office of Environment and Heritage 2018e). Squirrel Gliders habitat comprises mixed species stands with a shrub or Acacia midstorey and require abundant tree hollows for refuge and nest sites (NSW Office of Environment and Heritage 2018e). Their diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew, manna, invertebrates and pollen (NSW Office of Environment and Heritage 2018e). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2018a). A key threat to this species is fragmentation of habitat, the loss of hollow bearing trees and lack of recruitment of potentially new hollows in the future (NSW Office of Environment and Heritage 2018e).

Nocturnal surveys were undertaken throughout the development site and the surrounding woodlands. No Squirrel Gliders were observed 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, Squirrel Gliders are unlikely to occupy the development site on a regular basis. It is therefore unlikely that Squirrel Gliders will be significantly impacted by the proposed development.

Presence: No (*Surveyed*)

Koala *Phascolarctos cinereus*

BC Act Status	Vulnerable	EPBC Act Status	Vulnerable
Survey Period	Year round	Detection Method	Diurnal/Nocturnal surveys

The Koala has a fragmented distribution throughout eastern Australia (NSW Office of Environment and Heritage 2018c). In NSW Koalas mainly occur on the central and north coasts, with some populations in the west of the Great Dividing Range (NSW Office of Environment and Heritage 2018c). They inhabit eucalypt woodlands and forests and feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, however in any one area they will select a preferred species for foraging (NSW Office of Environment and Heritage 2018c). Koalas spend most of their time in trees, but will descend and traverse open ground to move between trees (NSW Office of Environment and Heritage 2018c). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2018a).

Diurnal and nocturnal surveys were undertaken throughout the development site and the surrounding woodlands. No Koalas were observed 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, Koalas are unlikely to occupy the development site on a regular basis. It is therefore unlikely that Koalas will be significantly impacted by the proposed development.

Presence: No (Surveyed)

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 2017e). 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 2018a). 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 2017e).

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 2017m) areas in grassland, woodland and disturbed habitats (NSW Office of Environment and Heritage 2017m). 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 2017m). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2018a). 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 2017m). These threats are manifest through urbanisation and development, as well as inappropriate cattle grazing (NSW Office of Environment and Heritage 2017m).

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 present)

5.2.4 Flora

Spike Rush *Eleocharis obicis*

BC Act Status	Vulnerable	EPBC Act Status	Vulnerable
Survey Period	Year round	Detection Method	Targeted flora surveys

Spike Rush is a small sedge is a tufted perennial with very short underground stem (NSW Office of Environment and Heritage 2017q). It grows in ephemeral wet situations such as roadside mitre drains and depressions, usually in low-lying grasslands (NSW Office of Environment and Heritage 2017q). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2018a).

There is no suitable habitat for this species within the development site. Targeted flora surveys for the 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	Vulnerable	EPBC Act Status	Vulnerable
Survey Period	September – November	Detection Method	Targeted flora surveys

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 2017h). It is predominantly found in Saltbush and Bluebush shrublands, it also occurs in Cypress Pine woodlands (NSW Office of Environment and Heritage 2017h). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2018a).

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 2017i). 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 2017i). It is found in sandy soils, either on flats or small rises (NSW Office of Environment and Heritage 2017i). There are no historical records of this species within 10 kms of the development site (NSW Office of Environment and Heritage 2018a).

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 2017j). It is currently only known to occur in the Riverina between Urana and Narranderra (NSW Office of Environment and Heritage 2017j). Sand-hill Spider Orchids grow to 40 cm in height, and bear one or two pale yellow flowers (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 2018a).

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 2017k). 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 2017k). The plant is a prostrate, spring flowering perennial, with purple flowers (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 2018a).

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 2017l). There are three historical records of this species within 10 kms of the development site, including one duplicate record of a colony of 67 individuals in Quandialla Road, 13 kms south-east of the study area (NSW Office of Environment and Heritage 2018a).

There is no suitable habitat for this species within most of the development site. Targeted flora surveys for the species, undertaken during the flowering season, and therefore most conspicuous time for this species, did not identify any of these plants either within the native vegetation that comprises Zone 2 of the development site, or in the higher quality native vegetation to east and west of this Zone, 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 2017n). 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 2017n).

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

The 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 2017p). It grows in association with species such as White Cypress-pine and Western Grey Box, 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 2017p). The seed is believed to be viable for three to five years (NSW Office of Environment and Heritage 2017p). 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. *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 2017p).

There are 12 historical records of *Austrostipa wakoolica* from within 10 kms of the development site, located north-east, north-west and south-west of the development site (Figure 6; NSW Office of Environment and Heritage 2018b). The records generally come from the state forests and protected areas near the development site, however two records also come from the road reserve of Goldfields Way, approximately 8kms south-west of the study area. All of the records of *Austrostipa wakoolica* are from 1991, and are paired in a way that suggests that they are duplicate records (NSW Office of Environment and Heritage 2018b).

There is no suitable habitat for this species within most of the development site. Targeted flora surveys for the species, undertaken during the flowering season, and therefore most conspicuous time for this species, did not identify any of these plants either within the native vegetation that comprises Zone 2 of the development site, or in the higher quality native vegetation to east and west of this Zone, 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 Peppergrass *Lepidium aschersonii*

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

Spiny Peppergrass is found on ridges of gilgai clays dominated by Brigalow *Acacia harpophylla*, Belah *Casuarina cristata*, Bulloak and Grey Box, often the understorey is dominated by exotic species (NSW Office of Environment and Heritage 2017r). 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 2017r). Plants become woody and more spinose in dry conditions (NSW Office of Environment and Heritage 2017r).

There are 2 historical records of Spiny Peppergrass from within 10 kms of the development site, (Figure 6; NSW Office of Environment and Heritage 2018b). A record from 1943 is likely to have been allocated a generalised location at Wyalong, while a more recent record from 2004 is located approximately 8 kms north of the study area (NSW Office of Environment and Heritage 2018b).

There is no suitable habitat for this species within most of the development site. Targeted flora surveys for the species, undertaken during the flowering season, and therefore most conspicuous time for this species, did not identify any of these plants either within the native vegetation that comprises Zone 2 of the development site, or in the higher quality native vegetation to east and west of this Zone, 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

Fauna surveys and habitat assessments identified a number of threatened species (not predicted through the BioBanking calculator) with a moderate chance of occurring within the development site on at least an occasional basis.

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).

Grey-crowned Babblers were regularly recorded in around the development site during both recent assessments (Ecolink Consulting Pty Ltd 2018; Figure 6). Historic records also exist from the vicinity of the development site (NSW Office of Environment and Heritage 2018a). This suggests that although threatening processes exist, the species is not uncommon in the landscape around the development site.

A number of roosting nests were observed close to the development site in the road reserve vegetation north and south of the development site. These nests appeared to represent the territories of two groups of babblers—one that is predominantly located in native vegetation north of the development site (the Spauls Lane extension) and one that is predominantly located in the south of the development site, including the former school site in the south-west of the wider development site (Figure 6). These birds were seen regularly during the current assessments, with between six and nine individuals counted in each group.

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 2017d).

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 45 scattered paddock trees that provide sentry posts for birds when foraging in open areas, such as paddocks.

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).

Two White-fronted Chats were observed feeding in Canola crops within the development site (Figure 6). White-fronted Chats have not previously been recorded within 10 kms of the development site.

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 2017t).*

The impacts to this species are likely to be limited to temporary, indirect impacts associated with noise and disturbance during construction works and the loss of a very small amount of foraging habitat. 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)

Painted Honeyeater *Grantiella picta*

BC Act Status	Vulnerable	EPBC Act Status	Vulnerable
Survey Period	Year round	Detection Method	Bird survey

The Painted Honeyeater occurs in forest and woodland, feeding largely on mistletoe berries, but also taking nectar and insects (Higgins et al. 2001). The Painted Honeyeater seems to prefer mistletoes from the genus *Amyema* (NSW Office of Environment and Heritage 2018d), which were recorded within the development site and surrounds. It is a migratory species, with most individuals breeding in southern Australia, and moving north in winter (Higgins et al. 2001).

There are seven historical records of this species within 10 kms of the development site, all the road reserves of the Newell Highway or its arterials (NSW Office of Environment and Heritage 2018a).

Painted Honeyeaters are threatened in NSW by loss of habitat by clearing, especially areas infested with Mistletoe (NSW Office of Environment and Heritage 2018d).

Bird surveys were undertaken to detect the presence of Painted Honeyeaters. Despite these targeted surveys, as well as the high probability of detecting these birds due to their distinctive call, 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 (particularly the low abundance of mistletoe plants) and the surrounding landscape, the lack of recent historical records and the results of the surveys, this species is not likely to be present within the development area on a regular basis and therefore not likely to be significantly impacted by the proposed development.

Presence: No (Surveyed)

A tylophora *Tylophora linearis*

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

Tylophora linearis is found in dry scrub and open forest habitats (NSW Office of Environment and Heritage 2018g). Recorded from low-altitude sedimentary flats in dry woodlands of Broad-leaved Red Ironbark *Eucalyptus fibrosa*, Red Ironbark, White Box *Eucalyptus albens*, Black Cypress Pine *Callitris endlicheri*, White Cypress Pine and Bullock (NSW Office of Environment and Heritage 2018g). It is a twining plants with dark green leaves and purple flowers (NSW Office of Environment and Heritage 2018g).

There is one historical record of *Tylophora linearis* from within 10 kms of the development site, of two plants approximately 10 kms north-east of the study area, near the South West Woodlands Nature Reserve (Figure 6; NSW Office of Environment and Heritage 2018b).

There is no suitable habitat for this species within most of the development site. Targeted flora surveys for the species, undertaken during the flowering season, and therefore most conspicuous time for this species, did not identify any of these plants either within the native vegetation that comprises Zone 2 of the development site, or in the higher quality native vegetation to east and west of this Zone, 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)

5.3.1 Threatened Species Risk Sensitivity

The BAM uses a biodiversity risk weighting to evaluate the ecological risks of threatened entities from the biodiversity offsets scheme. The risk matrix presented in Appendix 7 of the BAM has been used to assess the sensitivity of threatened PCTs and species for which offset credits are required (Table 5.1). The multiplier has been applied to offset credits required for the proposed development.

Table 5.1. Biodiversity risk rating for threatened PCTs and threatened species impacted by the proposed development*.

Credit Class	Sensitivity to Loss	Sensitivity to Gain	Multiplier
76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	PCT >90% Cleared Very High Sensitivity (3)	Very High (Swift Parrot)	3
Glossy Black Cockatoo	High	Moderate	2
Sloane's Froglet	Moderate	High	2
Swift Parrot	Very High	Moderate	3
Masked Owl	Moderate	Moderate	1.5

* Includes only species for which offset credits are required

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 22 threatened species, 11 listed migratory species (some of which are also threatened species), three 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 10.3) (Department of the Environment and Energy 2018).

5.4.2 Threatened Vegetation Communities

Of the three 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, which are characteristic of these communities:

- Weeping Myall Woodlands; and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

The Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia threatened ecological community, however requires further discussion.

Vegetation within the Newell Highway road reserve, adjacent to the development site, is classified as PCT 76 – Western Grey Box tall grassy woodland (Central West / Lachlan Regional Native Vegetation PCT Map Version 1.0. VIS_ID 4468). The current assessment confirmed that this vegetation possesses the floristic composition, soil profile and landform to be classified as PCT 76 (Table 4.1). 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.

Vegetation to the east and west of Zone 2, where the applicant proposes to provide access through the road reserve to the solar farm, is likely to be of sufficient quality and diversity to qualify as this ecological community. These areas are not proposed to be impacted by the solar farm. Instead, the applicant is proposing to provide access to the solar farm where this vegetation has already been impacted for the installation and maintenance of electricity infrastructure. This is a location where the mid- and overstorey vegetation has been removed.

When the vegetation in Zone 2 is 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;
- The patch is less than 0.5 ha in size; and,
- The mid and ground layers lack the requisite species diversity of perennial native species.

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

5.4.3 Threatened and Migratory Species

Of the 30 species that were identified as having the potential to occur within the development site, only two threatened fauna species and four threatened flora have at least a moderate likelihood of occurrence within the development site based on their known range, biology, behaviour, habitat preferences compared with the habitats available within the development site. These species include:

- Swift Parrot *Lathamus discolor*;
- Painted Honeyeater *Grantiella picta*;
- A spear grass *Austrostipa wakoolica*;
- Spiny Pepper-cress *Lepidium aschersonii*;
- Slender Darling-pea *Swainsona murrayana*; and
- A tylophora *Tylophora linearis*.

None of these species have previously been recorded within the development site, however each of these species have previously been recorded within 10 kms of the development site (Figure 6). These species are also threatened in NSW and their likelihood of occurrence is 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 500 kms 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 solar farm at the development site.

5.4.5 Potential for Significant Impact on an MNES

The highly disturbed landscape in which the proposed solar farm is located generally provides little habitat for most MNES. Where habitat may occur within the landscape, these values have been avoided by the proposed development. In the low quality, and historically cleared vegetation that comprises Zone 2, targeted flora surveys were undertaken to ensure that the presence of threatened flora species would be detected—none were recorded. This vegetation has also been determined not to meet thresholds to be considered a nationally threatened ecological community. It is therefore highly unlikely that there will be a significant impact to any MNES.

6 Impact Assessment

6.1 Avoid and Minimise Impacts

The preliminary investigations identified a small number of ecological constraints within the development site and surrounding landscape (Ecolink Consulting Pty Ltd 2018). This included patches of remnant vegetation and scattered trees, as well as potential habitat for threatened flora and fauna species (Ecolink Consulting Pty Ltd 2018). No serious or irreversible impacts to the ecological values of the development site have been identified as a result of the proposed development.

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. This includes the avoidance of the vegetation at the location of the historic school site in the south-western corner of the wider development site, as well as the higher quality patches of vegetation within the Newell Highway Road Reserve.

45 paddock trees are likely to require removal, which includes 13 hollow bearing trees (see Figure 5). The remainder of the development site (256 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 Wyalong Solar Farm may result in both direct and indirect impacts on biodiversity. The direct impacts of the project are expected to comprise:

- The loss of 0.16 ha of PCT 76 native vegetation;
- The removal of up to 45 paddock trees within the development site; and,
- The removal of up to 13 hollow-bearing trees (included within the 45 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.

These impacts are described further in Table 6.1.

Table 6.1. Summary of potential direct and indirect impacts from the proposed development

Type of impact	Frequency and intensity of impact	Duration of impact	Ecological values impacted	Mitigation proposed	Likely consequences
Direct loss of 0.16 ha of PCT 76 native vegetation	Once off occurrence, high intensity in area of impact.	Ongoing	Loss of an endangered PCT and impacts to threatened species including: <ul style="list-style-type: none"> • Glossy Black-Cockatoo; • Swift Parrot; • Masked Owl; and, • Sloane's Toadlet. 	Offset obligations to be met.	<ul style="list-style-type: none"> • Loss of 0.00004% of remaining PCT76 vegetation in state and small amounts of low quality habitat for threatened species.
Removal of up to 45 paddock trees (up to 13 of which contain hollows)	Once off occurrence, high intensity in area of impact.	Ongoing	Loss of up to 45 indigenous large trees; Nesting, roosting and foraging habitat for a range of common, and potentially threatened fauna species.	Offset obligations to be met; Wildlife handler to be present to salvage fauna from felled trees containing hollows as detailed in a Fauna Management Plan.	<ul style="list-style-type: none"> • Loss of up to 45 large old trees from the landscape; • Displacement of native fauna from the development site; • Reduction in the abundance and availability of tree hollows in the landscape.
Introduction and spread of weeds	Whenever vehicles enter the development site there is the potential for a low intensity infestation occurring.	Ongoing	Exclusion of native species by weeds Development becoming a source of off-site weed infestations.	During construction weeds will form a component of the Construction Environment Management Plan (CEMP) (or equivalent) to prevent the introduction and spread of weeds.	<ul style="list-style-type: none"> • Through implementation of management controls, the consequence is likely to be minor.
Inappropriate plant species used for revegetation	Once, when site rehabilitation is undertaken following construction	Once	Introduction of weed species into the landscape (see above)	The plant palette for the proposed development will be designed to ensure only suitable plants are used in the landscaping of the proposed solar farm	Through implementation of management controls, the consequence is likely to be minor.

Type of impact	Frequency and intensity of impact	Duration of impact	Ecological values impacted	Mitigation proposed	Likely consequences
Soil erosion	During construction and rain events, with intensity determined by rain intensity, ranging from insignificant to significant	Ongoing	Loss of topsoil resulting in the silting of waterways and loss of habitat	Erosion control will be managed through the installation of sediment fences and bund walls during construction as detailed in the (CEMP) (or equivalent). Once the construction phase is complete, revegetation of the site will reduce ongoing risks of soil erosion	Through implementation of management controls, the consequence is likely to be minor.
Water quality impacts	During construction (see above)	Ongoing	Increases in turbidity and suspended soils in adjacent creeks and waterways causing negative impacts to habitat for aquatic plants and animals	See above	Through implementation of management controls, and given regard to the landscape, the consequence is likely to be minor.
Noise disturbance	During construction. Noise levels unlikely to be significantly greater than noise associated with regular farming activities, although likely to be concentrated into a longer duration than normal	During construction	Disturbance to fauna species resulting in displacement of species during construction	Emergency procedures for interactions with injured or distressed fauna to be detailed in a Fauna Management Plan.	Through implementation of management controls, the consequence is likely to be minor.

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 Newell Highway, at a gap in the quality of native vegetation, where the road reserve vegetation is of relatively 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.

6.3.4 Biodiversity Management Plan

Details relating to the specific ongoing actions, outcome, timing and responsibility for implementation of actions will be provided within a Biodiversity Management Plan that is to be included as a condition of the development consent. This plan will be prepared and approved prior to the start of clearing for construction and be operational throughout the life of the solar farm.

6.4 Impact Summary

As outlined in Section 6.2, the Wyalong Solar Farm is expected to result in the removal of a total of up to 0.16 ha of PCT 76 native vegetation and up to 45 paddock trees. Further impacts to Glossy Black-Cockatoo, Swift Parrot, Masked Owl and Sloane's Toadlet were identified by the BAM

Calculator (Appendix 10.3), 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 summarised below. BAM calculator outputs are provided in Appendix 10.3 and 10.4.

6.4.1 Impacts Requiring Offsets

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 proposed development will impact up to 0.16 ha of PCT 76 in moderate-good condition (excluding the paddock trees). This will require the acquisition of two ecosystem credits. Impacts will also occur to four threatened species. Species credits will be required for these species:

- Glossy Black-Cockatoo – 2 species credits;
- Swift Parrot – 3 species credits;
- Masked Owl – 2 species credits; and,
- Sloane's Toadlet – 2 species credits.

The removal of paddock trees will also require ecosystem credits. The following Table 6.2, 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 6.2. Number of ecosystem credits required for each paddock tree.

Number	Species	DBH (cms)	Hollows	Class	Credit Requirement
1	Grey Box	71	N	3	0.75
2	Grey Box	141	N	3	0.75
3	Grey Box	28	N	2	0.5
4	Grey Box	180	N	3	0.75
5	Grey Box	175	Y	3	1
6	Grey Box	83	N	3	0.75
7	Grey Box	127	N	3	0.75
8	Grey Box	115	Y	3	1
9	Grey Box	36	N	2	0.5
10	Grey Box	101	N	3	0.75
11	Grey Box	90	N	3	0.75
12	Grey Box	153	N	3	0.75
13	Grey Box	128	N	3	0.75

Number	Species	DBH (cms)	Hollows	Class	Credit Requirement
14	Dead	67	Y	3	1
15	Grey Box	76	N	3	0.75
16	<i>Acacia salicina</i>	74	N	3	0.75
17	Black Cypress-pine	72	N	3	0.75
18	Grey Box	98	N	3	0.75
19	White Cypress-pine	73	N	3	0.75
20	Black Cypress-pine	55	N	3	0.75
21	Grey Box	92	Y	3	1
22	Grey Box	133	Y	3	1
23	Yellow Gum	29	N	2	0.5
24	Yellow Gum	29	N	2	0.5
25	Grey Box	100	Y	3	1
26	Dead	86	Y	3	1
27	Dead	84	Y	3	1
28	Grey Box	80	Y	3	1
29	Grey Box	86	Y	3	1
30	White Cypress-pine	94	N	3	0.75
31	Buloke	56	N	3	0.75
32	Black Cypress-pine	86	N	3	0.75
33	Grey Box	102	Y	3	1
34	Black Cypress-pine	56	N	3	0.75
35	Black Cypress-pine	60	N	3	0.75
36	Grey Box	79	N	3	0.75
37	Grey Box	70	Y	3	1
38	Grey Box	65	Y	3	1
39	White Cypress-pine	56	N	3	0.75
40	Dead	53	N	3	0.75
41	Black Cypress-pine	57	N	3	0.75
42	Dead	63	N	3	0.75
43	Black Cypress-pine	75	N	3	0.75
44	Grey Box	138	N	3	0.75
45	Grey Box	65	N	3	0.75
Total					36

6.4.2 Credit Profile

Table 6.3 provides a summary of offsets required for impacts to ecological values identified within the development site based on Section 6.4.1.

Table 6.3. 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	38	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
Glossy Black Cockatoo	2	Only Glossy Black Cockatoo	Any in NSW	N/A	N/A	N/A	N/A
Sloane's Froglet	2	Only Sloane's Froglet	Any in NSW	N/A	N/A	N/A	N/A
Swift Parrot	3	Only Swift Parrot	Any in NSW	N/A	N/A	N/A	N/A
Masked Owl	2	Only Masked Owl	Any in NSW	N/A	N/A	N/A	N/A

* variations are available

The applicant is committed to meet the offset requirement. The expected fee to achieve these offsets is provided in Table 6.4.

Table 6.4. Fees associated with offset credits for the proposed Wyalong Solar Farm.

Impact	Offset type	No of credits	Total fee (excl GST)
0.16 ha of Zone 2	PCT 76 Grey Box woodland	2	\$4,819.16
0.16 ha of Zone 2	Glossy Black Cockatoo	2	\$1,213.84
0.16 ha of Zone 2	Swift Parrot	3	\$1,136.81
0.16 ha of Zone 2	Masked Owl	2	\$1,213.84
0.16 ha of Zone 2	Sloane's Froglet	2	\$1,213.84
45 Paddock Trees in Zone 1	PCT 76 Grey Box woodland	36	\$86,744.80
Total			\$97,302.04

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 Wyalong Solar Farm. This began with preliminary ecological investigations at the development site to result 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), and the development of a Biodiversity Management Plan for the operation of the solar farm, would ensure the development meets the requirements to avoid and minimise impacts on biodiversity values as set out in Chapter 6 of the BDAR.

All areas within the final development site are regionally mapped as non-native vegetation, with the exception of the access point through the Newell Highway road reserve. The proposed footprint is almost entirely located on cropped and grazed land that goes through a regular process of disturbance. Native vegetation identified in the development site is limited to 45 paddock trees, 13 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. An additional 0.156 hectares of vegetation will be impacted in the road reserve to provide access to the proposed solar farm. Thirty-eight ecosystem credit class offsets and nine species class offsets are required for this vegetation. The applicant is committed to meeting their obligations in relation to ecosystem credits.

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

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




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9 Figures



Figure 1: Site map

Legend

-  Development site
-  Wider development site (Lot 160/750615)
-  Dams
-  Habitat corridors and stepping stones
- Transmission Lines**
-  132kV





1:10,587
Datum/Projection: GDA 1994 MGA Zone 55
October 2018



Figure 2: Location map

Legend

- Development site

Wider development site (Lot 160/750615)

1.5km assessment circle
- Transmission Lines

132kV

Dams
- Habitat corridors and stepping stones

NSW (Mitchell) Landscapes

Bimbi Plains

Manitoba Hills and Footslopes

03106209301,240

Meters

1:19,916

Datum/Projection: GDA 1994 MGA Zone 55

October 2018



Figure 3: Native vegetation within the assessment circle

Legend

Development site

Wider development site (Lot 160/750615)

1.5km assessment circle

Habitat corridors and stepping stones

PCT name

Derived tussock grassland of the central western plains and lower slopes of NSW

Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion

Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion

River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion

River Red Gum swampy woodland wetland on cowals (lakes) and associated flood channels in central NSW

Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

03106209301,240

Meters

1:19,916

Datum/Projection: GDA 1994 MGA Zone 55
October 2018



Figure 4: Hydrology within, and surrounding, the development site

Legend

- Development site
- Wider development site (Lot 160/750615)
- 1.5km assessment circle
- Habitat corridors and stepping stones
- Contours
- Creeks and Waterways**
- Mainly Dry
- Non Perennial
- Perennial

03106209301,240Meters









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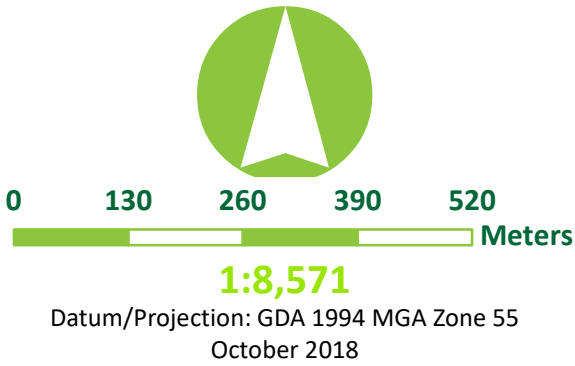
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October 2018



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

Legend

- | | | |
|--|---|--|
|  Development site |  Class 2 |  Zone 1 - Paddock Tree Area |
|  Wider development site (Lot 160/750615) |  Class 3 |  Zone 2 - Road Reserve |
|  Native vegetation | |  Plot Surveys |



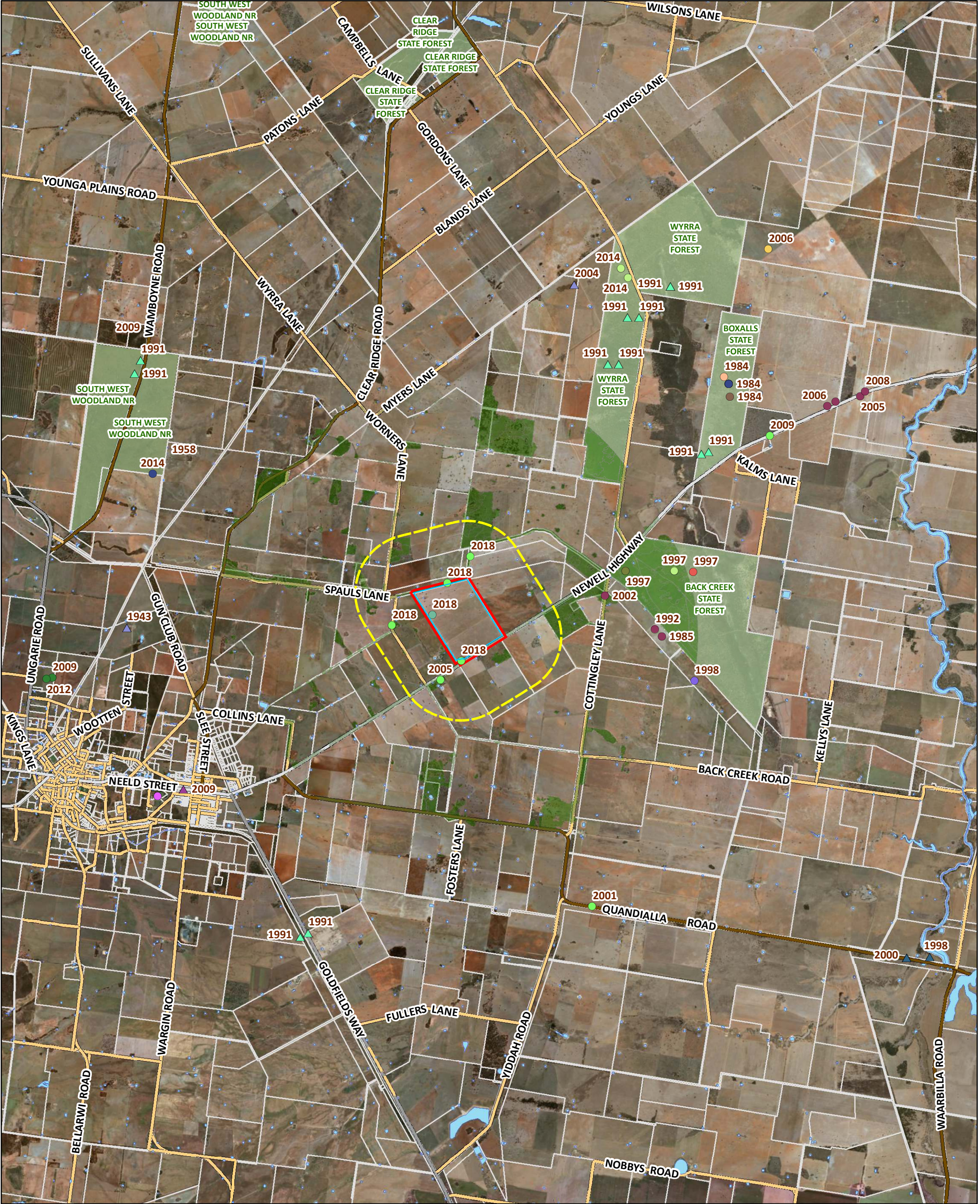


Figure 6: Results of the threatened species assessments

Legend

Development Site

Wider development site (Lot 160/750615)

1.5km assessment circle

Habitat corridors and stepping stones

Threatened Species

White-fronted Chat

Blue-billed Duck

Brown Treecreeper (eastern subspecies)

Diamond Firetail

Glossy Black-Cockatoo

Grey-crowned Babbler (eastern subspecies)

Hooded Robin (south-eastern form)

Little Eagle

Magpie Goose

Major Mitchell's Cockatoo

Painted Honeyeater

Speckled Warbler

Spotted Harrier

Swift Parrot

Varied Sittella

A spear-grass

Slender Darling Pea

Spiny Peppercross

Yellow Gum

01,3002,6003,9005,200

Meters

1:85,777

Datum/Projection: GDA 1994 MGA Zone 55
October 2018

10 Appendices

10.1 Plot Data

Transect No.				1	2	3	4				
Date				18-Sep	18-Sep	18-Sep	18-Sep				
Recorders				Simon Scott and Stuart Cooney	Simon Scott and Stuart Cooney	Simon Scott and Stuart Cooney	Simon Scott and Stuart Cooney				
Name				Road Reserve 1	Road Reserve 2	Road Reserve 3	Private Property 1				
Type				Impact	Reference	Reference	Reference				
Easting				6249572.5	6249733.6	6249359.7	6249670.6				
Northing				529510.1	529770.8	529177.6	529140.8				
Orientation				East	East	East	East				
IBRA Subregion				NSW South Western Slopes	NSW South Western Slopes	NSW South Western Slopes	NSW South Western Slopes				
PCT				76 - Western Grey Box Woodland	76 - Western Grey Box Woodland	76 - Western Grey Box Woodland	76 - Western Grey Box Woodland				
Eucalypts 80+				0	2 (2 hollows)	1 (1 hollow)	0				
50-79				0	1	0	1 (0 hollows)				
30-49				0	0	6	0				
20-29				0	0	6	0				
10-19				0	0	2	0				
5-9				0	0	3	0				
<5				0	0	1	1				
Non-Eucalypts 80+				0	0	0	0				
50-79				0	0	0	0				
30-49				0	0	0	0				
20-29				0	0	0	0				
10-19				0	8	0	1				
5-9				0	7	2	0				
<5				0	31	5	0				
Length of Logs				0	10	17	3				
Litter Cover				40	75	70	40				
Bare Ground Cover				10	2	12	25				
Cryptogram Cover				0.1	0.1	0.5	0.1				
Rock Cover				0	0.1	0	0				
Plant List				60	31	22	30				
GF Code	Status	Stratum	Species Name	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
S	N	MS	<i>Acacia deanei</i>			0.2	1	0.1	1		
S	N	MS	<i>Acacia hakeoides</i>					1	5		
T	N	OS	<i>Acacia omalophylla</i>	0.1	1	0.5	15				
T	N	OS	<i>Acacia salicina</i>			0.3	1				
T	N	OS	<i>Allocasuarina luehmannii</i>			1	3				
C	N	US	<i>Atriplex semibaccata</i>	1	50	0.1	5	0.1	5	0.1	10
G	N	US	<i>Austrostipa aristiglumis</i>			1	50				
G	N	US	<i>Austrostipa bigeniculata</i>	2	50						
G	N	US	<i>Austrostipa scabra</i> subsp. <i>falcata</i>	10	1000	1	50	1	100	8	50
G	N	US	<i>Austrostipa</i> sp.							0.1	30
	E	US	<i>Avena fatua</i>	1	100						
	E	US	<i>Brassica rapa</i> (or similar), canola	0.1	1						
T	N	OS	<i>Callitris glaucophylla</i>			5	40	1	12	0.5	1
F	N	US	<i>Calocephalus citreus</i>							0.1	1
G	N	US	<i>Chloris truncata</i>					0.5	50		
F	N	US	<i>Craspedia</i> sp.	0.1	10						
	E	US	<i>Cucumis myriocarpus</i> subsp. <i>leptodermis</i>	0.5	30						

Transect Number				1		3		4		5	
GF Code	Status	Stratum	Species Name	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
	E	US	<i>Echium plantagineum</i>							0.1	20
F	N	US	<i>Einadia nutans</i>					0.5	50	0.3	30
G	N	US	<i>Elymus scaber</i>	10	500			3	200	6	400
C	N	US	<i>Enchylaena tomentosa</i>	5	100	10	100	7	500	3	50
T	N	OS	<i>Eucalyptus microcarpa</i>			5	2	5	6	2	1
F	N	US	<i>Goodenia gracilis</i>	1	100					0.1	10
	E	US	<i>Hordeum</i> sp. (Barley)	2	500	3	200	2	100	3	100
R	N	US	<i>Juncus flavidus</i>	0.1	10	0.1	5				
	E	US	<i>Lolium perenne</i>	2	1000					3	300
R	N	US	<i>Lomandra filiformis</i>					0.1	3	0.1	20
	HT	MS	<i>Lycium ferocissimum</i>			0.5	2	0.1	1	0.1	1
	E	US	<i>Oxalis perennans</i>							0.1	5
	HT	US	<i>Romulea rosea</i>	3	5000					1	500
F	N	US	<i>Rumex brownii</i>	0.1	5						
G	N	US	<i>Rytidosperma caespitosum</i>	10	500	1	30			0.1	30
G	N	US	<i>Rytidosperma duttonianum</i>			1	30			0.1	30
G	N	US	<i>Rytidosperma setaceum</i>	10	500			0.5	50	1	50
C	N	US	<i>Sclerolaena muricata</i> var. <i>villosa</i>	3	100					0.5	10
F	N	US	<i>Vittadinia gracilis</i>							0.2	30
G	N	US	<i>Walwhalleya proluta</i>	0.1	10	2	30	0.5	50	0.1	20

10.2 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: 20/10/18 09:23:12

[Summary](#)

[Details](#)

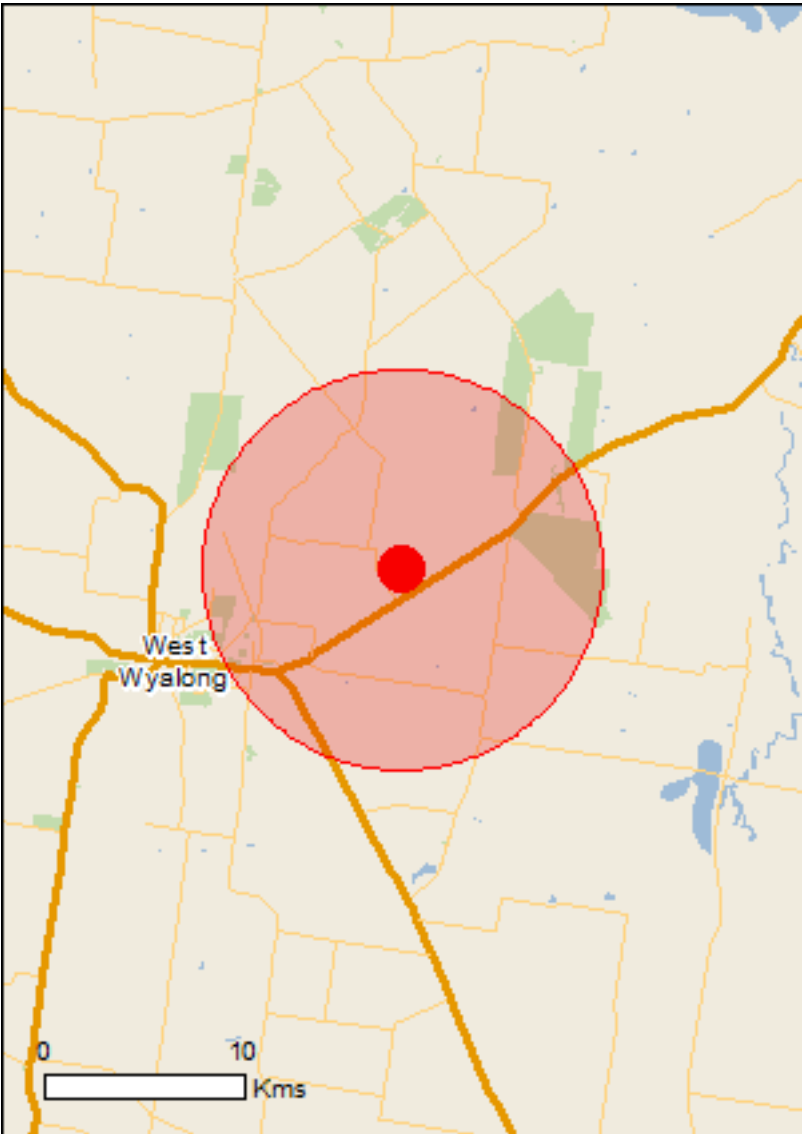
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

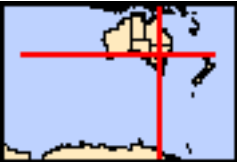
[Acknowledgements](#)



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[Coordinates](#)

[Buffer: 10.0Km](#)



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	22
Listed Migratory Species:	11

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:	18
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

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

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)		[Resource Information]
Name	Proximity	
Banrock station wetland complex	600 - 700km upstream	
Hattah-kulkyne lakes	400 - 500km upstream	
Riverland	500 - 600km upstream	
The coorong, and lakes alexandrina and albert wetland	700 - 800km upstream	

Listed Threatened Ecological Communities	[Resource Information]
--	--------------------------

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

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

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

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat 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 known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Extinct within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species

Name	Status	Type of Presence
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	habitat likely to occur within area Species or species habitat may occur within area
Fish		
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Austrostipa metatoris [66704]	Vulnerable	Species or species habitat may occur within area
Austrostipa wakoolica [66623]	Endangered	Species or species habitat known to occur within area
Lepidium aschersonii Spiny Pepper-cress [10976]	Vulnerable	Species or species habitat likely to occur within area
Philothea ericifolia [64942]	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
Tylophora linearis [55231]	Endangered	Species or species habitat may occur within area
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat 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 area

Name	Threatened	Type of Presence
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
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land		[Resource Information]
The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.		
Name		
Commonwealth Land - Australian Telecommunications Corporation		
Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
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
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat 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 known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
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
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves		[Resource Information]
Name		State
South West Woodland		NSW

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
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 rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur

Name	Status	Type of Presence
		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
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area

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

-33.88911 147.30796

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.

10.3 BAM Calculator output – Zone 2



BAM Vegetation Zones Report

Proposal Details

Assessment Id

00012982/BAAS17047/18/00012985

Assessor Name

Steven Sass

Assessor Number

BAAS17047

Assessment name

Wyalong Solar Farm

Report Created

30/10/2018

BAM data last updated *

24/02/2018

BAM Data version *

3

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

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	76_Mod-good	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Mod-good	0.16	1	

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00012982/BAAS17047/18/00012985	Wyalong Solar Farm	24/02/2018
Assessor Name	Report Created	BAM Data version *
Steven Sass	30/10/2018	3
Assessor Number	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BAAS17047		

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

Common Name	Scientific Name	Vegetation Types(s)
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Diamond Firetail	Stagonopleura guttata	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Dusky Woodswallow	Artamus cyanopterus cyanopterus	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Flame Robin	Petroica phoenicea	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Glossy Black-Cockatoo	Calyptorhynchus lathami	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Grey Falcon	Falco hypoleucos	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Grey-headed Flying-fox	Pteropus poliocephalus	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

BAM Predicted Species Report

Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Koala	Phascolarctos cinereus	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Little Eagle	Hieraaetus morphnoides	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Little Pied Bat	Chalinolobus picatus	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Major Mitchell's Cockatoo	Lophochroa leadbeateri	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Masked Owl	Tyto novaehollandiae	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Painted Honeyeater	Grantiella picta	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Scarlet Robin	Petroica boodang	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Speckled Warbler	Chthonicola sagittata	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Square-tailed Kite	Lophoictinia isura	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Superb Parrot	Polytelis swainsonii	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Swift Parrot	Lathamus discolor	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Turquoise Parrot	Neophema pulchella	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

BAM Predicted Species Report

Varied Sittella	Daphoenositta chrysoptera	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
White-bellied Sea-Eagle	Haliaeetus leucogaster	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Yellow-bellied Sheath-tail-bat	Saccolaimus flaviventris	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

BAM Candidate Species Report

Proposal Details

Assessment Id 00012982/BAAS17047/18/00012985	Proposal Name Wyalong Solar Farm	BAM data last updated * 24/02/2018
Assessor Name Steven Sass	Report Created 30/10/2018	BAM Data version * 3
Assessor Number BAAS17047	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	

List of Species Requiring Survey

Name	Presence	Survey Months
<i>Austrostipa wakoolica</i> A spear-grass	No (surveyed)	<div>Jan Feb Mar Apr May Jun</div> <div>Jul Aug Sep Oct Nov Dec</div>
<i>Brachyscome papillosa</i> Mossgiel Daisy	No (surveyed)	<div>Jan Feb Mar Apr May Jun</div> <div>Jul Aug Sep Oct Nov Dec</div>
<i>Eleocharis obicis</i> Spike-Rush	No (surveyed)	<div>Jan Feb Mar Apr May Jun</div> <div>Jul Aug Sep Oct Nov Dec</div>
<i>Burhinus grallarius</i> Bush Stone-curlew	No (surveyed)	<div>Jan Feb Mar Apr May Jun</div> <div>Jul Aug Sep Oct Nov Dec</div>
<i>Lophochroa leadbeateri</i> Major Mitchell's Cockatoo	No (surveyed)	<div>Jan Feb Mar Apr May Jun</div> <div>Jul Aug Sep Oct Nov Dec</div>
<i>Caladenia arenaria</i> Sand-hill Spider Orchid	No (surveyed)	<div>Jan Feb Mar Apr May Jun</div> <div>Jul Aug Sep Oct Nov Dec</div>
<i>Calyptorhynchus lathami</i> Glossy Black-Cockatoo	Yes (assumed present)	<div>Jan Feb Mar Apr May Jun</div> <div>Jul Aug Sep Oct Nov Dec</div>

BAM Candidate Species Report

<i>Diuris tricolor</i> Pine Donkey Orchid	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Lathamus discolor</i> Swift Parrot	Yes (assumed present)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Lepidium aschersonii</i> Spiny Peppergrass	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Lophoictinia isura</i> Square-tailed Kite	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Petaurus norfolcensis</i> Squirrel Glider	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Phascolarctos cinereus</i> Koala	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Polytelis swainsonii</i> Superb Parrot	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Swainsona murrayana</i> Slender Darling Pea	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Swainsona recta</i> Small Purple-pea	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
<i>Swainsona sericea</i> Silky Swainson-pea	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

BAM Candidate Species Report

<i>Tyto novaehollandiae</i> Masked Owl	Yes (assumed present)	<div>Jan</div> <div>Feb</div> <div>Mar</div> <div>Apr</div> <div>May</div> <div>Jun</div> <div>Jul</div> <div>Aug</div> <div>Sep</div> <div>Oct</div> <div>Nov</div> <div>Dec</div>
<i>Crinia sloanei</i> Sloane's Froglet	Yes (assumed present)	<div>Jan</div> <div>Feb</div> <div>Mar</div> <div>Apr</div> <div>May</div> <div>Jun</div> <div>Jul</div> <div>Aug</div> <div>Sep</div> <div>Oct</div> <div>Nov</div> <div>Dec</div>
<i>Hieraaetus morphnoides</i> Little Eagle	No (surveyed)	<div>Jan</div> <div>Feb</div> <div>Mar</div> <div>Apr</div> <div>May</div> <div>Jun</div> <div>Jul</div> <div>Aug</div> <div>Sep</div> <div>Oct</div> <div>Nov</div> <div>Dec</div>
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	No (surveyed)	<div>Jan</div> <div>Feb</div> <div>Mar</div> <div>Apr</div> <div>May</div> <div>Jun</div> <div>Jul</div> <div>Aug</div> <div>Sep</div> <div>Oct</div> <div>Nov</div> <div>Dec</div>
<i>Calyptrorhynchus lathamii</i> - endangered population Glossy Black-Cockatoo, Riverina population	No (surveyed)	<div>Jan</div> <div>Feb</div> <div>Mar</div> <div>Apr</div> <div>May</div> <div>Jun</div> <div>Jul</div> <div>Aug</div> <div>Sep</div> <div>Oct</div> <div>Nov</div> <div>Dec</div>

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00012982/BAAS17047/18/00012985	Wyalong Solar Farm	24/02/2018
Assessor Name	Report Created	BAM Data version *
Steven Sass	30/10/2018	3
Assessor Number	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BAAS17047		

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

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Candidate SAI	Ecosystem credits
Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions								
1	76_Mod-good	25.9	0.2	0.25	High Sensitivity to Potential Gain	2.00	TRUE	2
							Subtotal	2
							Total	2

BAM Credit Summary Report

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Candidate SAI	Species credits
<i>Calyptrorhynchus lathami</i> / Glossy Black-Cockatoo (Fauna)						
76_Mod-good	25.9	0.16	0.25	2	N/A	2
					Subtotal	2
<i>Crinia sloanei</i> / Sloane's Froglet (Fauna)						
76_Mod-good	25.9	0.16	0.25	1.5	False	2
					Subtotal	2
<i>Lathamus discolor</i> / Swift Parrot (Fauna)						
76_Mod-good	25.9	0.16	0.25	3	True	3
					Subtotal	3
<i>Tyto novaehollandiae</i> / Masked Owl (Fauna)						
76_Mod-good	25.9	0.16	0.25	2	N/A	2
					Subtotal	2



BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00012982/BAAS17047/18/00012985	Wyalong Solar Farm	24/02/2018
Assessor Name	Assessor Number	BAM Data version *
Steven Sass	BAAS17047	3
Proponent Names	Report Created	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.
	30/10/2018	

Candidate Serious and Irreversible Impacts

Nil

Nil

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

BAM Biodiversity Credit Report (Like for like)

No Changes

Ecosystem Credit Summary

PCT	TEC	Area	Credits
76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	0.2	2.00

Credit classes for	Like-for-like options		
76	Any PCT with the below TEC	Containing HBT	In the below IBRA subregions
	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (including PCT's 76, 80, 81, 82, 101, 110, 237, 248)	No	Lower Slopes,Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary



BAM Biodiversity Credit Report (Like for like)

Species	Area	Credits
Calyptrorhynchus lathami / Glossy Black-Cockatoo	0.2	2.00
Crinia sloanei / Sloane's Froglet	0.2	2.00
Lathamus discolor / Swift Parrot	0.2	3.00
Tyto novaehollandiae / Masked Owl	0.2	2.00

Calyptrorhynchus lathami / Glossy Black-Cockatoo	76_Mod-good	Like-for-like options	
		Only the below Spp	In the below IBRA subregions
		Calyptrorhynchus lathami /Glossy Black-Cockatoo	Any in NSW
Crinia sloanei / Sloane's Froglet	76_Mod-good	Like-for-like options	
		Only the below Spp	In the below IBRA subregions
		Crinia sloanei /Sloane's Froglet	Any in NSW
Lathamus discolor / Swift Parrot	76_Mod-good	Like-for-like options	
		Only the below Spp	In the below IBRA subregions



BAM Biodiversity Credit Report (Like for like)

		Lathamus discolor/Swift Parrot	Any in NSW
Tyto novaehollandiae/ Masked Owl	76_Mod-good	Like-for-like options	
		Only the below Spp	In the below IBRA subregions
		Tyto novaehollandiae/Masked Owl	Any in NSW



BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00012982/BAAS17047/18/00012985	Wyalong Solar Farm	24/02/2018
Assessor Name	Assessor Number	BAM Data version *
Steven Sass	BAAS17047	3
Proponent Name(s)	Report Created	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.
	30/10/2018	

Candidate Serious and Irreversible Impacts

Nil

Nil

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

BAM Biodiversity Credit Report (Variations)

No Changes

Ecosystem Credit Summary

PCT	TEC	Area	Credits
76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions	0.2	2.00

Credit classes for 76

Like-for-like options

Any PCT with the below TEC	Containing HBT	In the below IBRA subregions
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions (including PCT's 76, 80, 81, 82, 101, 110, 237, 248)	No	Lower Slopes,Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Any PCT in the below Formation	And in any of below trading groups	Containing HBT	In the below IBRA regions/subregions
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BAM Biodiversity Credit Report (Variations)

	Grassy Woodlands	Tier 2 or higher	No	IBRA Region: NSW South Western Slopes, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
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Species Credit Summary

Species	Area	Credits
Calyptrorhynchus lathami / Glossy Black-Cockatoo	0.2	2.00
Crinia sloanei / Sloane's Froglet	0.2	2.00
Lathamus discolor / Swift Parrot	0.2	3.00
Tyto novaehollandiae / Masked Owl	0.2	2.00

Calyptrorhynchus lathami / Glossy Black-Cockatoo	76_Mod-good	Like-for-like options		
		Only the below Spp		In the below IBRA subregions
		Calyptrorhynchus lathami /Glossy Black-Cockatoo		Any in NSW
		Variation options		
		Any Spp in the below Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	In the below IBRA subregions

BAM Biodiversity Credit Report (Variations)

		Fauna	Vulnerable	Lower Slopes,Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Crinia sloanei/ Sloane's Froglet	76_Mod-good	Like-for-like options		
		Only the below Spp		In the below IBRA subregions
		Crinia sloanei /Sloane's Froglet		Any in NSW
		Variation options		
		Any Spp in the below Kingdom	Any species with same or higher category of listing under Part 4 of teh BC Act showb below	In the below IBRA subregions
		Fauna	Vulnerable	Lower Slopes,Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Lathamus discolor/ Swift Parrot	76_Mod-good	Like-for-like options		
		Only the below Spp		In the below IBRA subregions

BAM Biodiversity Credit Report (Variations)

		Lathamus discolor /Swift Parrot		Any in NSW
		Variation options		
		Any Spp in the below Kingdom	Any species with same or higher category of listing under Part 4 of teh BC Act showb below	In the below IBRA subregions
		Fauna	Endangered	Lower Slopes,Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Tyto novaehollandiae /Masked Owl	76_Mod-good	Like-for-like options		
		Only the below Spp	In the below IBRA subregions	
		Tyto novaehollandiae /Masked Owl		Any in NSW
		Variation options		
		Any Spp in the below Kingdom	Any species with same or higher category of listing under Part 4 of teh BC Act showb below	In the below IBRA subregions

BAM Biodiversity Credit Report (Variations)

		Fauna	Vulnerable	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
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Biodiversity payment summary report

Assessment Id	Payment data version	Revision number	Report created
00012982/BAAS17047/18/00012985	36	0	30/10/2018

PCT list

Include	PCT common name	Credits
Yes	76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2

Species list

Include	Species	Credits
Yes	<i>Calyptrorhynchus lathamii</i> (Glossy Black-Cockatoo)	2
Yes	<i>Lathamus discolor</i> (Swift Parrot)	3
Yes	<i>Tyto novaehollandiae</i> (Masked Owl)	2
Yes	<i>Crinia sloanei</i> (Sloane's Froglet)	2

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

Biodiversity payment summary report

IBRA sub region	PCT common name	Baseline price	Dynamic coefficient	Market coefficient	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Lower Slopes	76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions Warning: This PCT has NO trades recorded	\$1,383.09	0.98932860	0.42807727	21.64%	\$20.00	1.0000	\$2,409.58	2	\$4,819.16
Subtotal (excl. GST)										\$4,819.16
GST										\$481.92
Total ecosystem credits (incl. GST)										\$5,301.08

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10140	<i>Calyptrorhynchus lathami</i> (Glossy Black-Cockatoo)	Vulnerable	\$485.58	20.8700%	\$20.00	2	\$1,213.84
10455	<i>Lathamus discolor</i> (Swift Parrot)	Endangered	\$296.96	20.8700%	\$20.00	3	\$1,136.81
10820	<i>Tyto novaehollandiae</i> (Masked Owl)	Vulnerable	\$485.58	20.8700%	\$20.00	2	\$1,213.84
20088	<i>Crinia sloanei</i> (Sloane's Froglet)	Vulnerable	\$485.58	20.8700%	\$20.00	2	\$1,213.84

Biodiversity payment summary report

Subtotal (excl. GST)		\$4,778.33
GST		\$477.83
Total species credits (incl. GST)		\$5,256.16
Grand total		\$10,557.24

10.4 BAM Calculator output – Zone 1 – Paddock trees

Paddock Tree Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00012990/BAAS17047/18/00012992	Wyalong Solar Farm Paddock Trees	24/02/2018
Assessor Name	Report Created	BAM Data version *
Steven Sass	29/10/2018	3
Assessor Number	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BAAS17047		

Paddock Trees

PCT code	PCT name	No. of trees	Species	DBHOB Category	Contain hollows	Class	Assessment required
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2	Eucalyptus microcarpa	>= 20cm and <50cm	False	2	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2	Eucalyptus melliodora	>= 20cm and <50cm	False	2	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species

Paddock Tree Report

76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2	Eucalyptus microcarpa	> 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	7	Callitris endlicheri	> 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	1	Allocasuarina luehmannii	> 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	3	Callitris glaucophylla	> 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	10	Eucalyptus microcarpa	> 50cm	True	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	14	Eucalyptus microcarpa	> 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species

Paddock Tree Report

76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	1	Acacia salicina	> 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2	Eucalyptus microcarpa	> 50cm	True	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00012990/BAAS17047/18/00012992	Wyalong Solar Farm Paddock Trees	24/02/2018
Assessor Name	Report Created	BAM Data version *
Steven Sass	29/10/2018	3
Assessor Number	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BAAS17047		

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

Common Name	Scientific Name
Barking Owl	Ninox connivens
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae
Dusky Woodswallow	Artamus cyanopterus cyanopterus
Flame Robin	Petroica phoenicea
Glossy Black-Cockatoo	Calyptorhynchus lathami
Grey Falcon	Falco hypoleucos
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata
Koala	Phascolarctos cinereus
Little Eagle	Hieraaetus morphnoides
Little Pied Bat	Chalinolobus picatus
Major Mitchell's Cockatoo	Lophochroa leadbeateri
Masked Owl	Tyto novaehollandiae
Painted Honeyeater	Grantiella picta
Scarlet Robin	Petroica boodang
Speckled Warbler	Chthonicola sagittata
Superb Parrot	Polytelis swainsonii
Swift Parrot	Lathamus discolor
Varied Sittella	Daphoenositta chrysoptera



BAM Predicted Species Report

White-bellied Sea-Eagle	Haliaeetus leucogaster
Yellow-bellied Sheath-tail-bat	Saccolaimus flaviventris

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00012990/BAAS17047/18/00012992	Wyalong Solar Farm Paddock Trees	24/02/2018
Assessor Name	Report Created	BAM Data version *
Steven Sass	29/10/2018	3
Assessor Number	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BAAS17047		

Paddock Trees Credit Requirement

Class	Contains hollows	Number of trees	Ecosystem credits
76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions			
2	False	2.0	1
2	False	2.0	1
3	False	2.0	2
3	False	7.0	5
3	False	1.0	1
3	False	3.0	2
3	True	10.0	10
3	False	14.0	11
3	False	1.0	1
3	True	2.0	2
			36
			36



BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00012990/BAAS17047/18/00012992	Wyalong Solar Farm Paddock Trees	24/02/2018
Assessor Name	Assessor Number	BAM Data version *
Steven Sass	BAAS17047	3
Proponent Names	Report Created	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.
	29/10/2018	

Candidate Serious and Irreversible Impacts

Nil

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Ecosystem Credit Summary

BAM Biodiversity Credit Report (Like for like)

PCT	TEC	Credits
76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions	36.00

Credit classes for	Like-for-like options		
76	Any PCT with the below TEC	Containing HBT	In the below IBRA subregions
	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions	Yes	Lower Slopes,Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.



BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00012990/BAAS17047/18/00012992	Wyalong Solar Farm Paddock Trees	24/02/2018
Assessor Name	Assessor Number	BAM Data version *
Steven Sass	BAAS17047	3
Proponent Name(s)	Report Created	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.
	29/10/2018	

Candidate Serious and Irreversible Impacts

Nil

Additional Information for Approval

PCTs With Customized Benchmarks
No Changes

Ecosystem Credit Summary

BAM Biodiversity Credit Report (Variations)

PCT	TEC	Credits
76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions	36.00

Credit classes for 76	Like-for-like options			
	Any PCT with the below TEC	Containing HBT	In the below IBRA subregions	
	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Yes	Lower Slopes,Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.	
	Variation options			
Any PCT in the below Formation	And in any of below trading groups	Containing HBT	In the below IBRA regions/subregions	
Grassy Woodlands	Tier 2	Yes (including artificial)		

Biodiversity payment summary report

Assessment Id	Payment data version	Revision number	Report created
00012990/BAAS17047/18/00012992	36	0	29/10/2018

PCT list

Include	PCT common name	Credits
Yes	76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	36

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

IBRA sub region	PCT common name	Baseline price	Dynamic coefficient	Market coefficient	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Lower Slopes	76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions Warning: This PCT has NO trades recorded	\$1,383.09	0.98932860	0.42807727	21.64%	\$20.00	1.0000	\$2,409.58	36	\$86,744.80

Subtotal (excl. GST) **\$86,744.80**

GST **\$8,674.48**



Biodiversity payment summary report

Total credits (incl. GST)	\$95,419.28
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11 Attachment 1. Preliminary Biodiversity Assessment Report

15 June 2018

Cédric Bergé
Environmental Consultant - Development Manager
ESCO Pacific
Level 4, 13 Cremorne Street
Richmond VIC 3121

Dear Cédric,

Re: Preliminary (Due Diligence) Biodiversity Assessment, West Wyalong Solar Farm, New South Wales

Introduction

ESCO Pacific engaged Ecolink Consulting to undertake a preliminary site inspection of 1086 Newell Highway, Wyalong, approximately 12 kilometres east of West Wyalong, New South Wales (the study area; Figure 1).

The purpose of this report is to provide ESCO Pacific with a brief overview of likely biodiversity values of the study area and provide a statement of potential ecological constraints to the future development of the site as a solar farm.

Methods

The study area was provided to Ecolink by ESCO Pacific in a KMZ file (Tulloch.kmz). It identifies approximately 259ha of land owned by the Tulloch family, located to the north of the Newell Highway (Figure 1).

A limited desktop assessment was undertaken to determine the historic records of threatened¹ flora and fauna species, or their habitats. This included:

¹ Threatened includes species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and *Threatened Species Conservation Act 1995* (NSW)

- The Department of the Environment and Energy (DoEE) Protected Matters Search Tool (Department of the Environment and Energy 2018); and
- BioNet - the database for the Atlas of NSW Wildlife (NSW Office of Environment and Heritage 2018)

A brief site assessment was undertaken of the study area on 13 June 2018 by Stuart Cooney, Principal Ecologist. The assessor drove throughout the property, stopping periodically to look at ecological features and vegetation that was representative of the vegetation communities. Photographs of vegetation typical of the property were taken. Surrounding areas were also briefly assessed, as well as potential access points to the proposed development.

During the site inspection, dominant species were recorded and general land use at the time of the assessment was recorded and mapped onto an iPad mini with GIS Pro software (accurate to +/- 5m). This data was used to create Figure 1. Areas of high ecological merit (e.g. threatened flora and fauna habitats) were assessed more closely than areas that were unlikely to support such values.

Limitations

Due to the brief nature of the assessment, the following limitations apply:

- A limited desktop assessment was undertaken to provide background information from historic data and databases. Plant Community Type (PCT) vegetation community mapping is not available for the study area and is estimated from nearby data.
- The assessment is preliminary in nature, and only a small amount of time was spent on site. More time would allow for a more complete understanding of the ecological values of the site.
- Winter is not the preferred season to undertaking biodiversity assessment as some plants may only be visible during certain time (e.g. geophytes, orchids), and the plants have generally finished flowering or seeding. This fertile material is used for identification purposes, and without it, the identification of some plants is difficult or impossible.
- Some fauna species may only be recorded during certain times or seasons (e.g. nocturnal mammals and birds, migratory birds). The author has made an informed decision about the likely presence of threatened species that may be present, or that may utilise habitats within the study area, based on a detailed desktop assessment, a review of the species' biology, an understanding of the ecological values of the local area, and an assessment of fauna habitats.

Nonetheless, the purpose of this preliminary assessment is to inform ESCO Pacific of high level constraints to development of the site, and this assessment is adequate for these purposes.

Results

The study area is characterised by an apparent long history of agricultural land use. It comprises three paddocks, each of which are fenced and are similar in nature, comprising large areas of cultivated earth where, at the time of the assessment, sprouting crops were growing. These

crops comprised Canola in the northern, and Barley in the middle and southern paddocks (Plates 1–2). The current land use has rotated these crops, with other nitrogen fixing species, for the last eight years under the current land-owner, and been managed in a similar way under previous land managers (K. Tulloch, Landowner, Pers. Comm. 14 Jun 2018). In years when cropping does not occur, the paddocks are grazed by cattle (K. Tulloch, Landowner, Pers. Comm. 14 Jun 2018).

A small number of isolated paddock trees remain within the paddocks. These trees are remnants of the woodlands that once dominated the landscape. These species comprise three species, in order of dominance: Western Grey Box *Eucalyptus microcarpa*, White Cypress Pine *Callitris glaucophylla*, and Buloke *Allocasuarina luehmannii*. Approximately 55 of these trees remain within the study area. Many of these trees are old trees that are senescing or dead and some of them contain hollows that may provide nesting resources for birds and mammals. On the western boundary of the study area some planted exotic Radiata Pines *Pinus radiata* line the fence, while some Australian native, but not indigenous, Red Ironbarks *Eucalyptus sideroxylon* have been planted along a fenceline separating two paddocks (Figure 1). The only other overstorey species recorded during the current assessment were some exotic Pepper Trees *Schinus molle* in the south of the study area, near the existing access point. This area is more heavily treed than surrounding areas and is understood to have historically been the site of a school, that has been removed (K. Tulloch, Landowner, Pers. Comm. 14 Jun 2018).

The understorey vegetation was generally of extremely low quality and almost entirely devoid of native vegetation. Native grasses may persist along fencelines and in the south-western corner of the study area, near the southern dam, where cultivation does not take place. Even in these areas, however few native species were recorded, partly due to the season, which makes the identification of native species difficult, but mostly because these areas remain dominated by pasture grasses and weeds from surrounding areas. Environmental weeds including Flaxleaf Fleabane *Conyza bonariensis*, Spear Thistle *Cirsium vulgare*, and Paddy Melon *Cucumis myriocarpus*, were among the most abundant weed species.

Ten native bird species were recorded during the current assessment (Table 1). A further three birds were recorded in higher quality habitat within the road reserve to the north of the study area. All of the recorded species recorded within the study area are common, large, gregarious species that have adapted well to a disturbed agricultural landscape. It would be expected that other birds, mammals and reptiles would be recorded within the study area with a greater amount of time spent on-site.

Three dams are located within the study area: one in each of the three paddocks (Figure 1; Plates 3–5). Although each of these dams held water at the time of the site assessment, none of them support aquatic vegetation and lack vegetation surrounding them, limiting their utility for many native fauna species. They are, however, likely to provide water to a range of species and Australian Wood Ducks *Chenonetta jubata*, a common indigenous species, was recorded during the current assessment on the southern-most dam.

Table 1. Fauna species recorded during the current assessment

Common Name	Scientific Name
Australian Wood Duck	<i>Chenonetta jubata</i>
Crested Pigeon	<i>Ocyphaps lophotes</i>
Galah	<i>Eolophus roseicapillus</i>
Eastern Rosella	<i>Platycercus eximius</i>
Blue Bonnet *	<i>Northiella haematogaster</i>
Australian Ringneck *	<i>Barnardius zonarius</i>
Red-rumped Parrot	<i>Psephotus haematonotus</i>
Noisy Miner	<i>Manorina melanocephala</i>
Grey-crowned Babbler *	<i>Pomatostomus temporalis</i>
Australian Raven	<i>Corvus coronoides</i>
Pied Butcherbird	<i>Cracticus nigrogularis</i>
Australian Magpie	<i>Cracticus tibicen</i>
Magpie-lark	<i>Grallina cyanoleuca</i>
Apostlebird	<i>Struthidea cinerea</i>

* species recorded north of the study area

Access to the study area will be achieved via the Newell Highway through the road reserve. The location of this access is yet to be determined, however likely sites include the current access site in the south-western corner of the study area, or closer to where the power lines cross into the property, further east. Generally the road reserve retains relatively high quality remnant vegetation with an intact overstorey and midstorey, and a moderate quality understorey (Plate 6). This vegetation extends for most of the length of the study area, however it has been cleared where the powerlines cross the Newell Highway and enter the study area (Plate 7). Here, the vegetation is of lower quality than the rest of the road reserve, lacking overstorey trees and midstorey shrubs. Some parts of this vegetation may be 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, which is also considered a threatened vegetation community under NSW policy.

Seven threatened flora and fourteen threatened fauna species have previously been recorded within three kilometres of the study area (Figure 2). This includes:

- Magpie Goose *Anseranas semipalmata* (Vulnerable (NSW));
- Blue-billed Duck *Oxyura australis* (Vulnerable (NSW));
- Spotted Harrier *Circus assimilis* (Vulnerable (NSW));
- Little Eagle *Hieraaetus morphnoides* (Vulnerable (NSW));
- Glossy Black-Cockatoo *Calyptorhynchus lathami* (Vulnerable (NSW));
- Major Mitchell's Cockatoo *Lophochroa leadbeateri* (Vulnerable (NSW));
- Swift Parrot *Lathamus discolor* (Endangered (NSW)/Critically Endangered EPBC Act);
- Brown Treecreeper (eastern subspecies) *Climacteris picumnus victoriae* (Vulnerable (NSW));
- Speckled Warbler *Chthonicola sagittata* (Vulnerable (NSW));

- Painted Honeyeater *Grantiella picta* (Vulnerable (NSW)/Vulnerable EPBC Act);
- Grey-crowned Babbler (eastern subspecies) *Pomatostomus temporalis temporalis* (Vulnerable (NSW));
- Varied Sittella *Daphoenositta chrysoptera* (Vulnerable (NSW));
- Hooded Robin (south-eastern form) *Melanodryas cucullata cucullata* (Vulnerable (NSW));
- Diamond Firetail *Stagonopleura guttata* (Vulnerable (NSW));
- A spear-grass *Austrostipa wakoolica* (Endangered (NSW)/Endangered EPBC Act);
- Yellow Gum *Eucalyptus leucoxylon* subsp. *pruinosa* (Vulnerable (NSW));
- Spiny Peppercress *Lepidium aschersonii* (Vulnerable (NSW)/Vulnerable EPBC Act);
- *Philothea angustifolia* subsp. *angustifolia* (Endangered (NSW));
- *Philothea ericifolia* (Vulnerable (NSW)/Vulnerable EPBC Act);
- Slender Darling Pea *Swainsona murrayana* (Vulnerable (NSW)/Vulnerable EPBC Act);
- *Tylophora linearis* (Vulnerable (NSW)/Endangered EPBC Act).

None of these species have previously been recorded from within the study area. During the current assessment, Grey-crowned Babblers were recorded to the north of the study area, in higher quality habitat, and this species have previously been recorded from the road reserve to the south-west of the study area. There is only a low likelihood that any threatened flora species occur within private property, although there is a higher likelihood of occurrence within road reserve and further assessment may be warranted in this location. There is the potential that the other threatened fauna species occur within private property on occasion, when foraging or moving between other more suitable habitats within the landscape, and a more detailed assessment will be required to accurately determine their use of the study area. Again, higher quality habitats occur within the road reserve, and these may also require further investigation. Further assessments are likely to form part of the Biodiversity Development Assessment Report (BDAR) and Environmental Impact Statement (EIS) requirements for this project.

Brief assessments of the properties to the east and west of the study area, from the fences of the study area, suggest that neither of these properties are likely to be significantly less constrained from an ecological perspective. Each of these paddocks contain a similar, mix of isolated paddock trees over a cropped understorey, although the density of the paddock trees may be higher on these surrounding paddocks. These paddocks were briefly assessed as potential alternative locations, should the current study area prove to be unviable for any reason.

Discussion

The vegetation within the study area is generally highly modified from its original state, associated with a long history of agricultural land use. It is characterised by scattered indigenous trees, amongst paddocks of exotic agricultural pastures. Accordingly the ecological values are generally described as low.

The most notable ecological values within the study area are the scattered Grey Box, White Cypress Pine and Buloke paddock trees, some of which contain hollows, which are important resources for a range of species, potentially including threatened species, such as owls, other

hollow nesting birds and bats. Higher ecological values occur within the road reserve that fronts the study area. The road reserve contains remnant woodland vegetation and is likely to provide important habitat corridors for a range of species, including plants and animals, to move across the landscape.

There are no significant waterways or wetlands within the study area. Although three dams occur within the study area, these dams lack vegetation and are unlikely to provide significant habitat to any species, although they may provide sources for water for large and mobile species that persist within the landscape.

Threatened flora species are unlikely to persist within the study area. Some threatened flora species may persist in the patches of native vegetation within the road reserve, and targeted surveys, in the appropriate season, would be required in locations that may be impacted by the proposed development. Threatened fauna species are similarly unlikely to persist within the study area due to the lack of high quality habitat, although mobile species such as birds and bats may use the study area infrequently or temporarily when moving between higher quality habitats within the landscape. On this basis it is unlikely to provide important or significant habitat for any threatened fauna species and none are likely to occur. Nonetheless, it is likely that the regulatory process for the EIS will require threatened species surveys for some of the fauna species that have been recorded near the study area, and others that are modelled to occur. These surveys will generally have seasonal constraints, but are likely to be limited in scope, given the lack of suitable habitat for threatened species within the study area.

It is unlikely that any nationally threatened ecological communities occur within the study area. Vegetation within the road reserve may be 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, which is also considered a threatened vegetation community under NSW policy. Further surveys of the preferred access point to the solar farm will be required to confirm the presence of this community.

The ecological values of the study area are generally low, and unlikely to be significant limitation to the development of the site. Nonetheless, the following recommendations are made to determine the nature and extent of those values, and ways to minimise future impacts to them:

- Where possible, avoid the indigenous paddock trees and patches of native vegetation in the road reserve, when developing the site's layout;
- Use the existing access point to the study area for construction and operational purposes. Where this is not possible more detailed surveys, including threatened flora species surveys, will be required at the alternative access point;
- Enter preliminary data into the BDAR Calculator to determine the threatened species modelled to occur and plan a survey timetable to ensure that survey requirements are met in a timely manner;
- Undertake a tree assessment within the study area to record location, species, size and presence of hollow/nesting habitat;
- Undertake appropriate Plot surveys, consistent with the BDAR, to complete the offset calculation process; and,

- Undertake targeted flora and fauna surveys that are likely to be required as part of the BDAR process, pending preliminary interrogation of the offset calculator, liaison with regulators, and development design/impacts.

We look forward to further assisting with this project in the future should you wish to proceed.

I trust the above meets with your expectations, but please call me if you have any queries, or require any amendments (Mobile phone no: 0419 894 948).

Kind regards,

A handwritten signature in black ink, appearing to read 'Stuart Cooney'.

Stuart Cooney
Principal Ecologist
Ecolink Consulting Pty Ltd

References

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Available at <http://www.environment.gov.au/arcgis-framework/apps/pmst/pmst.jsf>.
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Accessed 26 April 2018. NSW Office of Environment and Heritage, Sydney.

Plates



Plate 1. Ploughed paddocks within the study area looking north



Plate 2. Ploughed paddocks within the study area looking south



Plate 3. Northern –most dam



Plate 4. Central dam



Plate 5. Southern-most dam, with remnant vegetation in the Newell Highway road reserve to the south



Plate 6. Road reserve of the Newell Highway looking east



Plate 7. Gap in the Newell Highway road reserve native vegetation for the power line easement and potential access point



Figure 1. Results of the current assessment.

Wyalong Solar Farm, NSW

Legend

- Study Area
- Scattered Paddock Trees



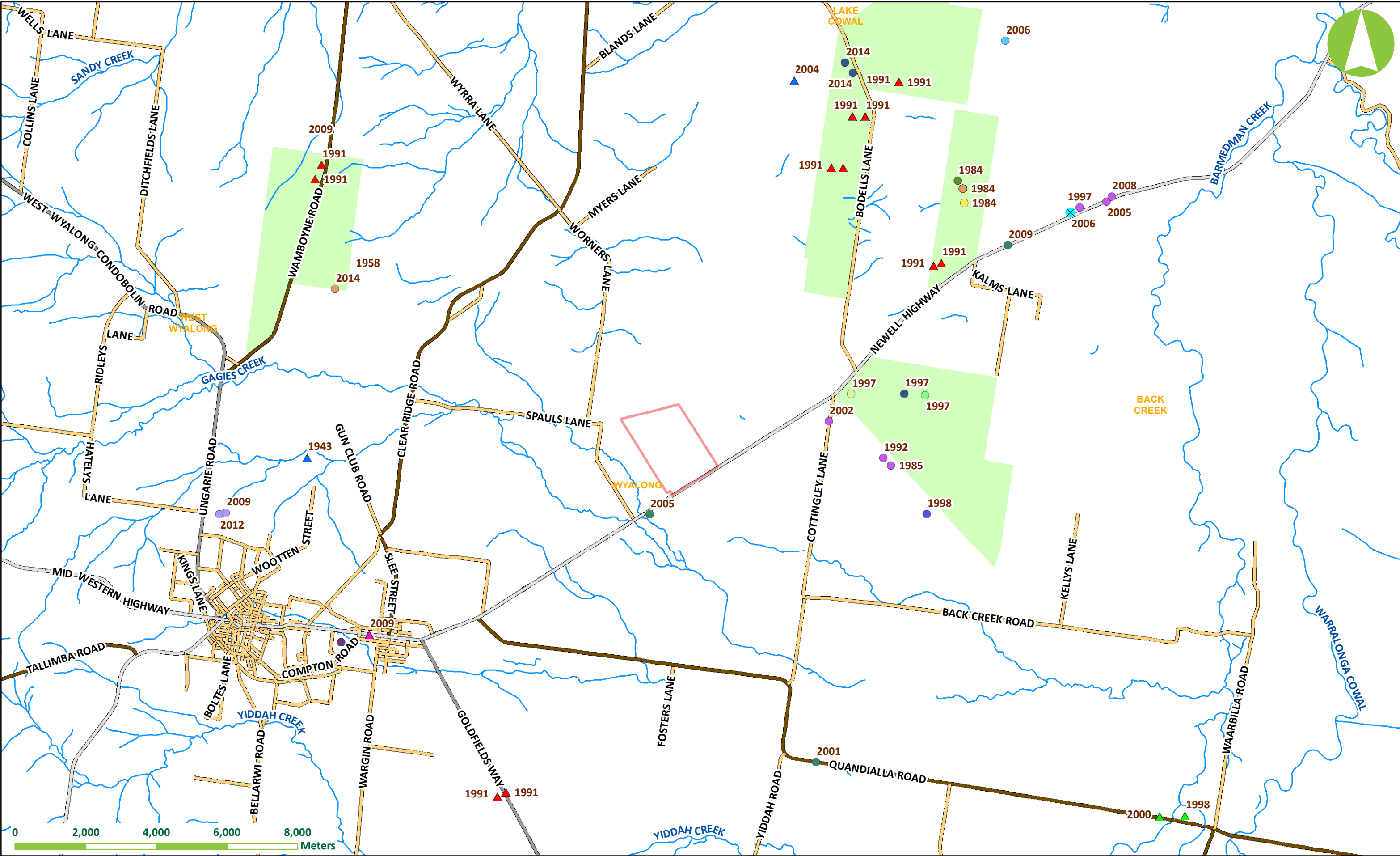


Figure 1. Results of the current assessment.

Wyalong Solar Farm, NSW