APPENDIX C
BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Stubbo Solar Farm
Biodiversity Development Assessment Report

UPC\AC Renewables Australia

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This document has been prepared by Eco Logical Australia Pty Ltd. Data from surveys undertaken by Red Sand Ecology also contributed to this assessment.

Template 2.8.1

Executive Summary

Eco Logical Australia Pty Ltd (ELA) was commissioned by UPC\AC Renewables Australia (UPC) to prepare a Biodiversity Development Assessment Report (BDAR) under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Biodiversity Assessment Method (BAM) for the development of a major grid-connected solar farm near Stubbo, NSW – the Stubbo Solar Farm.

This report has been prepared to meet the requirements of the Biodiversity Assessment Method (BAM) established under Section 6.7 of the NSW BC Act. The accredited BAM assessor who prepared the assessment is Tom Schmidt (BAAS19034).

The detailed project design is currently in preparation and this BDAR has been applied by assessing a development site within which all direct impacts (both construction and operation) will occur.

UPC has designed the development site by taking steps to avoid, minimise and mitigate impacts to biodiversity values. An original larger investigation area was surveyed in 2019, and the current site selected and refined over several iterations to avoid the areas of highest biodiversity value.

The development site covers approximately 1,200 ha and is primarily used for sheep and cattle grazing and cropping. Native vegetation is modified by both historical and ongoing farming practices and is generally restricted to isolated paddock trees or small patches of paddock trees with a modified understorey. Paddock areas, representing over 99% of the development site, are considered to be Category 1 – Exempt Land. These areas no longer comprise native plant communities due to historical agricultural activities including cropping and pasture improvement.

Two Plant Community Types (PCTs) were recorded in the development site totalling 5.53 ha including:

- PCT 281 - Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (5.29 ha)
- PCT 1770 - Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South (0.24 ha)

PCT 281 can conform to White Box - Yellow Box - Blakely's Red Gum Grassy Woodland, a Critically Endangered Ecological Community (CEEC) listed under the BC Act and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). All 5.29 ha of PCT 281 within the development site has been conservatively assessed to meet the CEEC threshold at a State level. Within the development site 0.17 ha was assessed as meeting the condition thresholds for the CEEC listed under the EPBC Act.

Flora and fauna habitats across the development site are generally significantly degraded, typical of a highly modified farming landscape. Assessment and survey of potential threatened species habitats recorded two threatened fauna species within or adjacent to the development site; Black Falcon (*Falco subniger*) and Barking Owl (*Ninox connivens*). Barking Owl is a candidate species and was assumed present within potential breeding habitat in the development site.

An assessment of the likely impacts of the project on aquatic ecology, including aquatic and riparian biodiversity and key fish habitats was undertaken. No significant impacts to aquatic ecological values are expected to occur.

An assessment of the impacts of the project on matters of national environmental significance (MNES) within the development site was undertaken to determine whether referral of the project to the Commonwealth Minister for the Environment is required. Assessments of significance were completed for one threatened ecological community, three threatened species and two migratory species. All assessments concluded that no significant impacts to MNES are predicted to result from the project.

Impacts requiring offsets are:

- PCT 281 - Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion_Low (5.12 ha); requiring 78 credits.
- PCT 281 - Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion_Mod_good (0.17 ha): requiring 7 credits.
- PCT 1770 - Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South_Low (0.24 ha); requiring 2 credits.
- Barking Owl (Breeding) 4.4ha; requiring 66 credits.

This BDAR has been prepared in accordance with the BAM. The development site has been designed to avoid and minimise impacts and is predominately located in areas of low or no biodiversity value. The residual impact of the proposed development requires 87 ecosystem credits and 66 species credits.

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Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	NSW Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	Critically Endangered Ecological Community
DNG	Derived Native Grassland
DoEE	Commonwealth Department of Environment and Energy
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
FM Act	NSW Fisheries Management Act 1994
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area

Abbreviation	Description
LLS	Local Land Service
NSW	New South Wales
NOW	NSW Office of Water
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SSI	State Significant Infrastructure
TEC	Threatened Ecological Community
VIS	Vegetation Information System
WM Act	NSW Water Management Act 2000

1. Stage 1: Biodiversity assessment

1.1 Introduction

Eco Logical Australia Pty Ltd (ELA) was commissioned by UPC\AC Renewables Australia (UPC\AC) to prepare a Biodiversity Development Assessment Report (BDAR) under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Biodiversity Assessment Method (BAM) for the development of a major grid-connected solar farm near Stubbo, NSW—the Stubbo Solar Farm. The Stubbo Solar Farm is designated as a State Significant Development (SSD-10452) under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The Planning Secretary's Environmental Assessment Requirements (SEARs) for the project were issued on 5 May 2020 and require the preparation of a BDAR to assess biodiversity impacts.

This Biodiversity Development Assessment Report (BDAR) has been prepared by Tom Schmidt, who is an Accredited Person (BAAS19034) under the BC Act. The contents of this BDAR complies with the minimum requirements outlined in the BAM (2017).

1.1.1 Assessment requirements

The SEARs relating to biodiversity and the relevant sections in this report are listed in Table 1.

Table 1: Agency requirements (DPIE- Biodiversity Conservation Division)

Assessment requirement	Relevant section
SEARs	
An assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the *Biodiversity Conservation Act 2016* (NSW), the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR), unless BCD (formerly OEH) and DPE determine that the proposed development is not likely to have any significant impacts on biodiversity values	Assessment has been undertaken in accordance with the BAM (2017) and documented in this BDAR.
The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM	Section 2.
An assessment of the likely impacts of the project on aquatic ecology, including aquatic and riparian biodiversity and key fish habitats	2.2.7
Biodiversity Conservation Division	
Biodiversity impacts related to the proposed development are to be assessed in accordance with Section 7.9 of the *Biodiversity Conservation Act 2016* the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the *Biodiversity Conservation Act 2016* (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and Biodiversity Assessment Method, unless the Department determine that the proposed development is not likely to have any significant impacts on biodiversity values.	Assessment has been undertaken in accordance with the BAM (2017) and documented in this BDAR.
The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method.	Section 2.
The BDAR must include details of the measures proposed to address the offset obligation as follows;	The total number and class of credits required to be retired to address the offset obligation for the

Assessment requirement	Relevant section
• The total number and classes of biodiversity credits required to be retired for the development/project; • The number and classes of like-for-like biodiversity credits proposed to be retired; • The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules; • Any proposal to fund a biodiversity conservation action; • Any proposal to conduct ecological rehabilitation (if a mining project); • Any proposal to make a payment to the Biodiversity Conservation Fund. If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.	proposed development are detailed in Section 2.5.
The BDAR must be submitted with all spatial data associated with the survey and assessment as per Appendix 11 of the BAM.	Spatial data is available in ESRI format and will be supplied to BCD.
The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the Biodiversity Conservation Act 2016.	This BDAR has been prepared by Tom Schmidt, Ecologist and BAM Assessor BAAS19034. This BDAR was also reviewed by Lily Gorrell Senior Ecologist and BAM Assessor BAAS17101

1.1.2 General description of the study area

The study area is located approximately 12 km north east of Gulgong in the Mid-Western Regional Council Local Government Area (LGA), within the NSW South Western Slopes Bioregion.

The study area is made up of several farming properties zoned as RU1 – Primary Production (under Mid-Western Regional LEP 2012) which are currently used primarily for livestock grazing and cropping. The study area is characterised by modified pastures with widely scattered remnant paddock trees (Plate 1).

The land is gently undulating lower slopes and flats associated with Stubbo Creek, an ephemeral waterway that drains westward through the centre of the site, with elevation ranges from approximately 550m in the east to 450m in the west. The project design includes an Environmental Exclusion Zone (EEZ) broadly around this area to avoid and minimise impacts on biodiversity, heritage and hydrology values. Within the EEZ larger patches of paddock trees and higher condition woodland are also present (Plate 2) and these areas have been excluded from the development site. The study area is accessed via Barneys Reef Road from the west, and Blue Springs Road from the east.

This report includes two base maps, the Site Map (Figure 1) and the Location Map (Figure 2).

Plate 1: General view of the development site showing modified pasture and widely scattered paddock trees.

Plate 2: General view of habitat within the EEZ that is excluded from the development site.

1.1.3 Development site

The proposed solar farm consists of Photovoltaic (PV) panels, which would have a combined capacity of approximately 400 megawatts (MW). The detailed design of the proposed solar farm is not yet completed. As such, this BDAR has been applied by assessing a maximum development site within which all direct impacts (both construction and operation) will occur.

The development site covers approximately 1,200 ha and is roughly divided in half into a northern and southern portion by the EEZ which occurs surrounding Stubbo Creek (Figure 1).

Up to two access/cable crossings will cross Stubbo Creek to provide connection between the northern and southern areas. Crossings will have a footprint of up to 20 m wide and will avoid all significant ecological and heritage values within the EEZ.

Three access options are included in this assessment, two from Blue Springs Road in the east and one from Barneys Reef Road in the west. It is likely that only one or two of these access options will be utilised in the final design and are outlined in the main Environmental Impact Statement (EIS) report. Access roads will be up to 10 m wide, with an allowance made for up to 15 m at the intersections with the public roads.

The development site has a history of cropping and grazing and is largely cleared of native vegetation. The large paddocks contain pastural grasses, legumes with scattered native paddock trees. All large patches of remnant vegetation within the study area have been avoided and are excluded from the development site.

The development site boundary has undergone several iterations with the view to reduce, where possible, the impacts to biodiversity, whilst maintaining a functional solar farm. Initial biodiversity investigations were undertaken in 2019 (by RPS and Red Sand Ecology) over a significantly larger area than the current development site. A preliminary EEZ was included within the early design, and following detailed field assessments and vegetation mapping as part of this BDAR the EEZ was expanded. Additional EEZs were also added to further avoid areas of native vegetation. Several other small areas of native vegetation near the periphery of the development site and riparian buffers will be avoided and are excluded from the development site (Figure 1).

1.1.4 Sources of information used

The following data sources were reviewed as part of this report:

- BioNet Atlas (DPIE 2020a)
- BioNet Threatened Biodiversity Data Collection (TBDC) (DPIE 2020b)
- BioNet Vegetation Classification (VIS) (DPIE 2020)
- Protected Matters Search Tool (PMST) (DAWE 2020a)
- Species Profile and Threats Database (DAWE 2020b)
- Register of Declared Areas of Outstanding Biodiversity Value
- Waterway Stream Orders (DPI, 2013)
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7 (DoEE, 2017)
- Stubbo Solar Farm Stage One Ecological Assessment (Red Sand Ecology 2019)
- NSW Department of Primary Industries freshwater threatened species distribution maps (Riches et al, 2016)
- Key Fish Habitat Maps (DPI 2007)

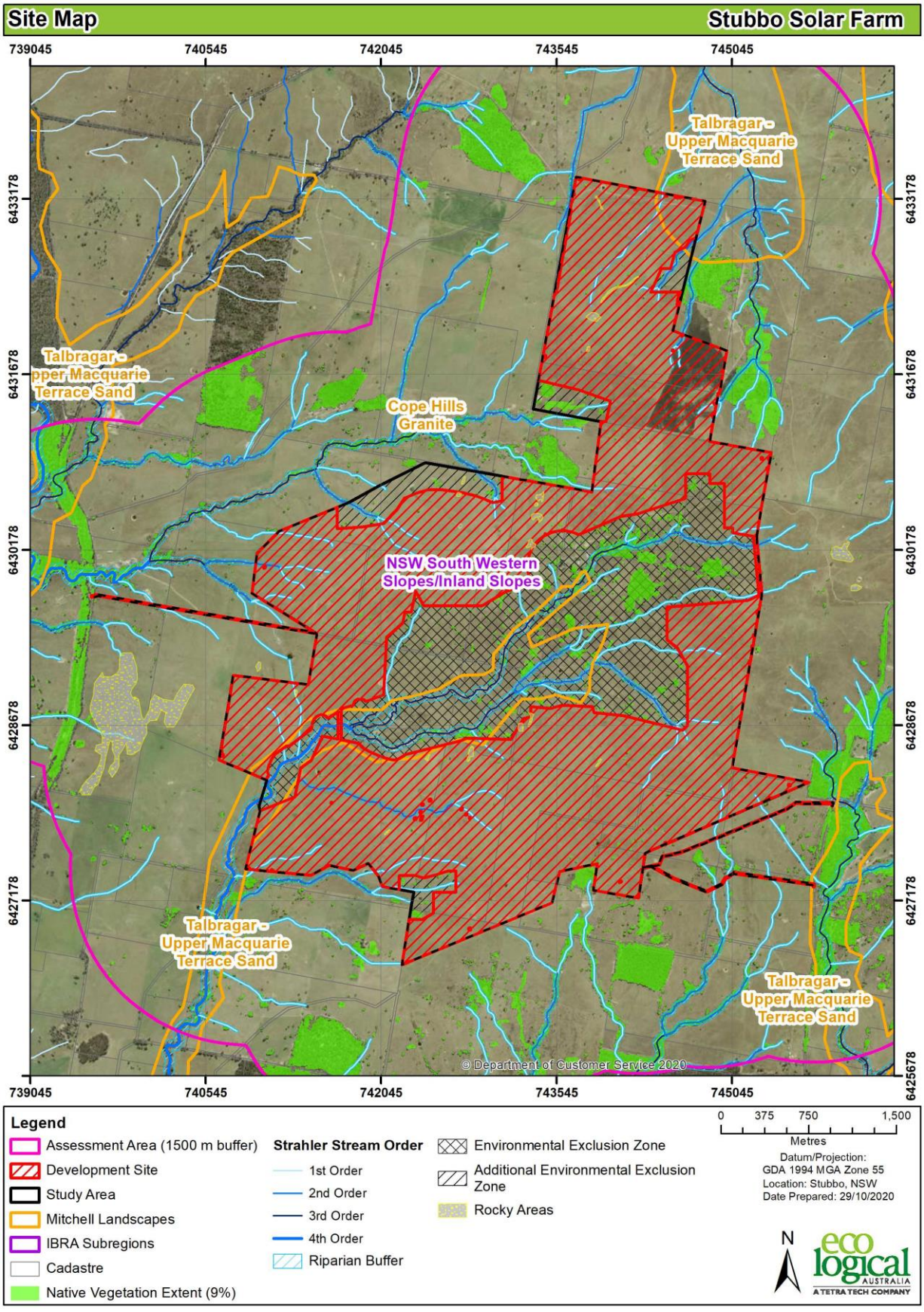

Figure 1: Site Map

Note: The dark area in aerial imagery in north east of development site is darkened due to agricultural activities/cropping and does not represent native vegetation.

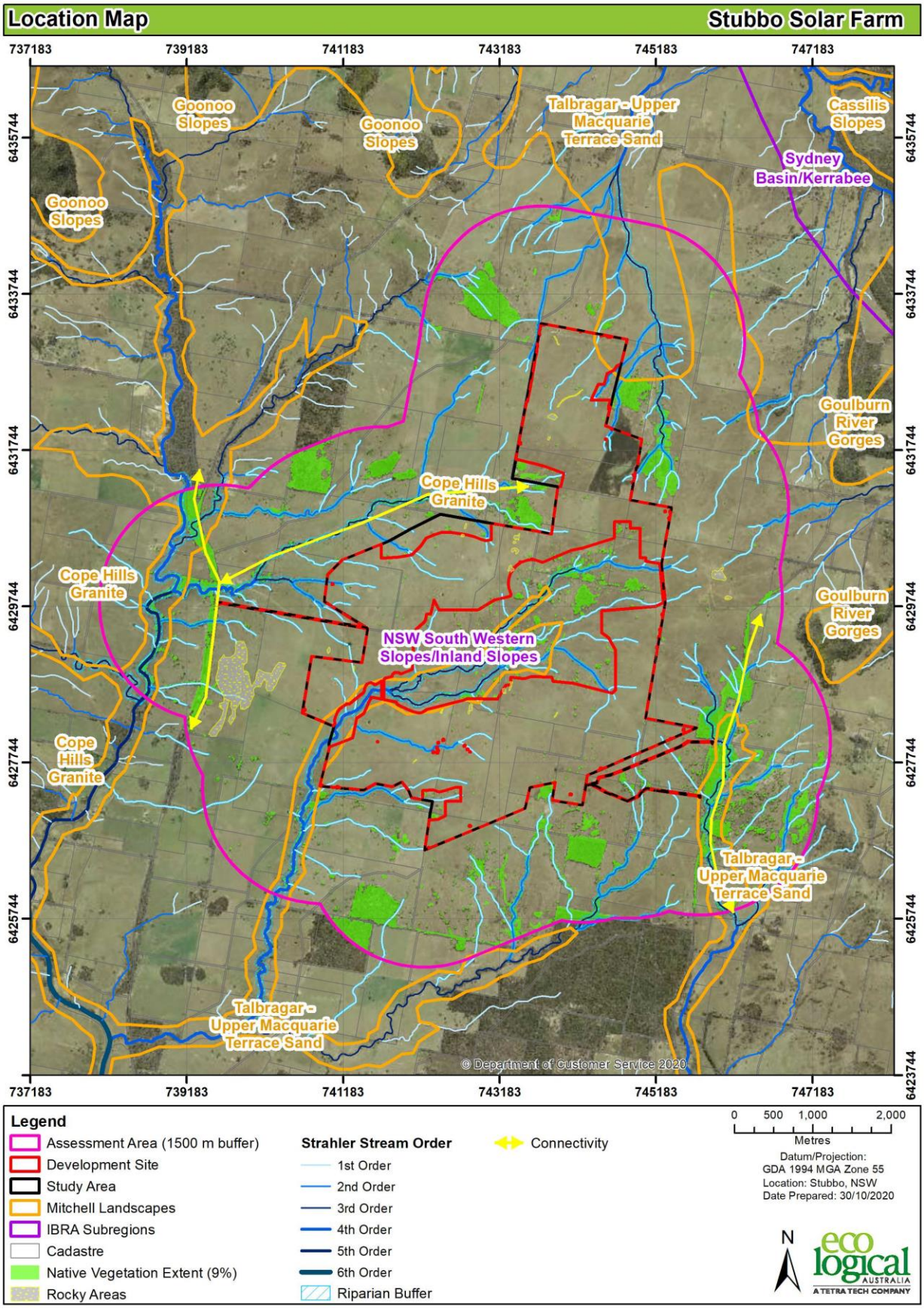

Figure 2: Location Map

1.2 Legislative context

Table 2: Legislative context

Name	Relevance to the project	Report Section
Commonwealth		
Environmental Protection and Biodiversity Conservation Act 1999	Matters of National Environmental Significance (MNES) have been identified on or near the development site. This report assesses impacts to MNES and concludes that the development is not likely to have a significant impact on MNES. UPC intend to prepare an EPBC Referral for project certainty.	MNES are addressed in Section 2.6.
State		
Environmental Planning and Assessment Act 1979	The proposed development is State Significant Development (SSD 10452) and is to be assessed under Part 4.1 of the EP&A Act. SEARs were issued on 5 May 2020 and require assessment of: • an assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the NSW BC Act the BAM and documented in a BDAR, unless BCD and DPIE determine that the proposed development is not likely to have any significant impacts on biodiversity values; and • the BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM; • an assessment of the likely impacts of the project on aquatic ecology, including aquatic and riparian biodiversity and key fish habitats;	Biodiversity values are assessed in Section 1. Impacts area assessed in Sections 2. Aquatic ecology is assessed in Section 1.7.
Biodiversity Conservation Act 2016	The proposed development is an SSD and requires submission of a Biodiversity Development Assessment Report (BDAR).	This report is a BDAR prepared in accordance with the BAM (2017).
Fisheries Management Act 1994	The development involves potential impacts to threatened species or their habitats listed in the FM Act and therefore assessments of significance are required in accordance with s5A of the EP&A Act.	Aquatic ecology is assessed in Section 1.7.
Planning Instruments		
SEPP (State and Regional Development) 2011	The proposed development is identified as an SSD under this SEPP.	-
SEPP (Infrastructure) 2007 (ISEPP)	The ISEPP aims to provide the framework to effectively deliver infrastructure projects throughout NSW. Relevant to this proposal, Clause 34(7) of the ISEPP provides that development for the purpose of a solar energy system may be carried out by any person with consent on any land providing it is not within a prescribed residential zone. The proposal is located within land zoned Primary Production (RU1). Primary Production (RU1) is not a prescribed residential zone and therefore the proposed development is permissible with consent pursuant to Clause 34(7).	-
SEPP – Koala Habitat Protection	SEPP – Koala Habitat Protection only applies to developments where Council is the determining authority.	-.
Mid-Western Regional Local Environmental Plan 2012	The project is a State Significant Development and will comply with EP&A Act and all relevant State Planning Instruments. The proposed development will aim to comply with LEP requirements and objectives in consultation with Mid-Western Regional Council.	-

Name	Relevance to the project	Report Section
	Clause 6.5 of the LEP relates to mapped areas of Biodiversity Sensitivity. The development has been designed to avoid, minimise and mitigate impacts to mapped areas of High and Moderate Biodiversity Sensitivity. This report addresses all requirements of Clause 6.5.	

1.3 Landscape features

1.3.1 IBRA regions and subregions

The development site falls within the Interim Biogeographic Regionalisation for Australia (IBRA) region and subregions as outlined in Table 3 and Table 4.

Table 3: IBRA regions

IBRA region	Area within development site (ha)
NSW South Western Slopes	The development site is wholly contained (100%) within the South Western Slopes Bioregion

Table 4: IBRA subregions

IBRA subregion	Area within development site (ha)
Inland Slopes	The development site is wholly contained (100%) within the Inland Slopes subregion

1.3.2 Native vegetation extent

The extent of native vegetation within the development site and buffer is outlined in Table 5.

Table 5: Native vegetation extent

Area within the development site (ha)	Area within the 1,500 m buffer area (ha)
5.53ha	549ha

There are minor differences between the mapped vegetation extent within the development site and the aerial imagery for the following reason:

- Approximately 30 paddock trees visible in aerial imagery across the development site are no longer present on the ground.

1.3.3 Rivers and streams

The development site contains rivers and streams as outlined in Table 6. Watercourses and stream buffers are mapped on the Site Map (Figure 1) and the Location Map (Figure 2).

Table 6: Rivers and streams

River/stream	Order	Riparian buffer
Stubbo Creek	1-4	10m-40m (Plate 3)
Unnamed second order drainage	2	20m
Unnamed first order drainage	1	10m (Plate 4)

Plate 3: Stubbo Creek at the western crossing point (fourth order stream).

Plate 4: Unnamed ephemeral drainage line within development site

1.3.4 Wetlands

The development site does not contain any significant wetlands.

Approximately 19 small farm dams are present across the development site. None of these dams contain significant amounts of aquatic vegetation or high quality wetland habitat (Plate 5; Plate 6).

Plate 5: Typical farm dam within the development site.

Plate 6: Typical farm dam within the development site (aerial view).

1.3.5 Connectivity features

Connectivity features are present at the periphery of the development site, associated with road reserves and vegetated drainages (Figure 2). These areas contain higher quality, more connected woodland habitats within the assessment area and may facilitate movement of threatened species across their local range.

1.3.6 Areas of geological significance and soil hazard features

The development site and assessment area do not contain any areas of geological significance such as karsts, caves, crevices or cliffs. Areas of granite rocky outcropping are present across the development site (Figure 1 and 2; Plate 7). The suitability of these areas as fauna habitat is addressed in Section 1.5.

The development site occurs on the Rouse Soil Landscape, described as undulating hills and low hills with granite outcropping as tors and sloping pavements. Parent rocks are granite, adamellite and granodiorite. Soils are mainly shallow Siliceous Sands and Earthy Sands on mid-slopes and upper slopes. Yellow Soloths and yellow Solodic Soils on lower slopes and in depressions (DPIE 2020).

This soil landscape is considered to have a high to very high erosion hazard under heavy grazing. Within the development site gully erosion is present in some drainage lines (Plate 4). No other soil hazard features are known to occur.

Plate 7: Rock outcropping within the development site. Habitat quality degraded due to grazing.

1.3.7 Areas of Outstanding Biodiversity Value

No Areas of Outstanding Biodiversity Value (AOBV) are present within the development site or assessment area.

1.3.8 Site context

1.3.8.1 Method applied

The BAM site-based method has been applied to this development.

1.3.8.2 Percent native vegetation cover in the landscape

The current percent native vegetation cover in the landscape was assessed in a Geographic Information System (GIS) using aerial imagery sourced from SIX Maps. The results of this analysis are shown in Table 7.

Table 7: Percent native vegetation cover in the landscape

Area within the development site (ha)	Cover within the 1,500 m buffer area (%)
5.53 ha (0.45% of 1,232 ha development site)	9% (549 ha out of the 6,072ha assessment area)

1.3.8.3 Patch size

The development site contains a high number of very small patches of native vegetation. Due to the complexity of calculating patch size for each patch, patch size was conservatively assessed as 101ha (i.e. the maximum) for all patches.

1.4 Native vegetation

1.4.1 Survey effort

Preliminary vegetation survey was undertaken by ELA ecologists Tom Schmidt and Martin Sullivan on 25 and 26 May 2020. The purpose of the survey was to collect rapid data points to broadly identify the extent and type of native vegetation and PCTs present and inform initial vegetation mapping. This information was used to refine the development site to avoid and minimise impacts to biodiversity values within the study area.

Vegetation integrity surveys were undertaken within the development site and broader study area including the EEZ. Surveys were completed by ELA ecologists Tom Schmidt and Daniel McKenzie on 2-4 September 2020, Tom Kelly and David Allworth from 15-18 September 2020 and Tom Schmidt on 15-16 October 2020 (Figure 5).

A total of 33 full-floristic vegetation plots were surveyed to identify PCTs and TECs (Table 8). A total of 33 vegetation integrity plots were undertaken in accordance with the BAM (Table 9).

Survey plots were completed across the study area, including areas that have now been avoided and are no longer within the development site. Where a sufficient number of plots was available from within the development site, only those plots were included in the assessment of the vegetation integrity score. Only a very small area of moderate-good condition vegetation (total of 0.17 ha) is present within the final development site and no plots were undertaken in these areas due to their limited size. As such, all plots from this vegetation zone within the study area were utilised in calculating the vegetation integrity score for this zone. The plots undertaken in the broader study area are representative and in better condition than the small patches inside the development site, therefore this is considered to be a conservative approach.

All field data collected at full-floristic and vegetation integrity plots is included in Appendix B:.

1.4.1.1 Previous surveys

Previous surveys were undertaken during 2019 by RPS and Red Sand Ecology across a larger study area.

RPS collected rapid vegetation data points and BAM plot data across a larger regional study area that was used by UPC to identify the study area by avoiding significant areas of native vegetation. Red Sand Ecology completed BAM plot surveys across the study area and surrounding areas to inform the preliminary environmental assessment. The Central West Region, including Stubbo, was experiencing drought conditions during 2019 and the plot data from these surveys was not used in this assessment.

Table 8: Full-floristic PCT identification plots

PCT ID	PCT Name	Number of plots surveyed
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	26
1770	Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South	1
-	Modified pasture /cropland (Category 1 Land)	7
Total		**33**

Table 9: Vegetation integrity plots

Veg Zone	PCT ID	PCT Name	Condition	Area (ha)	Plots required	Plots surveyed
1	281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Low	5.12	3	10
2	281		Mod-good	0.17	1	14
3	1770	Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South	Low	0.24	1	1
Category 1 Land	-	Non-Native	-	1226.8	0	7
N/A	281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Planted	Not within development site	0	1
Total						**33**

1.4.2 Category 1 Land

A BDAR for an SSD does not need to assess the impacts of any clearing of native vegetation and loss of habitat on land classified as 'Category 1 – exempt land' (Category 1 Land) under the NSW *Local Land Services Act 2013* (LLS Act), other than impacts 'prescribed' in Clause 6.1 of the NSW Biodiversity Conservation Regulation 2017.

Category 1 Land is not currently mapped on the Native Vegetation Regulatory Map. In the absence of published mapping, Category 1 Land is taken to include land that meets any of the following criteria:

- Land cleared of native vegetation as at 1 January 1990 or lawfully cleared after 1 January 1990
- Low conservation grasslands
- Land containing only low conservation groundcover (not being grasslands)
- Native vegetation identified as regrowth in a Property Vegetation Plan under the repealed *Native Vegetation Act 2003*
- Land bio-certified under the BC Act.

All paddock areas within the development site are considered to qualify as Category 1 Land for the following reasons:

1. Modified pasture in the NSW Land Use Mapping (DPIE 2017)
    - The majority of the development footprint is identified as “Grazing modified pastures” in the NSW Land Use Mapping (Figure 3). A small proportion of the development footprint is mapped as “Grazing native pastures”; however, in these areas there is evidence of ploughing in current and historical aerial imagery and these areas were observed to be in the same condition as the remainder of the site.
2. Evidence of pasture improvement and cropping
    - Aerial imagery reveals extensive cropping and ploughing over time from 1964 to current; including historic images and current imagery (Plate 8 to Plate 11).
3. Current condition (recorded using BAM)
    - The current vegetation integrity score for the paddock zone within the development site is 5.2 (assessed using 7 BAM plots across the area (Category 1 Land (Table 9)). This confirms the above assessment that these areas of the development site are in very low condition and would not require offsetting under the BAM.

For any part of the proposed development that is on Category 1 Land, only 'prescribed impacts' require further assessment.

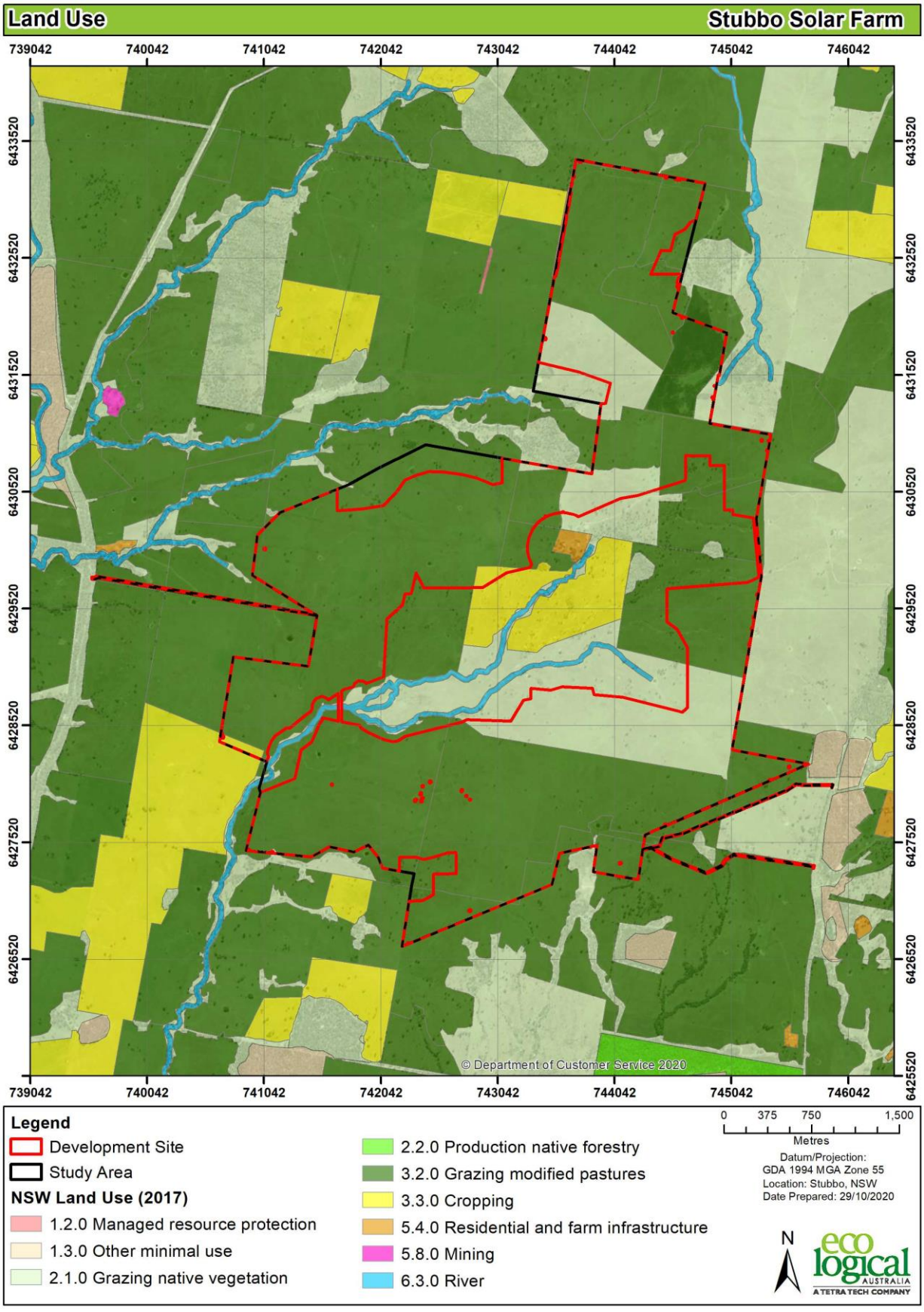

Figure 3: NSW Land Use mapping identifying modified pastures across the majority of the development site

Plate 8: Example of cropping/ploughing from 1982 aerial imagery

Plate 9: Current cropping (bright green) and evidence of past cropping/ploughing striations in modified pasture in foreground

Plate 10: Pasture improvement evident in striated paddocks of modified pasture in the development site

Plate 11: Improved pasture typical of the development site

1.4.3 Plant Community Types present and threatened ecological communities

Two PCTs were identified on the development site (Table 10, Figure 4). One of which is listed as a TEC under the BC Act and EPBC Act (Table 11, Figure 6). A total of three vegetation zones were recorded as described in the profiles in Table 13Table 15. The selection of the PCTs occurring on the development site was based on a quantitative analysis of full-floristic plot data and PCT descriptions in the VIS, with justification for the selections provided in Table 12. The estimated percentage cleared value for each PCT, sourced from the VIS, is also presented in Table 10.

It has been conservatively estimated that all 5.29 ha of PCT 281 within the development site comprises of the NSW BC Act listed CEEC *White Box Yellow Box Blakely's Red Gum Woodland* (Table 11). Disturbed remnants are still considered to form part of the community including remnants where the vegetation, either understorey, overstorey or both, would, under appropriate management, respond to assisted natural regeneration, such as where the natural soil and associated seed bank are still at least partially intact (NSW Scientific Committee 2011). It is considered that some areas within the 5.29 ha would respond to assisted natural regeneration.

The majority of PCT 281 does not meet the condition thresholds for EPBC Act listed CEEC *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* due to the degraded understory not containing sufficient cover or diversity of native species. 0.17 ha of PCT 281, where the groundcover was in higher condition is considered to represent the listed community (Table 11).

Table 10: Plant Community Types

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Area	Percent cleared	TEC
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Western Slopes Grassy Woodlands	Grassy Woodlands	5.29ha	67	Yes
1770	Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South	Western Slopes Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	0.24ha	11	No

Table 11: Threatened Ecological Communities

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Area (ha)	Listing status	Name	Area (ha)
281	Critically Endangered	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South	5.29	Critically Endangered	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	0.17ha

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Area (ha)	Listing status	Name	Area (ha)
		Western Slopes, South East Corner and Riverina Bioregions				

Table 12: PCT selection justification

PCT ID	PCT Name	Selection criteria	Species relied upon for identification of vegetation type and relative abundance
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	IBRA Region and Subregion Species	*Angophora floribunda* (Rough-barked Apple), *Eucalyptus blakelyi* (Blakely's Red Gum), *E. melliodora* (Yellow Box) – dominant canopy species.
1770	Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South	IBRA Region and Subregion Canopy species	*Eucalyptus crebra* (Narrow-leaved Ironbark) is the dominant canopy species within this PCT at the site. Due to disturbance few other diagnostic species remain.

Table 13: PCT281_Low

PCT 281 Low			
Vegetation formation/class/structure	Western Slopes Grassy Woodlands / Grassy Woodlands / Woodland		
Conservation status	BC Act: CEEC. EPBC Act: Not listed due to not meeting condition thresholds.		
	This community occurs across the site as scattered individual remnant trees and some small clumps of trees within modified pasture. The mid-storey is absent. Canopy regeneration is absent. The groundcover contains a mix of exotic pasture species with fallen timber in some patches. The groundcover is significantly degraded.		
Characteristic canopy trees	*Angophora floribunda* (Rough-barked Apple), *Eucalyptus blakelyi* (Blakely's Red Gum), *E. melliodora* (Yellow Box)		
Characteristic mid-storey	Absent.		
Characteristic groundcovers	*Austrostipa* spp., Eragrostis sp., *Aristida* sp.,		
Mean native richness	10		
Exotic species / HTW cover	*Arctotheca calendula*, *Echium plantagineum, Lolium* sp., *Medicago* sp. and *Trifolium* spp / 0.3		
Condition	Low		
Variation and disturbance	This zone is characterised by remnant canopy with a highly degraded understorey that contains a mixture of exotic and native species. This zone includes isolated trees within paddock and small groups of trees		
% cleared in NSW	67		
No. sites sampled	10 (only the 7 sites within the development footprint were used in calculating the vegetation integrity score)		
Threatened flora species	No present. This zone is considered too degraded for threatened flora to occur.		
Fauna habitats	Hollow bearing trees, flowering eucalypts. Fallen logs are present in some patches.		
Composition	**Structure**	**Function**	**Vegetation Integrity Score**
51	24.2	22.9	30.5

Table 14: PCT 281 Moderate - good

PCT 281 Moderate-good			
Vegetation formation/class/structure	Western Slopes Grassy Woodlands / Grassy Woodlands / Woodland		
Conservation status	BC Act: CEEC EPBC Act: CEEC where condition thresholds are met.		
	This zone is characterised by remnant canopy with a partly intact shrub and groundcover layer, although exotic species are also abundant. This zone within the development site has generally suffered from some level of historic clearing or disturbance but is regenerating. This zone occurs within the development site as narrow strips of road reserve vegetation and a small patch at the edge of the development site near the southern boundary where some regeneration and shrubs are present.		
Characteristic canopy trees	*Angophora floribunda* (Rough-barked Apple), *Eucalyptus blakelyi* (Blakely's Red Gum), *E. melliodora* (Yellow Box)		
Characteristic mid-storey	*Acacia implexa, Cassinia sifton, Acacia decora, Sannantha cunninghamii*		
Characteristic groundcovers	*Aristida ramosa, Austrostipa spp., Arundanella nepalensis, Calotis lappulacaea, Cheilanthes* sp*, Wahlenbergia* spp.		
Mean native richness	27		
Exotic species / HTW cover	*Arctotheca calendula, Lolium sp,* Trifolium spp. *Acetosella vulgaris, Hypochaeris radicata* / 0.16		
Condition	Low		
Variation and disturbance	Access road options have been selected in areas so that no trees will be impacted but where some mid-storey and groundcover is present.		
% cleared in NSW	67		
No. sites sampled	14. Plots utilised for calculations within this zone were taken from the study area as no plots were undertaken in the development site due to the small size of these areas i.e. could not fit a plot in. Vegetation in the study area was considered representative of the condition of the small areas of vegetation within PCT 281 Moderate-good, and in some cases is an overestimation of the condition within the development site.		
Threatened flora species	Not present, targeted survey did not detect potential threatened species within this zone in the development site.		
Fauna habitats	Patches within the development site do not contain hollow bearing trees or significant amounts of fallen timber. Patches within the broader study area contain hollow bearing trees, flowering eucalypts and fallen logs.		
Composition	**Structure**	**Function**	**Vegetation Integrity Score**
84.2	76.3	70.8	76.9

Table 15: PCT 1770 Low

PCT 1770 Low			
Vegetation formation/class/structure	Dry Sclerophyll Forest (Shrubby sub-formation) / Western Slopes Dry Sclerophyll Forest / Woodland		
Conservation status	BC Act: Not listed EPBC Act: Not listed		
	This community occurs as isolated remnant paddock trees of *Eucalyptus crebra* (Narrow-leaved ironbark) with a highly degraded understorey that contains a mixture of exotic and native species.		
Characteristic canopy trees	*Eucalyptus crebra* (Narrow-leaved Ironbark)		
Characteristic mid-storey	Absent		
Characteristic groundcovers	*Erodium crinitum, Austrostipa scabra, Cynodon dactylon, Chloris truncata, Rumex brownii.*		
Mean native richness	8		
Exotic species / HTW cover	*Arctotheca calendula*, *Spergularia rubra, Trifolium* spp. *Medicago* sp. / 0.1		
Condition	Low		
Variation and disturbance	This zone includes widely scattered remnant trees within exotic modified pasture.		
% cleared in NSW	11		
No. sites sampled	1		
Threatened flora species	No present. This zone is considered too degraded for threatened flora to occur.		
Fauna habitats	Hollow bearing trees, flowering eucalypts and fallen logs are present.		
Composition	**Structure**	**Function**	**Vegetation Integrity Score**
28.6	5.2	35.1	17.4

Table 16: Exotic pasture (Category 1 Land)

Exotic/modified pastures and cropland (Category 1 Land)			
Vegetation formation/class/structure	Not applicable		
Conservation status	Not listed		
	Areas of exotic/modified pasture within the development site no longer conform to any PCT. These areas have been cleared of canopy and mid-storey. The groundcover has been modified through pasture improvement, ploughed/sown, cropped and heavy grazing. Exotic pasture species dominate. Scattered native grasses and forbs are present, and the native species *Erodium crinitum* acts as a dominant pasture weed in some areas.		
Characteristic canopy trees	Not present.		
Characteristic mid-storey	Not present.		
Characteristic groundcovers	Exotics: *Arctotheca calendula* (Cape Dandelion), *Trifolium* spp. (Clovers), *Medicago* sp. (Medic), *Echium plantagineum* (Paterson's Curse), *Lolium* sp. (Rye Grass), *Eragrostis cilianensis* (Stinkgrass), Avena sp. (Oats), *Spergularia rubra* (Red Sandspurry), *Lepidium* spp. (Peppergrasses). Native: *Erodium crinitum* (Blue Storksbill), *Eragrostis* sp. (Lovegrass), *Austrostipa* spp (Speargrasses), *Aristida spp.* (Wiregrasses), *Crassula* sp. (Stonecrop).		
Exotic species / HTW cover	As listed above / 1.3		
Condition	Very low – not representative of a native plant community type		
Variation and disturbance	Includes modified pastures and cropland.		
% cleared in NSW	n/a		
No. sites sampled	6		
Threatened flora species	None present. This zone is considered too degraded for threatened flora to occur.		
Fauna habitats	Limited habitat opportunities.		
Similar PCTs	n/a		
Composition	**Structure**	**Function**	**Vegetation Integrity Score**
60	38.2	0.1	5.2

1.4.4 Vegetation integrity assessment

A vegetation integrity assessment using the Credit Calculator (BAMC) was undertaken and the results are outlined in Table 17.

Table 17: Vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current vegetation integrity score
1	281	Low	5.12	51	24.2	22.9	30.5
2	281	Mod - good	0.17	84.2	76.3	70.8	76.9
3	1770	Low	0.24	28.6	5.2	35.1	17.4

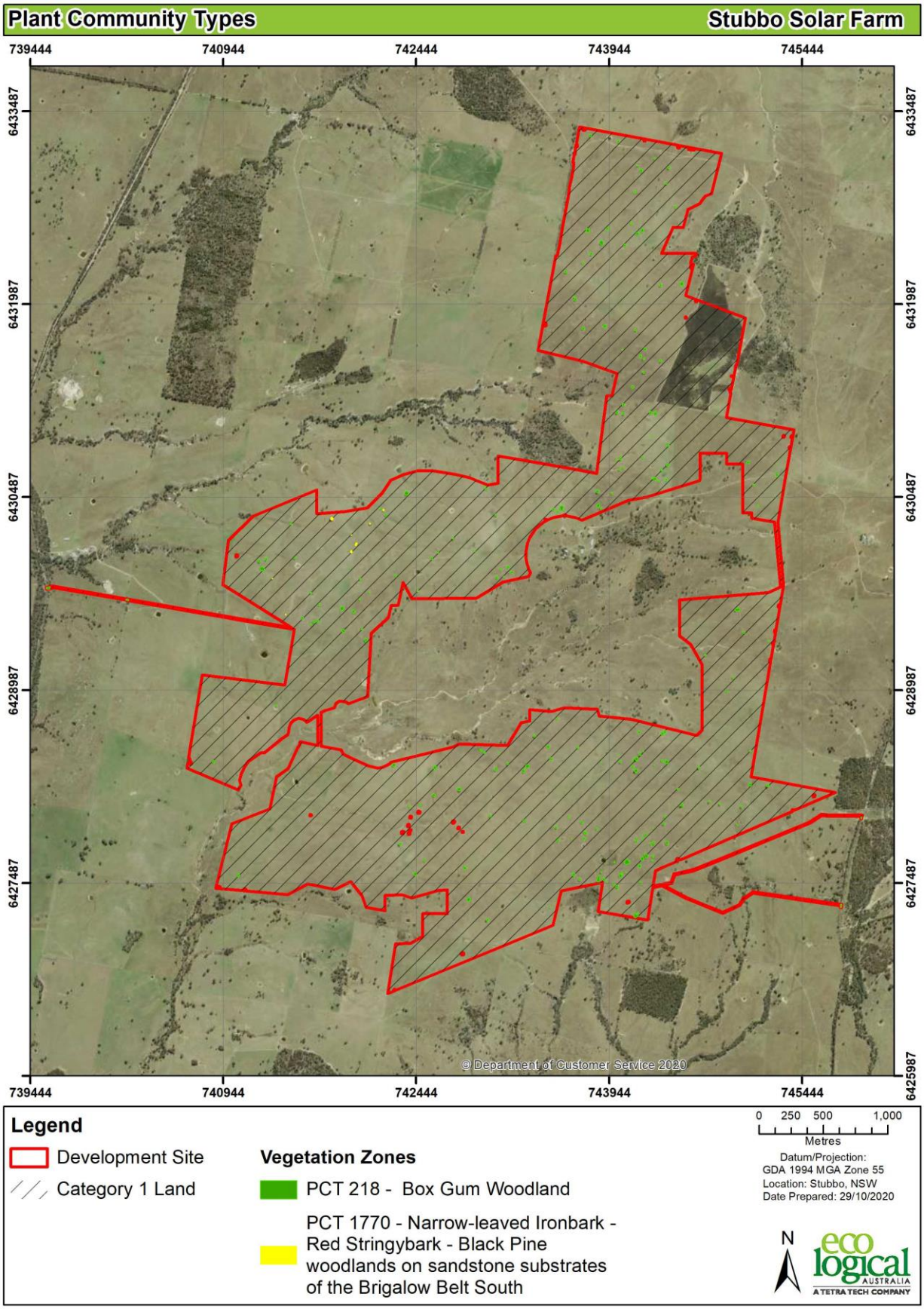

Figure 4: Plant Community Types and native vegetation extent

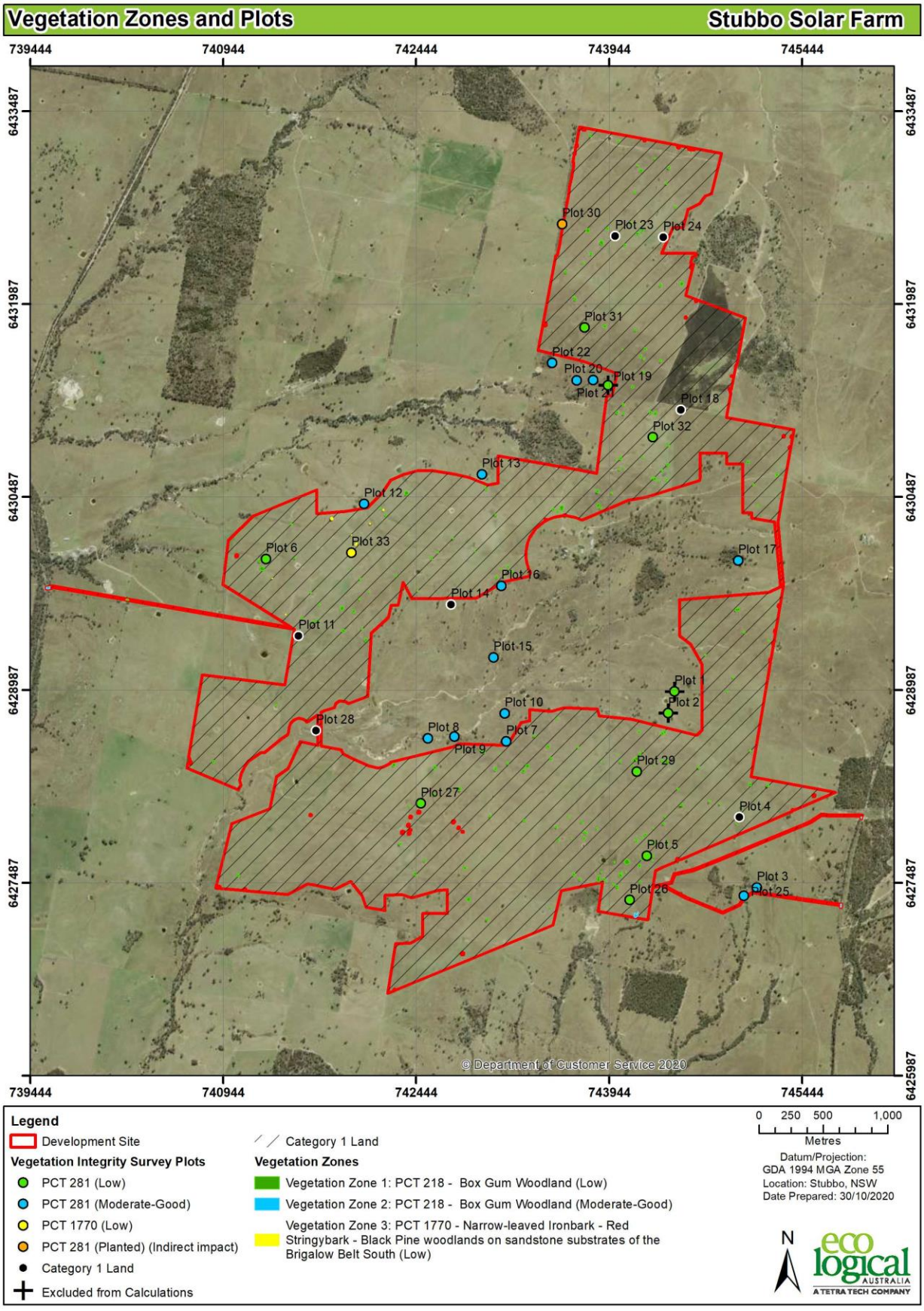

Figure 5: Plot locations

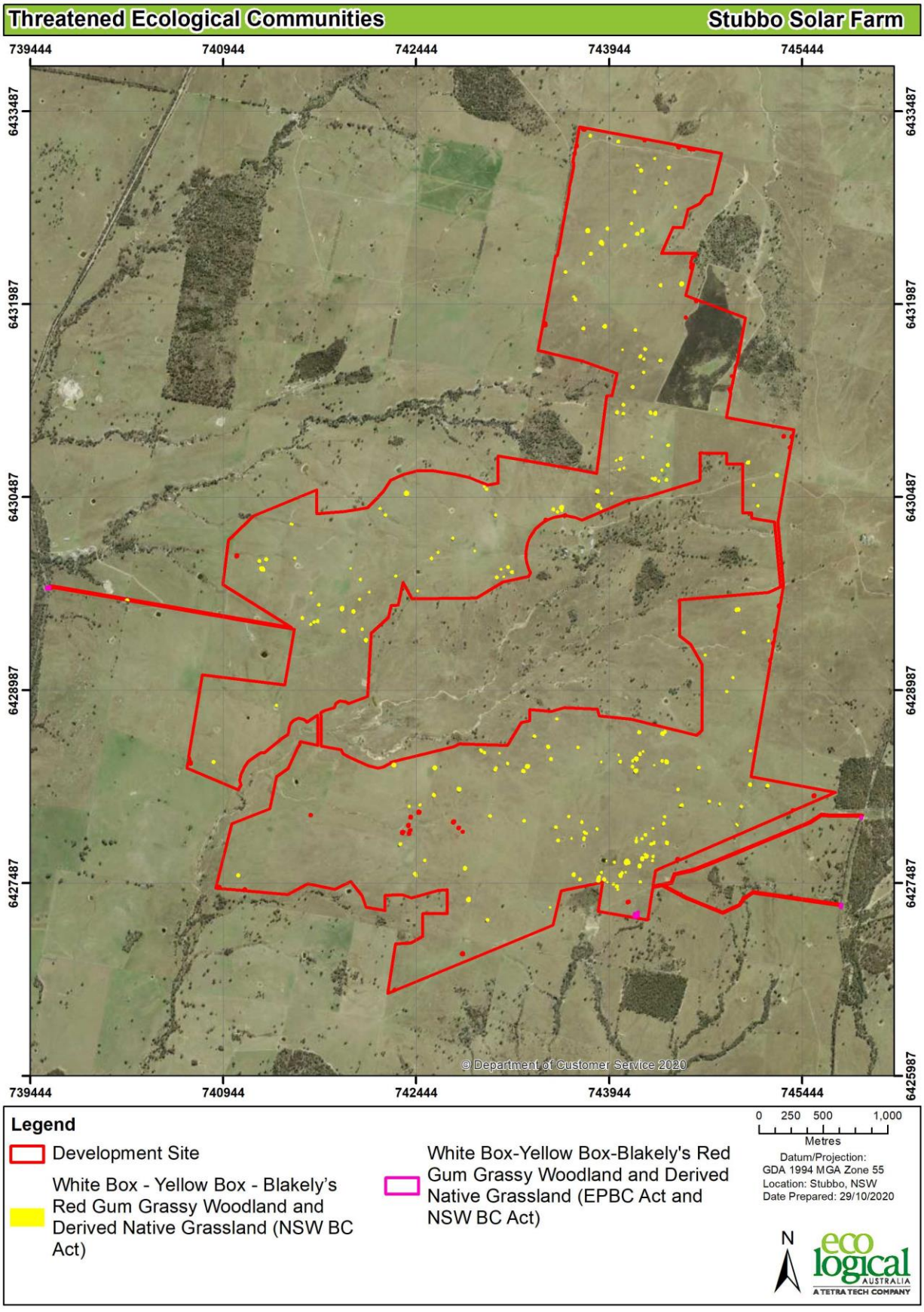

Figure 6: Threatened Ecological Communities

1.5 Threatened species

1.5.1 Fauna habitats

Fauna habitats were assessed concurrent with vegetation surveys. Fauna habitats within the development site are typical of a predominately cleared grazing farmland, with the available habitat features considerably degraded. The following sections describe the habitat features present within the development site.

1.5.1.1 Grassland/modified pasture/cropped areas

Modified pastures (Plate 12) and cropped areas (Plate 13) dominate the development site (representing over 99% of the development site) and present limited habitat opportunities and primarily providing foraging habitat for common farmland birds such as Australasian Pipit (*Anthus novaeseelandiae*), Australian Magpie (*Cracticus tibicen*) and Nankeen Kestrel (*Falco cenchroides*).

Plate 12: Modified pasture typical of the development site. Limited habitat opportunities.

Plate 13: Cropped Oat paddock within development site. Limited habitat opportunities.

1.5.1.2 Woodland habitats

Woodland areas in low condition within the development site contain a seasonal flower resource, trees with hollows and fallen timber. The mid-storey is generally absent, and the groundcover is highly modified and degraded and does not contain dense tussock grasses or other significant habitat features (Plate 14; Plate 15). Hollows are abundant, including large hollows >20 cm in diameter, and common farmland birds such as Galah (*Eolophus roseicapilla*), Eastern Rosella (*Platycercus eximius*) and Sulphur-crested Cockatoo (*Cacatua galerita*) were observed using hollows. Higher condition woodland areas contain some shrubs and a higher diversity of native groundcover species, although these areas are very limited in extent within the development site, with only 0.17 ha present.

Woodlands within the development site generally have poor connectivity as they are present as isolated paddock trees or small patches. Habitat corridors are present at the periphery of the development site along public road reserves.

Plate 14: Low condition woodland within the development site. Mature scattered trees with degraded/exotic groundcover.

Plate 15: Woodland with more intact mid-storey and ground cover. Typical of road reserves access points.

1.5.1.3 Farm dams

Numerous small farm dams are present across the development site. These areas present habitat for common species such as ducks, herons and grebes. Habitat quality is low owing to the bare, eroded banks, and general lack of emergent and surrounding vegetation cover (Plate 16).

Plate 16: Typical fam dam within the development site

1.5.1.4 Rock outcrops

Granite rock outcrops occur across the development site and vary in nature from large boulders to smaller scattered surface rock. Areas that include only large deeply embedded granite boulders are not considered suitable habitat for Pink-tailed Worm Lizard (*Aprasia parapulchella*) (Plate 17). Areas with loose surface rock were considered potential habitat for Pink-tailed Worm Lizard (Plate 18). Five outcrop areas with some loose surface rock were considered to contain marginal or potential habitat and were surveyed for Pink-tailed Worm Lizard.

Plate 17: Rock outcropping within the development site. Habitat quality degraded due to grazing.

Plate 18: Rock outcropping within the development site. Considered potential habitat for Pink-tailed Worm Lizard.

1.5.1.5 Aquatic habitats

Aquatic habitats within the development site include:

- ephemeral stream with semi-permanent pools and small patches of aquatic vegetation (Stubbo Creek) (Plate 19 and Plate 21)
- ephemeral, unnamed drainage lines within cleared paddocks
- farm dams.

Riparian areas within the development site are generally cleared, or contain widely scattered remnant eucalypts with predominantly exotic, degraded groundcover vegetation due to a history of agricultural disturbance (Plate 22).

Aquatic habitat features absent from the development site are overhanging banks, overhanging vegetation, dense leaf litter and rocks and snags.

The development site includes up to two access and cable crossings of Stubbo Creek as part of the development. The western crossing (fourth order stream) and the eastern crossing (second order stream). At the western crossing Stubbo Creek is a semi-permanent stream 1-4 m wide and up to 30 cm deep, on a fine gravel substrate. The creek is within an approximately 15 m wide x 2 m deep gully (Plate 21). This area contains small patches of aquatic plants such as *Typha* sp. (Bullrush), and where the eroded banks contain vegetation it is predominately exotic pasture species and weeds. At the eastern crossing, Stubbo Creek is an ephemeral drainage line present as a minor depression within exotic pasture and does not contain any significant habitat features (Plate 20).

Several first order drainage lines also occur within the development site. These areas are typically ephemeral drainage lines, present as minor depressions within cleared paddocks areas and do not contain any significant habitat features.

Plate 19: Western crossing location of Stubbo Creek (fourth order stream)

Plate 20: Eastern crossing of Stubbo Creek (second order stream)

Plate 21: Stubbo Creek aquatic habitat in the development site. Semi-permanent shallow pool.

Plate 22: Unnamed ephemeral drainage line within development site lacking aquatic habitat

1.5.1.6 Key Fish Habitat

The development site contains mapped Key Fish Habitat at the location of the western cable crossing of Stubbo Creek (Plate 19). No other areas of Key Fish Habitat are present within the development site.

The likelihood of impacts to waterways are assessed in relation to their sensitivity (TYPE) and waterway class (CLASS).

Habitat at the proposed western cable crossing of Stubbo Creek represents TYPE 2 – Moderately sensitive key fish habitat and is CLASS 2 – Moderate fish habitat as it contains an intermittent creek, with clearly defined bed and banks with semi-permanent water.

All other drainage lines within the development site are considered CLASS 4 - unlikely fish habitat and are not mapped as key fish habitat. Farms dams within the development site do not present key fish habitat.

1.5.1.7 Threatened aquatic species

The development site contains one area, at the western crossing of Stubbo Creek, that is mapped within the indicative distribution of the Purple Spotted Gudgeon (*Mogurnda adspersa*) (Figure 7). Purple Spotted Gudgeon is listed as endangered under the NSW *Fisheries Management Act 1994* (FM Act).

Purple Spotted Gudgeon is a benthic species that can be found in a variety of habitat types such as rivers, creeks and billabongs with slow-moving or still waters or in streams with low turbidity. Cover in the form of aquatic vegetation, overhanging vegetation from river banks, leaf litter, rocks or snags are important for the species.

Habitat quality for Purple Spotted Gudgeon in the development site is considered to be low due to:

- limited covering habitat such as overhanging trees and banks, snags and rocks
- absence of surrounding tree and shrub vegetation
- ephemeral nature (i.e. the site would be dry at times)
- high level of disturbance and eutrophication from agricultural activities

As such, Purple Spotted Gudgeon is considered unlikely to occur within the development site.

The development site is not within the indicative distribution of any other threatened freshwater fish species listed under the FM Act (Riches et. al 2016), or are they considered likely to occur based on the habitats present.

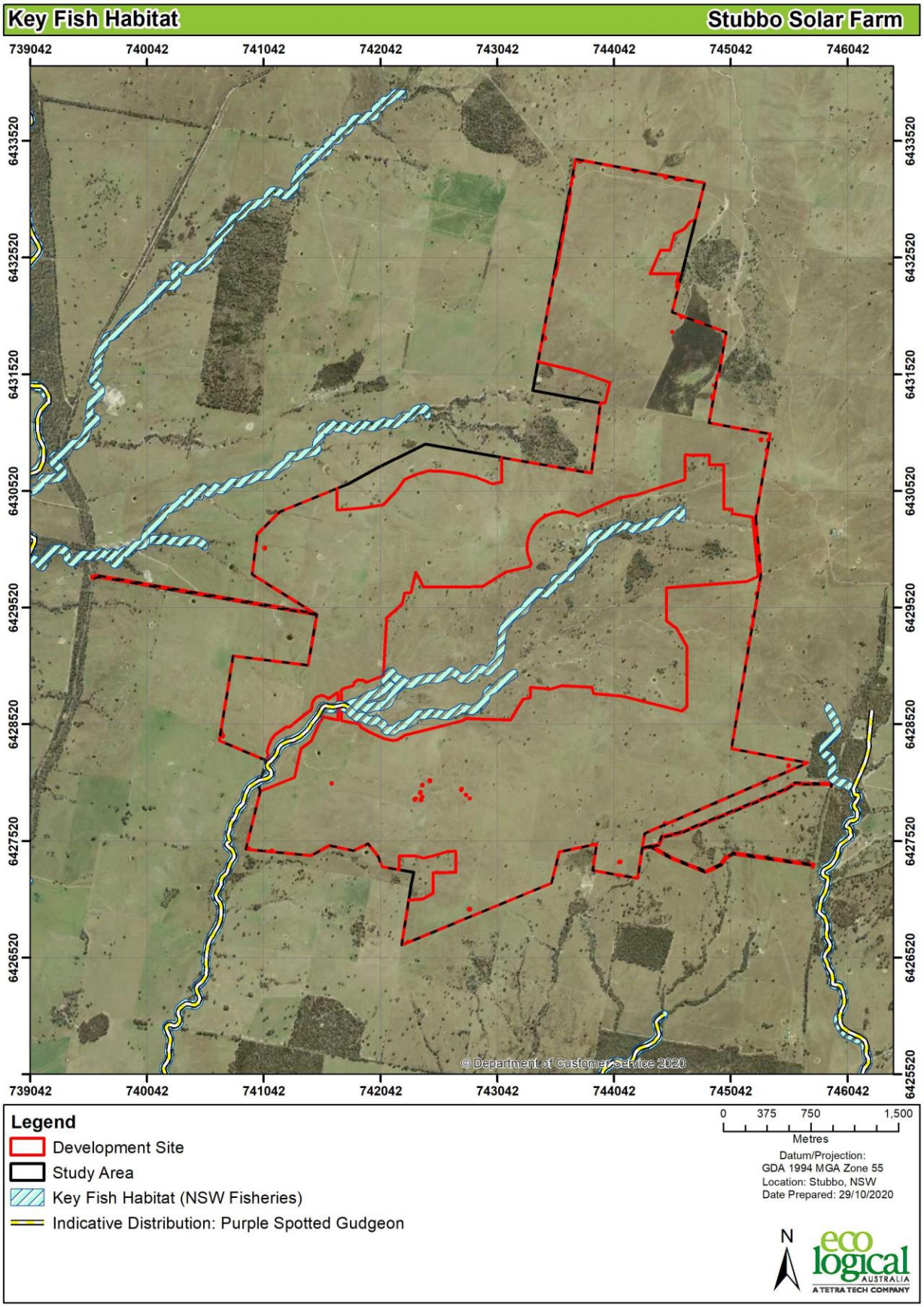

Figure 7: Key Fish Habitat and threatened species distributions

1.5.1.8 Features not present

Within the development site the following habitat features are not present:

- cliffs, overhangs, escarpments or crevices
- old mines or tunnels within 2km
- wetlands
- Flying-fox camps
- Important habitat for Regent Honeyeater or Swift Parrot

1.5.2 Threatened flora species habitat

Potential habitat for threatened flora shrub and groundcover species is not present within Category 1 Land or low condition woodland (Woodland-Low) due the habitat being too degraded from a history of agricultural disturbance including, clearing, cropping, pasture improvement and grazing. These areas represent the majority (>1230 ha or 99.9%) of the development site.

Potential habitat for threatened flora species is present within higher condition woodland areas (Woodland-Moderate-good) of the development site. These areas of potential habitat cover a small portion (0.17 ha or 0.01%) of the development site and are present as narrow strips of road reserve vegetation and a small patch at the edge of the development site near the southern boundary.

1.5.3 Ecosystem credit species

Ecosystem credit species predicted to occur at the development site, their associated habitat constraints, geographic limitations and sensitivity to gain class are included in Table 18. Ecosystem credit species were identified through operation of the BAM Credit Calculator in accordance with the BAM.

Black Falcon (*Falco berigora*) and Barking Owl (*Ninox connivens*) were manually added to the assessment as these species were recorded in close proximity to the development site during surveys.

No ecosystem credit species were excluded from the assessment.

Table 18: Predicted ecosystem credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC listing status
Anthochaera phrygia	Regent Honeyeater	(Foraging habitat only)	n/a	High	Critically Endangered	Critically Endangered
Artamus cyanopterus cyanopterus	Dusky Woodswallow	n/a	n/a	Moderate	Vulnerable	Not listed
Chthonicola sagittata	Speckled Warbler	n/a	n/a	High	Vulnerable	Not listed
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	n/a	n/a	High	Vulnerable	Not listed
Dasyurus maculatus	Spotted-tailed Quoll	n/a	n/a	High	Vulnerable	Endangered
Falco subniger	Black Falcon	n/a	n/a	Moderate	Vulnerable	Not listed
Glossopsitta pusilla	Little Lorikeet	n/a	n/a	High	Vulnerable	Not listed
Haliaeetus leucogaster	White-bellied Sea-Eagle	(Foraging habitat only) #	n/a	High	Vulnerable	Not listed
Lathamus discolor	Swift Parrot	(Foraging habitat only)	n/a	Moderate	Endangered	Critically Endangered
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	n/a	n/a	Moderate	Vulnerable	Not listed
Miniopterus orianae oceanensis	Large Bent-winged Bat	(Foraging habitat only)	n/a	High	Vulnerable	Not listed
Ninox connivens	Barking Owl	(Foraging habitat only)	n/a	Moderate	Vulnerable	Not listed
Petroica boodang	Scarlet Robin	n/a	n/a	Moderate	Vulnerable	Not listed
Petroica phoenicea	Flame Robin	n/a	n/a	Moderate	Vulnerable	Not listed
Phascolarctos cinereus	Koala	(Foraging habitat only)	n/a	High	Vulnerable	Vulnerable
Polytelis swainsonii	Superb Parrot	(Foraging habitat only)	n/a	Moderate	Vulnerable	Vulnerable
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	n/a	n/a	Moderate	Vulnerable	Not listed
Pteropus poliocephalus	Grey-headed Flying-fox	(Foraging habitat only)	n/a	High	Vulnerable	Vulnerable
Stagonopleura guttata	Diamond Firetail	n/a	n/a	Moderate	Vulnerable	Not listed

Note: **#** = Waterbodies; within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines

1.5.4 Species credit species

Species credit species predicted to occur at the development site (i.e. candidate species), their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 19.

Candidate species were identified through operation of the BAM Credit Calculator in accordance with the BAM. Barking Owl was manually added to the list of candidate species as it was recorded in proximity to the development site.

Based on an assessment of habitat constraints, geographic limitations, and site degradation, the following species have been considered for further assessment:

- Ausfeld's Wattle (*Acacia ausfeldii*)
- Silky Swainson-pea (*Swainsona sericea*)
- Koala (*Phascolarctos cinereus*)
- Pink-tailed Worm Lizard (*Aprasia parapulchella*)
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*)
- Superb Parrot (*Polytelis swainsonii*)
- Barking Owl (*Ninox connivens*)

All other species have been excluded from assessment as described in Table 19.

Table 19: Candidate species credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	Paddock trees use	Nearest record in BioNet	Further assessment?
Acacia ausfeldii	Ausfeld's Wattle	Footslopes and other low rises on sandstone.	n/a	High	Vulnerable	Not listed	East of Dubbo in the Mudgee-Ulan-Gulgong area of the NSW South Western Slopes bioregion, as well as the Brigalow Belt South, South Eastern Highlands and the Sydney Basin bioregions.	Eucalypt woodland in sandy soil; often in remnant roadside patches of woodland.	Associated species include *Eucalyptus albens, E. blakelyi* and *Callitris* spp., with an understorey dominated by *Cassinia* spp. and grasses. Likely to have a dormant soil seedbank from which germination is stimulated by fire. Established plants are likely to be killed by fire. Flowers from August to October.	No	8km east of site.	Yes. Potential in roadside areas of access options. Other areas lack mid-storey shrub layer and are therefore considered too degraded.
Dichanthium setosum	Bluegrass	n/a	n/a	High	Vulnerable	Vulnerable	In NSW, found on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes.	Cleared woodland, grassy roadside remnants and highly disturbed pasture, on heavy basaltic black soils and red-brown loams with clay subsoil.	Associated species include *Eucalyptus albens, Eucalyptus melanophloia, Eucalyptus melliodora, Eucalyptus viminalis, Myoporum debile, Aristida ramosa, Themeda triandra, Poa sieberiana, Bothriochloa ambigua, Medicago minima, Leptorhynchos squamatus, Lomandra* aff. *longifolia, Ajuga australis, Calotis hispidula and Austrodanthonia, Dichopogon, Brachyscome, Vittadinia, Wahlenbergia* and Psoralea species. Flowering time is mostly in summer.	No	45km south west of site	No. Microhabitat not present -incorrect soil type. Development site does not contain heavy basaltic black soils or red-brown loams with clay subsoil. Habitat too degraded.
Euphrasia arguta		n/a	n/a	High	Critically Endangered	Critically Endangered	In NSW, recently recorded only from Nundle area of the north western slopes and tablelands, from near the Hastings River and from the Barrington Tops.	Eucalypt forest with a mixed grass and shrub understorey, disturbed areas, along roadsides.	Annual habit and has been observed to die off over the winter months, with active growth and flowering occurring between January and April. As with other species of *Euphrasia,* this species is semi-parasitic and attaches to the roots of other associated plants.	No	50km south east of study area (record >100 years old).	No. Habitat too degraded.
Prasophyllum petilum	Tarengo Leek Orchid	n/a	East of Binalong, south and east of Boorowa.	High	Endangered	Endangered	Four sites in NSW: at Boorowa, Captains Flat, Ilford and Delegate. Also experimentally introduced at Bowning Cemetery NSW.	Natural Temperate Grassland, grassy woodland, and Box-Gum woodland.	Flowers in October at Boorowa and Ilford, and December at Captains Flat and Delegate. Flowers are followed by fleshy seed capsules in summer. Plants retreat into subterranean tubers after fruiting, so are not visible above-ground.	No	100km east of development site.	No. Geographic limitation.
Swainsona sericea	Silky Swainson-pea	n/a	n/a	High	Vulnerable	Not listed	In NSW, recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. Also an isolated record from the far north-west of NSW.	Natural Temperate Grassland and *Eucalyptus pauciflora* (Snow Gum) Woodland on the Monaro, and Box-Gum Woodland in the Southern Tablelands and South West Slopes.	Sometimes found in association with cypress-pines *Callitris* spp. Regenerates from seed after fire.	No	6km south east of development site.	Yes. In higher quality habitats only. Other areas too degraded.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	Paddock trees use	Nearest record in BioNet	Further assessment?
Anthochaera phrygia	Regent Honeyeater	As per mapped areas	n/a	High	Critically Endangered	Critically Endangered	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions.	Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of *Casuarina cunninghamiana* (River Oak).	Two of three known key breeding areas are in NSW: the Capertee Valley and Bundarra-Barraba region. The species breeds between July and January and usually nests in horizontal branches or forks in tall mature eucalypts and Sheoaks. The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes.	No	7km south east of development site.	No. Development site is not within mapped important area.
Aprasia parapulchella	Pink-tailed Legless Lizard	Rocky areas or within 50m of rocky areas	n/a	High	Vulnerable	Vulnerable	In NSW, only known from the Central and Southern Tablelands, and the South Western Slopes.	Sloping, open woodland areas with predominantly native grassy groundlayers, rocky outcrops or scattered, partially-buried rocks.	Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites. Feeds on the larvae and eggs of the ants with which it shares its burrows. It is thought that this species lays 2 eggs inside the ant nests during summer; the young first appear in March.	No	35km east of development site.	Yes. Some areas of potential habitat. Other rocky areas do not contain small, partially embedded surface rock and are considered to be too degraded.
Haliaeetus leucogaster	White-bellied Sea-Eagle	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	n/a	High	Vulnerable	Not listed	Distributed along the coastline of mainland Australia and Tasmania, extending inland along some of the larger waterways, especially in eastern Australia.	Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	The breeding season extends from June to January (or sometimes February) in southern Australia. Breeding habitat is usually close to water, but may occur up to a kilometre away. Nests are mainly located in tall open forest or woodland, but sometimes in other habitats such as dense forest, closed scrub or in remnant trees on cleared land. The White-bellied Sea-Eagle feeds opportunistically on a variety of fish, birds, reptiles, mammals and crustaceans, and on carrion and offal.	Yes	700m north west of development site.	Yes.
Lathamus discolor	Swift Parrot	As per mapped areas	n/a	Moderate	Endangered	Critically Endangered	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes.	Box-ironbark forests and woodlands.	Favoured feed trees include winter flowering species such as *Eucalyptus robusta*, *Corymbia maculata*, *C. gummifera*, *E. sideroxylon*, and *E. albens*. Commonly used lerp infested trees include *E. microcarpa*, *E. moluccana* and *E. pilularis*. Following winter they return to Tasmania where they breed from September to January.	Yes	11km east of development site.	No. Development site is not within mapped important area.
Litoria booroolongensis	Booroolong Frog	n/a	n/a	High	Endangered	Endangered	Restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. Several populations have recently been recorded in the Namoi catchment.	Permanent streams with some fringing vegetation cover such as ferns, sedges or grasses.	Breeding occurs in spring and early summer and tadpoles metamorphose in late summer to early autumn. Eggs are laid in submerged rock crevices and tadpoles grow in slow-flowing pools	No	90km south of development site.	No. No permanent streams are present. Habitat is too degraded.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	Paddock trees use	Nearest record in BioNet	Further assessment?
Petaurus norfolcensis	Squirrel Glider	n/a	n/a	High	Vulnerable	Not listed	Widely though sparsely distributed on both sides of the Great Dividing Range in eastern Australia, from northern Qld to western Victoria.	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.	Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of *Acacia* gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.	Yes	10km north east of development site.	No. Habitat too degraded. Widely scattered paddock trees generally separated by greater than 50m.
Phascogale tapoatafa	Brush-tailed Phascogale	n/a	n/a	High	Vulnerable	Not listed	In NSW it is mainly found east of the Great Dividing Range although there are occasional records west of the divide.	Dry sclerophyll open forest, heath, swamps, rainforest and wet sclerophyll forest.	Agile climber foraging preferentially in rough barked trees. Feeds mostly on arthropods but will also eat other invertebrates, nectar and sometimes small vertebrates. Nest and shelter in tree hollows and use many different hollows over a short time span. Mating occurs May - July; males die soon after the mating season whereas females can live for up to three years but generally only produce one litter.	Yes	120km east of development site.	No. Habitat too degraded. Also, no records within 100km of site - species generally occurs east of the Great Dividing Range.
Phascolarctos cinereus	Koala	Areas identified via survey as important habitat	n/a	High	Vulnerable	Vulnerable	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands.	Eucalypt woodlands and forests.	Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Females breed at two years of age, with mating occurring between September and February.	Yes	8km south of the development site.	Yes.
Polytelis swainsonii	Superb Parrot	Hollow bearing trees: Living or dead *E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta* with hollows greater than 5cm diameter; greater than 4m above ground or trees with a DBH of greater than 30cm.	n/a	Moderate	Vulnerable	Vulnerable	In NSW, occurs on inland slopes of the Great Divide and on adjacent plains, especially along the major river-systems.	Box-gum woodland, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest.	Nest in small colonies, often with more than one nest in a single tree. Breed between September and January. May forage up to 10 km from nesting sites, primarily in grassy box woodland. Feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain.	Yes	35km south of the development site.	Yes.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	Paddock trees use	Nearest record in BioNet	Further assessment?
Pteropus poliocephalus	Grey-headed Flying-fox	Other: Breeding camps	n/a	High	Vulnerable	Vulnerable	Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria.	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Annual mating commences in January and a single young is born in October or November. Can travel up to 50 km from the camp to forage. Feed on the nectar and pollen of *Eucalyptus, Melaleuca* and *Banksia* species, and fruits of rainforest trees and vines. Also forage in cultivated gardens and fruit crops.	No	22km south of the development site.	No. No breeding camps present. Nearest camp is at Mudgee, 35km south of development site.
Miniopterus orianae oceanensis	Eastern Bentwing-bat	Caves: Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave;" observation type code "E nest-roost;" with numbers of individuals >500	n/a	High	Vulnerable	Not listed	In NSW it occurs on both sides of the Great Dividing Range, from the coast inland to Moree, Dubbo and Wagga Wagga.	Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	It forages above and below the tree canopy on small insects, especially moths. The bats congregate at the same maternity roosts each year to give birth and rear young. In the southern part of the species' range this occurs during spring. Maternity roosts may be located in caves, abandoned mines, concrete bunkers and lava tubes. Over-wintering roosts used outside the breeding period include cooler caves, old mines, and stormwater channels, under bridges and occasionally buildings.	No	7km east of study area.	No. No caves, tunnels, mines or other structures potentially used for breeding are present.
Ninox connivens	Barking Owl	Hollow bearing trees. Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground.	n/a	High	Vulnerable	Not listed	Wide but sparse distribution in NSW, avoiding the most central arid regions. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests.	Woodland and open forest, including fragmented remnants and partly cleared farmland, wetland and riverine forest.	It roosts in dense shaded foliage in large trees. Nesting occurs in hollows in large, old eucalypts, either living or dead. The nesting season is during mid-winter and spring; but may vary between pairs and from year to year. The Barking Owl preferentially hunts small arboreal mammals such as Squirrel Gliders and Ringtail Possums, but also takes birds, invertebrates and terrestrial mammals.	Yes	Recorded incidentally 500m south of study area	Yes.

1.5.5 Targeted surveys

Targeted surveys for species credit species were undertaken at the development site using the methods described below on the dates outlined in Table 20. Targeted surveys were undertaken in accordance with the relevant guidelines for flora (DPIE 2020c) and fauna (DEC 2004). The locations of targeted surveys are shown on Figure 8, with the results of the surveys shown as individual species polygons on Figure 9.

1.5.5.1 Parallel transects for threatened flora

Parallel transects of less than 5 m spacing were undertaken across areas of potential habitat for threatened flora species during 15 and 16 October 2020. Potential habitat was considered to be PCT 281 Mod-good, which represents areas comprising of moderately intact native mid-storey and groundcover species.

No threatened flora species were recorded.

1.5.5.2 Call playback

Koala

Call-playback for Koala was undertaken at two locations on two separate nights in September 2020. A Koala call sequence was broadcast 3-4 times followed by five minutes of quiet listening. Call playback was preceded and followed by spotlighting.

No Koala were recorded.

Owls

Red Sand Ecology undertook targeted Barking Owl and Powerful Owl surveys on three nights in September 2019. Daytime searches were conducted on foot during daylight hours to locate roost or nest sites of densely foliaged trees and tall shrubs, and also in the eucalypt canopy. No signs of owl roosts such as faeces and owl pellets were recorded. Evening dusk watches during calm, dry weather were used to identify suitable habitat for location of call playback sessions. Playback sequence included calls of both species, with periods of 2-5 mins of continuous calls broadcast at ~ 110% of natural volume interspersed with periods (2-5 mins) of silence to listen between each species. Simultaneously, spotlighting searches were conducted to search for owls. Spotlighting was conducted along transects through potential habitat areas.

Red Sand Ecology did not record any Owls or evidence thereof.

A Barking Owl was incidentally recorded by ELA approximately 500m south of the development site on 25 May 2020. Barking Owl is a species credit species known to use paddock trees. This species has been assumed present and impacts are assessed in Section 2.2.1.

1.5.5.3 Spotlighting

Red Sand Ecology undertook spotlighting surveys for Owls and Koala on three nights in September 2019 along transects through potential habitat areas within the development site, EEZ and surrounding area.

ELA completed spotlighting surveys targeting Koala from a slow-moving vehicle along Blue Springs Road and Barneys Reef Road on two separate nights in September 2020. These surveys were aimed at Koala

and targeted these areas due to them being considered highest quality potential habitat adjoining the development site.

No threatened species were recorded.

1.5.5.4 Koala SAT survey

Two Koala Spot Assessment Technique (Phillips and Callaghan 2011) surveys were completed in September 2020 targeting areas that represent the highest quality and most connected habitat. These were near the potential access route locations along Blue Springs Road and Barneys Reef Road, where road reserve vegetation provides the best local connectivity and habitat quality. For each SAT survey, a central tree was selected. A search of the ground within 1 m of the base of the centre tree and the nearest 29 trees (>10cm DBH) was undertaken for Koala faecal pellets. Approximately 2 person minutes of search effort was undertaken at each tree.

No evidence of Koala was recorded.

1.5.5.5 Diurnal bird surveys

Bird surveys were undertaken using the 20min/2ha search method in September 2019 and May, September and October 2020. All species heard and/or observed were recorded. Red Sand Ecology also completed diurnal bird surveys targeting Regent Honeyeater and Swift Parrot, including an initial 5 minutes of call-playback followed by 15 minutes of searching. Surveyors also recorded bird species incidentally throughout other surveys and while traversing the site.

Searches for large stick nests such as those used by the White-bellied Sea-Eagle were undertaken across the development site during vegetation surveys by ELA in September and October 2020. No large stick nests were recorded.

No species credit species were recorded during diurnal bird surveys.

Red Sand Ecology recorded a Black Falcon (*Falco subniger*) on the south west of the study area. Black Falcon is an ecosystem credit species.

1.5.5.6 Active searching (rock turning)

Active searches were undertaken for Pink-tailed Worm Lizard in all areas of potential habitat over two separate days in October 2020. Potential habitat was rocky outcrops that contain loosely embedded rock (i.e. rocks that could be turned to search). A total of approximately 300 rocks were turned mostly in the northern part of the study area. The remaining rocky outcrops had limited potential habitat and few rocks available to turn. Other outcrops within the development site only contain larger, deeply embedded boulders and were not considered suitable habitat.

No Pink-tailed Worm Lizard or other reptiles were recorded during the targeted survey.

Table 20: Targeted surveys

Date	Surveyors	Target species
30/08/2019	Sarah Hobson and Rebecca Martin (Red Sand Ecology)	Koala
01/09/2019	Sarah Hobson and Rebecca Martin (Red Sand Ecology)	Koala, birds
02/09/2019	Sarah Hobson and Rebecca Martin (Red Sand Ecology)	Birds

Date	Surveyors	Target species
04/09/2019	Sarah Hobson and Rebecca Martin (Red Sand Ecology)	Koala
05/09/2019	Sarah Hobson and Rebecca Martin (Red Sand Ecology)	Koala, birds
25/05/2020	Tom Schmidt and Martin Sullivan (Eco Logical Australia)	Birds
26/05/2020	Tom Schmidt and Martin Sullivan (Eco Logical Australia)	Birds
02/09/2020	Tom Schmidt and Daniel McKenzie (Eco Logical Australia)	Koala, birds
03/09/2020	Tom Schmidt and Daniel McKenzie (Eco Logical Australia)	Koala, birds
04/09/2020	Tom Schmidt and Daniel McKenzie (Eco Logical Australia)	Birds
15/09/2020	Tomas Kelly and David Allworth (Eco Logical Australia)	Birds
16/09/2020	Tomas Kelly and David Allworth (Eco Logical Australia)	Birds
17/09/2020	Tomas Kelly and David Allworth (Eco Logical Australia)	Birds
18/09/2020	Tomas Kelly and David Allworth (Eco Logical Australia)	Birds
15/10/2020	Tom Schmidt (Eco Logical Australia)	Flora, Pink-tailed Worm Lizard, birds
16/10/2020	Tom Schmidt (Eco Logical Australia)	Flora, Pink-tailed Worm Lizard, birds

Weather conditions during the targeted surveys are outlined in Table 21.

Table 21: Weather conditions

Date	Rainfall (mm)	Minimum temperature ^{0}C	Maximum temperature ^{0}C
30/08/2019	0	3.0	21.0
01/09/2019	0	3.2	22.0
02/09/2019	2	2.6	22.0
03/09/2019	0	6.7	26.0
04/09/2019	0	6.2	27.8
05/09/2019	0	8.2	28.7
25/05/2020	1.2	3.2	15.7
26/05/2020	2.2	7.2	18.9
02/09/2020	0	4.0	23.8
03/09/2020	0	11.6	26.0
04/09/2020	0	13.7	26.6
15/09/2020	0	7.4	23.3
16/09/2020	0	8.7	24.4
17/09/2020	0	8.3	26.7
18/09/2020	0	12	22.0
15/10/2020	0	11.6	27.8
16/10/2020	0	10.2	27.4

Observations taken from BOM weather station Gulgong (Station 062013) approximately 12km south west of the development site, and Dunedoo Post Office (Station 064009) approximately 30km north of the development site when data not recorded at Gulgong.

Survey effort undertaken at the development is outlined in Table 22.

Table 22: Survey effort

Method	Habitat (ha)	Stratification units	Total effort	Target species
Area search	5.53ha	1 - Woodlands	11 sites, 7 person hours plus additional incidental observations over 17 separate survey days	Birds
Call playback	5.53ha	1 - Woodlands	3 nights for Barking Owl 3 nights for Koala	Barking Owl Koala
Habitat search (day)	1.97 ha	All rocky outcrops with potential habitat. 1 stratification unit	300 rocks turned across five separate outcrop areas over two days. 2.5 person hours	Pink-tailed Worm Lizard
Parallel transects	0.17 ha	1 – Woodland mod_good	1.5 person hours over two days	Flora
Koala SAT	5.53 ha	1 – Woodland mod_good	2 SATs	Koala
Spotlighting	5.53ha	1 - Woodlands	3 nights for Barking Owl 5 nights for Koala	Barking Owl Koala

Following completion of targeted surveys, the species credit species included in the assessment are outlined in Table 23.

Table 23: Species credit species included in the assessment

Species	Common Name	Species presence	Geographic limitations	Number of individuals / Habitat (ha)	Biodiversity Risk Weighting
Ninox connivens	Barking Owl	Yes (assumed present)	n/a	4.4 ha	2.00
Polytelis swainsonii	Superb Parrot	No (surveyed)	n/a	0	2.00
Phascolarctos cinereus	Koala	No (surveyed)	n/a	0	2.00
Haliaeetus leucogaster	White-bellied Sea-Eagle	No (surveyed)	n/a	0	2.00
Aprasia parapulchella	Pink-tailed Worm Lizard	No (surveyed)	n/a	0	2.00
Swainsona sericea	Silky Swainson-pea	No (surveyed)	n/a	0	2.00

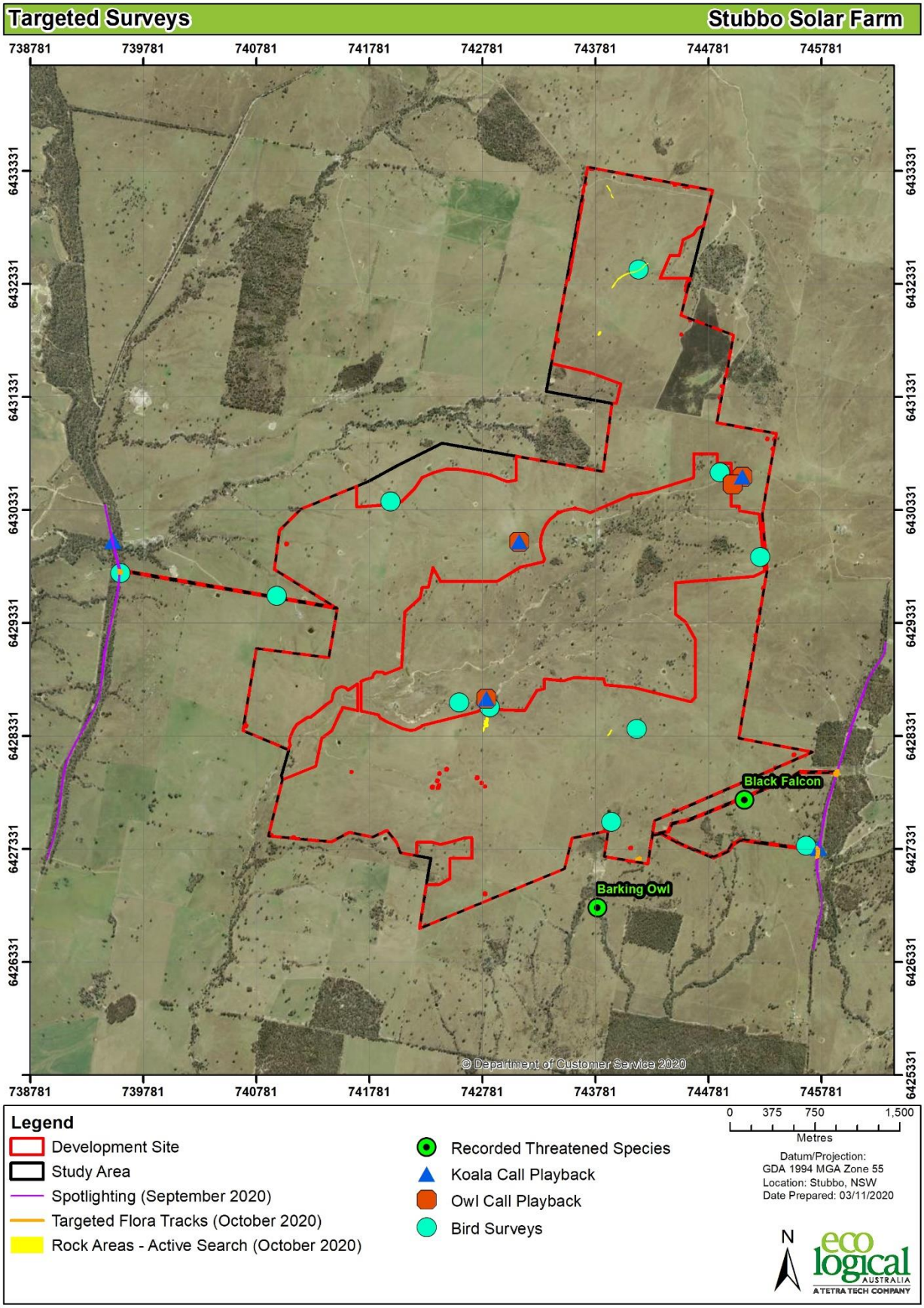

Figure 8: Targeted surveys

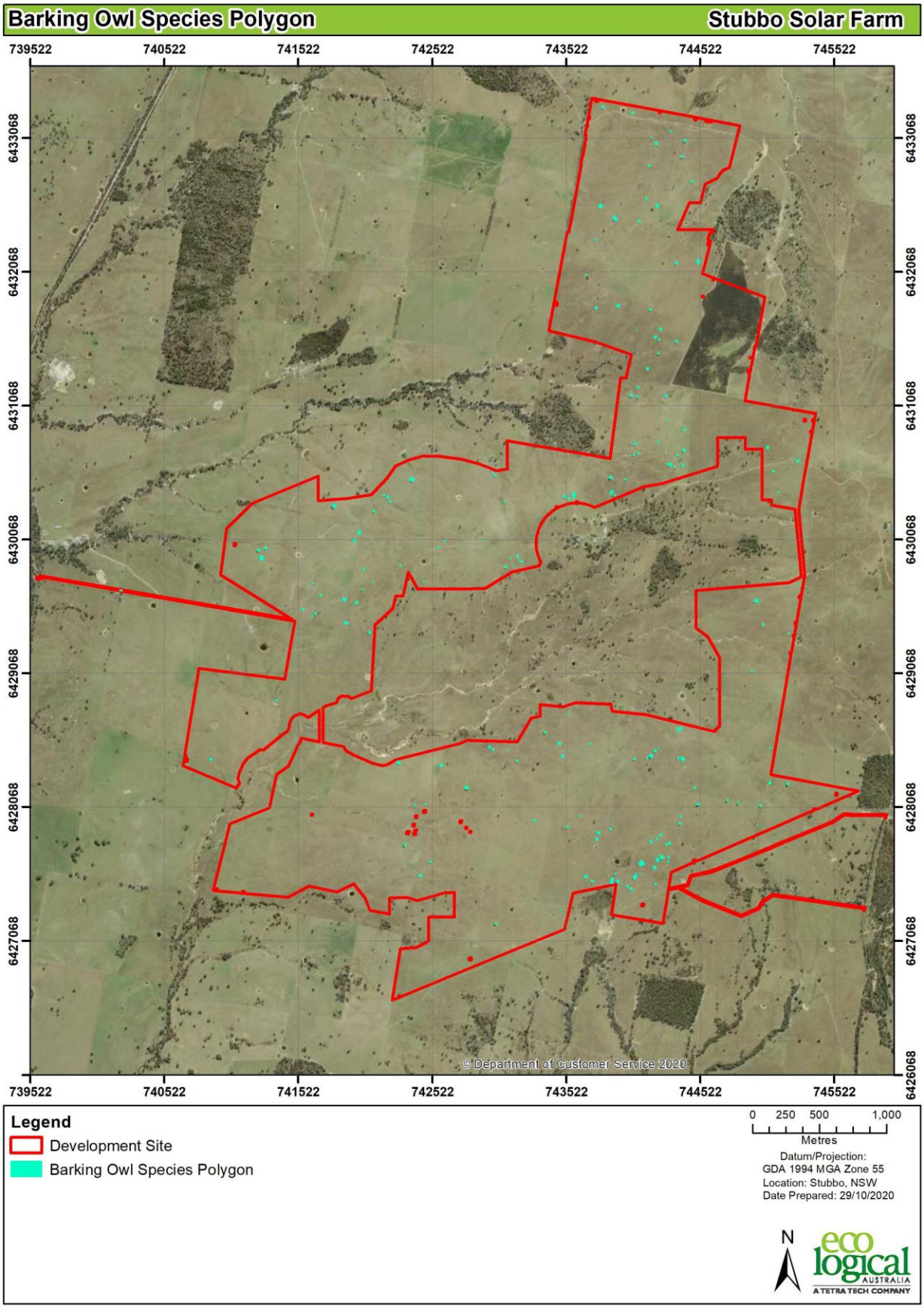

Figure 9: Species polygons

2. Stage 2: Impact assessment (biodiversity values)

2.1 Avoiding impacts

2.1.1 Locating a project to avoid and minimise impacts on vegetation and habitat

The development has been located in a way which avoids and minimises impacts as outlined in Table 24.

Table 24: Locating a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
locating the project in areas where there are no biodiversity values	Areas of cleared land and low condition vegetation have been utilised wherever possible.	The placement of the development site has centred around the areas of lowest biodiversity value within the development boundary (cleared paddock – Category 1 Land), avoiding larger woodland areas (such as within the EEZ).
locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition	Impacts to native vegetation have generally been restricted to isolated paddock trees or small, isolated patches of trees. Larger areas of more intact native vegetation have been avoided wherever possible.	The placement of the development site has centred around the area of lowest biodiversity value (cleared paddock – Category 1 Land).
locating the project in areas that avoid habitat for species and vegetation in high threat categories (e.g. an EEC or CEEC), indicated by the biodiversity risk weighting for a species	The development site has not been able to completely avoid impacts to areas providing species habitat and EEC vegetation.	The placement of the development site has centred around the area of lowest biodiversity value (cleared paddock – Category 1 Land) and aimed to minimise impacts to CEEC and species habitat by avoiding higher quality remaining vegetation within and surrounding the development site.
locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained	The development footprint has been centred around the area of least biodiversity impact with the aim to conserve connectivity values surrounding the development site.	The major connectivity features within the landscape are along road reserves associated with Blue Springs Road and Barneys Reef Road and the larger areas of intact vegetation south of the development site. Connectivity will be retained in these areas around the periphery of the proposal.

Regarding measures to avoid and minimise impacts during site selection and planning phase, the suitability of the development site has been selected with consideration given to limiting the amount of intact vegetation to be removed. The original investigations for the Stubbo Solar Farm included a broader area than the current development site, and multiple iterations of the development site boundary have resulted in a development site that largely avoids intact native vegetation with majority of the proposed development site being located on Category 1 Land with little to no biodiversity value. This can be seen in Figure 1 which indicates where additional environmental exclusion zones have been added to reduce impact to areas of greater biodiversity values. The main EEZ was also expanded after

completion of initial EIS studies to avoid and minimise impacts to environmental values (biodiversity, heritage and hydrology).

2.1.2 Designing a project to avoid and minimise impacts on vegetation and habitat

The development has been designed in a way which avoids and minimises impacts as outlined in Table 25.

Table 25: Designing a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
reducing the clearing footprint of the project	In designing the development, the aim was to conserve the more intact vegetation (such as within the EEZ) whilst centring development in the most cleared portion of the study area.	The design has minimised vegetation clearing through strategic placement.
locating ancillary facilities in areas where there are no biodiversity values	The design has endeavoured to locate ancillary facilities within Category 1 Land and avoid patches of native vegetation.	The placement of ancillary facilities has been designed to minimise impacts to biodiversity values by locating them in areas of no biodiversity values (Category 1 Land).
locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)	The design has endeavoured to locate ancillary facilities in areas of vegetation on the periphery of the cleared land that suffers from edge effects and disturbance from past clearing activities and current disturbance pressures.	The placement of ancillary facilities has been designed to minimise impacts to biodiversity values by locating them in areas of lower biodiversity value (cleared paddock) within the development site boundary.
locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC)	It has not been possible to completely avoid impacts to areas providing species habitat and EEC vegetation. The placement of the development site has minimised impacts as far as practicable to the EEC vegetation whilst maximising extent necessary for development.	The placement of ancillary facilities has been designed to work in and around areas of cleared land. No clearing of species habitat or CEEC will occur solely for ancillary facilities.
providing structures to enable species and genetic material to move across barriers or hostile gaps	The development site will not increase any hostile gaps or barriers.	Corridor movement will be retained for species around the periphery of the site.
making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site.	Proponent to retain all remaining vegetation outside of the development site.	The proponent will demarcate all areas outside the development site boundary to be retained.
Efforts to avoid and minimise impacts through design must be documented and justified	The proposed development site boundary has been refined from an original larger investigation area resulting in a development site that largely avoids intact native vegetation with majority of the proposed development site being located on	The design has avoided and minimised vegetation clearing through strategic placement. The original larger investigation area included larger patches of more intact woodland (Figure 1). The EEZ includes the largest areas of native vegetation within the study area and has been avoided.

Approach	How addressed	Justification
	Category 1 Land with little to no biodiversity value.	

The project has been designed to avoid and minimise impacts to native vegetation and habitat. This has been achieved is through site selection and refinement to reduce clearing of native vegetation and siting the project predominantly within areas of non-native vegetation and limited connectivity features.

2.1.3 Prescribed biodiversity impacts

The development site has prescribed biodiversity impacts as outlined in Table 26.

Rock outcrops are present; however, they do not contain threatened species or ecological communities and are therefore not a prescribed impact.

Table 26: Prescribed biodiversity impacts

Prescribed biodiversity impact	Description in relation to the development site	Threatened species or ecological communities effected
impacts of development on the habitat of threatened species or ecological communities associated with: • **karst, caves, crevices, cliffs and other geological features of significance, or** • **rocks, or** • **human made structures, or** • **non-native vegetation**	Several rock outcrops are present within Category 1 Land within the development site. Threatened species are not present in potential rocky habitat following targeted survey. Therefore, the impacts to rocks are not considered a prescribed impact.	Nil
impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Removal of paddock trees which create stepping stones for movement of highly mobile species. Existing connectivity is only suitable for highly mobile species that will continue to be able to move across the landscape	Highly mobile species such as woodland birds
impacts of development on movement of threatened species that maintains their lifecycle	n/a	n/a
impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining)	n/a	n/a
impacts of wind turbine strikes on protected animals	n/a	n/a
impacts of vehicle strikes on threatened species or on animals that are part of a TEC.	vehicle movements associated with the project have the potential to increase the occurrence of vehicle strike on fauna in the locality	Fauna species part of the Box Gum woodland TEC

2.2 Assessment of Impacts

2.2.1 Direct impacts

The direct impacts of the proposed development are associated with clearing of native vegetation and threatened species habitat that cannot be avoided. These impacts will occur during construction.

The direct impacts of the development on:

- native vegetation are outlined in Table 27
- threatened ecological communities are outlined in Table 28
- threatened species and threatened species habitat is outlined in Table 29
- prescribed biodiversity impacts are outlined in Section 2.2.2.

Direct impacts including the maximum project footprint (construction and operation) are shown on Figure 10. All works associated with decommissioning the proposed solar farm will be undertaken within the development site. As such, no additional direct impacts are associated with the decommissioning phase of the project.

Table 27: Direct impacts to native vegetation

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Western Slopes Grassy Woodlands	Grassy Woodlands	Clearing of 5.29 ha
1770	Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South	Western Slopes Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	Clearing of 0.24 ha

Table 28: Direct impacts on threatened ecological communities

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Direct impact (ha)	Listing status	Name	Direct impact (ha)
281	Critically Endangered	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	Clearing of 5.29 ha	Critically Endangered	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Clearing of 0.17 ha

Table 29: Direct impacts on threatened species and threatened species habitat

Species	Common Name	Direct impact number of individuals / habitat (ha)	NSW listing status	EPBC Listing status
Ninox connivens	Barking Owl	Clearing of 4.4 ha	V	-

Barking Owl (Breeding) was assumed present. The species polygon includes all native vegetation within the development site except for patches that were known to not contain trees with hollows larger than 20cm in diameter. Not all patches/trees were subject to a detailed hollow survey, therefore the species polygon is a conservative estimate.

2.2.2 Change in vegetation integrity

The change in vegetation integrity as a result of the development is outlined in Table 30. The assessment has assumed total loss for all areas of native vegetation within the development site and as such the future vegetation score is 0.

Table 30: Change in vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity
1	281	Low		30.5	0	-30.5
2	281	Mod_good		76.9	0	-76.9
3	1770	Low		17.4	0	-17.4

2.2.3 Indirect impacts

The indirect impacts of the development are outlined in Table 31. Indirect impact zones are shown on Figure 11.

The potential indirect impacts of the proposal include sedimentation and water contamination, the generation of excessive noise, dust or light spill, spread of weeds and pests, rubbish dumping and increased risk of fire. Areas subject to indirect impacts

Table 31: Indirect impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
sedimentation and contaminated and/or nutrient rich run-off	Construction / decommissioning	Runoff during construction works	10 m from Development Site boundary	During heavy rainfall or storm events	During rainfall events	Short-term impacts
noise, dust or light spill	Construction / decommissioning	Noise and dust created from machinery (no night works proposed	Noise and dust likely to carry further than 10 m from	Daily, during construction works Nightly during	Sporadic throughout construction period	Short-term impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
		therefore no light spill)	Development boundary	operation of development		
transport of weeds and pathogens from the site to adjacent vegetation	Construction / decommissioning	Spread of weed seed or pathogens	Potential for spread into adjacent habitat	Daily, during construction works	Sporadic throughout construction period	Short-term impacts
rubbish dumping	Construction / operation / decommissioning	Illegal dumping by construction crews	Potential for rubbish to spread via wind into adjacent vegetation	Potential to occur at any time throughout construction or operational phases	During working hours for construction Potential at any point during operation of the development	During working hours for construction Potential at any point during operation of the development
increase in predatory species populations	Construction / operation	Potential for an increase in predatory species in the locality through disturbance to vegetation	Throughout adjacent vegetation	Likely to occur gradually after disturbance to habitat and vegetation takes place	For a period after clearing works take place	At any point once clearing and disturbance to habitat take place
increase in pest animal populations	Construction / operation	Potential for an increase in pest animal populations in the locality through disturbance to vegetation	Throughout adjacent vegetation	Likely to occur gradually after disturbance to habitat and vegetation takes place	For a period after clearing works take place	At any point once clearing and disturbance to habitat take place
increased risk of fire	Construction / operation / decommissioning	Potential for fire to spark during construction works especially any electrical or machinery works	Throughout adjacent vegetation	Potential to occur at any time throughout construction or operational phases	During working hours for construction Potential at any point during operation of the development	During working hours for construction Potential at any point during operation of the development

The project is not likely to significantly impact groundwater during construction, operation or decommissioning due to the nature of the project requiring a limited amount of subsurface disturbance and the estimated depth to groundwater. No impacts to Groundwater Dependent Ecosystems (GDE), if present, are expected to occur as a result of the proposed development.

2.2.4 Prescribed biodiversity impacts

The development site has the prescribed biodiversity impacts as outlined in Table 32.

Table 32: Direct impacts on prescribed biodiversity impacts

Prescribed biodiversity impact	Nature	Extent	Frequency	Duration	Timing
impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Removal of paddock trees which create stepping stones for movement of highly mobile species	Existing connectivity is only suitable for highly mobile species that will continue to be able to move across the landscape	Ongoing	Potential at any point during operation of the development	Permanent
impacts of vehicle strikes on threatened species or on animals that are part of a TEC.	Increased traffic movements have potential to increase impacts to fauna species	Adjoining roads.	Potential at any time.	Potential at any point during construction and operation of the development	Potential at any point during construction and operation of the development

Impacts on connectivity are expected to be minor as the areas to be removed are only suitable as connective habitat for highly mobile species that will continue to be able to move throughout their local range. The main connectivity features within the locality will be retained.

Impacts of vehicle strike are unlikely to be significant as traffic management and speed limits will reduce the likelihood of vehicle strike. The proposed development is not expected to funnel any threatened species towards roads and impacts are likely to be on common species such as Kangaroos and Wombats.

2.2.5 Mitigating and managing impacts

Measures proposed to mitigate and manage impacts at the development site before, during and after construction are outlined in Table 33.

Table 33: Measured proposed to mitigate and manage impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
timing works to avoid critical life cycle events such as breeding or nursing	Moderate	Minor	Active breeding or nesting identified during pre-clearance surveys will be avoided in August, September and October which is the breeding/nesting period for most fauna species.	Impacts to fauna during nesting/nursing avoided	Construction	Site manager
instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	Major	Minor	Pre-clearance surveys will be undertaken prior to tree clearing. A qualified ecologist/licenced wildlife handler will supervise tree removal in accordance with best practise methods.	Any fauna utilising habitat within the Development Site will be identified and managed to ensure clearing works minimise the likelihood of injuring resident fauna	Prior to construction	Site ecologist
relocate habitat features (fallen timber, hollow logs) from within the development site	Moderate	Minor	A procedure will be developed for the relocation of habitat features (e.g. fallen timber, hollow logs) to adjacent retained habitat.	Enhancement of retained habitats	Prior to construction	Site manager
clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chain-saw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	Moderate	Minor	Clearing protocols will be developed that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance (e.g. removal of native vegetation by chainsaw instead of heavy machinery where only partial clearing is proposed). Fencing (or other barriers as required) and signage will be placed around those areas of vegetation to be maintained to prevent any accidental construction damage and provide a permanent barrier between the development footprint and retained areas.	Vegetation to be retained outside of the Development Site boundary will not be disturbed	Construction	Site manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
			The type of fencing during construction may be of a temporary nature and scale that is robust enough to withstand damage during this stage of work. Use of appropriate machinery for vegetation removal adjacent to retained areas.			
sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Minor	Negligible	Appropriate controls will be implemented to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways. All works within proximity to the drainage lines will have adequate sediment and erosion controls (e.g. sediment barriers, sedimentation ponds). Revegetation will also commence as soon as is practicable to minimise risks of erosion. Suitable species will be used as ground cover species in any revegetation areas.	Erosion and sedimentation will be controlled	Construction and decommissioning	Site manager
daily/seasonal timing of construction and operational activities to reduce impacts of noise	Minor	Negligible	Construction works will only be undertaken during daylight hours.	Noise impacts associated with the development will be managed	Construction / operation /decommissioning	Site manager
light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	Minor	Negligible	Construction works will only be undertaken during daylight hours and night lights will not be used. Lights associated with operation will be directional to avoid unnecessarily shining light into adjacent retained vegetation where possible.	Light impacts of construction will be avoided as all works will occur during daylight hours Light spill into adjacent vegetation is reduced	Construction / operation /decommissioning	Site manager
adaptive dust monitoring programs to control air quality	Minor	Negligible	Dust suppression measures will be implemented to limit dust on site. Revegetation will also be commenced as soon	Mitigate dust created during construction activities	Construction and decommissioning	Site manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
			as practicable to minimise areas likely to create dust. Suitable species will be used as ground cover species in any revegetation areas.			
hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Minor	Negligible	All machinery will be cleaned prior to entering and exiting the study area to minimise the transport of weeds to vegetated areas to be retained. Weeds that are present within the study area that are listed under the *NSW Biosecurity Act 2015* will be managed.	Weed impacts managed	Construction	Site manager
staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Minor	Negligible	All personnel working on the project will undertake an environmental induction as part of their site familiarisation. This will include: • site environmental procedures (vegetation management, sediment and erosion control, exclusion fencing and noxious weeds) • what to do in case of environmental emergency (e.g. chemical spills, fire, injured fauna) • key contacts in the case of an environmental emergency.	Staff trained and aware of environmental issues and responsibilities on site	Construction	Site manager
traffic management to reduce risk of vehicle strike	Minor	Negligible	A Traffic Management Plan will be developed which includes speed limits and controls to reduce risk of fauna strike. Any vehicle strike incidents will be recorded.	Reduced fauna strike	Construction / operation	Site manager
development control measures to regulate activity in vegetation and habitat adjacent to development including controls on pet ownership, rubbish disposal, wood collection, fire	Minor	Negligible	A strategy will be developed and implemented to protect vegetation and habitat adjacent to the project. This will outline the following: • rubbish disposal guidance	Adjacent habitat protected	Construction	Site manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
management and disturbance to nests and other niche habitats			• prohibition of wood collection • prohibition of lighting of fires • no-go-zones for native vegetation outside the development footprint • speed limits on the surrounding road network			
design and construction of creek crossing sensitive to aquatic habitat	Moderate	Minor	All waterway crossings will be designed in accordance with *Policy and Guidelines for Fish Friendly Waterway Crossing* (DPI, n.d.) where appropriate.	Crossing constructed with negligible impacts to aquatic habitats	Detailed design	Site manager

2.2.6 Serious and Irreversible Impacts (SAII)

The development has candidate Serious and Irreversible Impacts (SAII) for one TEC as outlined in Table 34. Detailed consideration of whether impacts on the candidate TEC are serious and irreversible is included in Table 36. The proposed impacts are not considered to be a SAII on the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland TEC as the impacts are to a relatively small areas in low condition; larger and higher quality areas will be retained within the study area and locality; and the impacts will be offset Biodiversity Offset Scheme under the BC Act which will deliver like for like offsets in NSW.

Table 34: Candidate Serious and Irreversible Impacts

Species / Community	Principle	Direct impact individuals / area (ha)	Threshold
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland	Principles 1 and 2	5.29 ha	No listed threshold

Table 35: Determining whether impacts are serious and irreversible

Determining whether impacts are serious and irreversible	Assessment
Principle 1	
Does the proposal impact on a species, population or ecological community that is a candidate entity because it is in a rapid rate of decline?	Yes, the White Box Yellow Box Blakely's Red Gum Woodland is identified as potentially being SAII.
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	There is no threshold for impacts that may trigger a serious and irreversible impact. Therefore, the determination of a serious and irreversible impact is to be assessed on a case-by-case basis
Principle 2	
Does the proposal impact on a species that is a candidate entity because it has been identified as having a very small population size?	Yes
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible	No threshold is identified, and the community is widespread in several bioregions NSW. Further consideration of potential serious and irreversible impacts is outlined in Table 36 below
Principle 3	
Does the proposal impact on the habitat of a species or an area of an ecological community that is a candidate entity because it has a very limited geographic distribution?	No
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.	n/a
Principle 4	
Does the proposal impact on a species, a component of species habitat or an ecological community that is a candidate entity because it is irreplaceable?	No

Determining whether impacts are serious and irreversible	Assessment
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.	n/a

Table 36: Evaluation of an impact on a TEC

Impact Assessment Provisions	Assessment
1. the area and condition of the TEC to be impacted directly and indirectly by the proposed development	Direct impacts will remove 5.29 ha of the TEC. 5.12 ha removal of low condition present as scattered paddock trees among exotic pasture. 0.17 ha present as moderate to good quality woodland.
2. the extent and overall condition of the TEC within an area of 1500 metres, and then 5000 metres, surrounding the proposed development footprint.	In the absence of accurate and detailed mapping of the TEC in the region, an assessment of the extent of the TEC has been made using the vegetation formation layer from the Central Tablelands State Vegetation Type Map (OEH 2017). All areas of the formation 'Grassy Woodland' were plotted and the area calculated. Conservatively assuming that 50% of the area of Grassy Woodland is the TEC, the estimated extent of the TEC extent surrounding the proposed development footprint is: • 155 ha of Grassy Woodland within 1500m (this represents removal of an estimated 3% of the community within 1500m) • 689 ha of Grassy Woodland within 5000 metres (this represents removal of an estimated 0.76% of the community within 5000m) It is likely that the condition of the CEEC within the areas surrounding the development site varies. Higher quality remnants are likely to be present in road reserves and along drainage lines. Higher quality and larger areas are present within the EEZ than the development site.
3. an estimate of the extant area and overall condition of the TEC remaining before and after the impact of the proposed development has been taken into consideration	The extant area of the TEC is difficult to distinguish, as it occurs widely across NSW. It occurs in a variety of condition states and is fragmented over a wide distribution. Higher quality and larger areas of the community have been retained within the EEZ of the development site and also occur in the surrounding landscape. The extant area and overall condition of the community is not likely to be significantly changed as a result of the proposed development due to the small area and low condition of the areas to be impacted.
4. the development proposal's impact on:	
a. abiotic factors critical to the long-term survival of the TEC; for example, will the impact lead to a reduction of groundwater levels or substantial alteration of surface water patterns; will it alter natural disturbance regimes that the TEC depends upon, e.g. fire, flooding etc.?	The development is unlikely to have any impacts on abiotic factors critical to the long term survival of the TEC. This TEC within the development site is already highly disturbed and modified. Solar panels will be mounted above the ground with minimal impacts to surface water flows expected.

Impact Assessment Provisions	Assessment
b. characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of under-storey species or harvesting of plants	The proposed development will impact 5.29 ha of the community including mature trees containing hollows. These areas are generally considered to be in low condition and occur as isolated paddock trees over exotic groundcover. No introduced fire or flooding regimes would occur and no increase of natural occurrences of these events is anticipated from the development. The harvesting of plants will not occur within the remaining areas of the TEC.
c. the quality and integrity of an occurrence of the TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the TEC	5.29 ha will be directly impacted. The TEC within the development site is already highly disturbed and modified and indirect impacts are not expected to significantly reduce the quality or integrity of any additional areas of the TEC following the implementation of mitigation measures.
5. direct or indirect fragmentation and isolation of an area of the TEC	The TEC within the development site is already highly modified and fragmented. The proposed development will result in minor increases to the fragmentation which already exists within the highly modified farming landscape comprising of widely scattered paddock trees. Better quality and more intact areas of the TEC in the locality have been retained.
6. the measures proposed to contribute to the recovery of the TEC in the IBRA subregion.	The TEC will be offset in accordance with the Biodiversity Offset Scheme under the BC Act which will deliver like for like offsets in NSW. Additionally, through avoid and minimise, better quality and more intact areas of the TEC in the locality have been retained.

2.2.7 Aquatic impact assessment

Direct impacts to aquatic habitat are associated with the western crossing of Stubbo Creek.

Potential direct impacts are associated with potential disturbance to the watercourse bed and bank during construction. A crossing will be designed and constructed in accordance with *Policy and Guidelines for Fish Friendly Waterway Crossing* (DPI undated), with the aim to minimise potential impacts on aquatic habitats and avoid obstruction of fish passage. The proponent will aim to avoid any obstruction of fish passage or dredging &/or reclamation. Otherwise the crossing will comply with the requirements of the FM Act (Part 7 Permit). Given the degraded nature of the aquatic habitat present and mitigation measures proposed, the direct impacts to aquatic habitat are unlikely to be significant.

Potential indirect impacts on aquatic habitat include:

- impacts to water quality (if water is present) during construction of the creek crossing
- potential increase in run-off/sedimentation during construction, operation and decommissioning

Given the degraded nature of the aquatic habitat present and mitigation measures proposed, the direct impacts to aquatic habitat are unlikely to be significant.

The proposed development is unlikely to impact aquatic threatened species as outlined in Section 1.7.3.

2.3 Risk assessment

A risk assessment has been undertaken for any residual impacts likely to remain after the mitigation measures in Section 2.2.5 have been applied. Likelihood criteria, consequence criteria and the risk matrix are provided in Table 37, Table 38 and Table 39 respectively.

Table 37: Likelihood criteria

Likelihood criteria	Description
Almost certain (Common)	Will occur, or is of a continuous nature, or the likelihood is unknown. There is likely to be an event at least once a year or greater (up to ten times per year). It often occurs in similar environments. The event is expected to occur in most circumstances.
Likely (Has occurred in recent history)	There is likely to be an event on average every one to five years. Likely to have been a similar incident occurring in similar environments. The event will probably occur in most circumstances.
Possible (Could happen, has occurred in the past, but not common)	The event could occur. There is likely to be an event on average every five to twenty years.
Unlikely (Not likely or uncommon)	The event could occur but is not expected. A rare occurrence (once per one hundred years).
Remote (Rare or practically impossible)	The event may occur only in exceptional circumstances. Very rare occurrence (once per one thousand years). Unlikely that it has occurred elsewhere; and, if it has occurred, it is regarded as unique.

Table 38: Consequence criteria

Consequence category	Description
Critical (Severe, widespread long-term effect)	Destruction of sensitive environmental features. Severe impact on ecosystem. Impacts are irreversible and/or widespread. Regulatory and high-level government intervention/action. Community outrage expected. Prosecution likely.
Major (Wider spread, moderate to long term effect)	Long-term impact of regional significance on sensitive environmental features (e.g. wetlands). Likely to result in regulatory intervention/action. Environmental harm either temporary or permanent, requiring immediate attention. Community outrage possible. Prosecution possible.
Moderate (Localised, short-term to moderate effect)	Short term impact on sensitive environmental features. Triggers regulatory investigation. Significant changes that may be rehabilitated with difficulty. Repeated public concern.
Minor (Localised short-term effect)	Impact on fauna, flora and/or habitat but no negative effects on ecosystem. Easily rehabilitated. Requires immediate regulator notification.
Negligible (Minimal impact or no lasting effect)	Negligible impact on fauna/flora, habitat, aquatic ecosystem or water resources. Impacts are local, temporary and reversible. Incident reporting according to routine protocols.

Table 39: Risk matrix

Consequence	Likelihood				
	Almost certain	Likely	Possible	Unlikely	Remote
Critical	Very High	Very High	High	High	Medium
Major	Very High	High	High	Medium	Medium
Moderate	High	Medium	Medium	Medium	Low
Minor	Medium	Medium	Low	Low	Very Low
Negligible	Medium	Low	Low	Very Low	Very Low

Table 40: Risk assessment

Potential impact	Project phase	Risk (pre-mitigation)	Risk (post mitigation)
Vegetation clearing	Construction / operation	Low	Very low
sedimentation and contaminated and/or nutrient rich run-off	Construction	Low	Very low
noise, dust or light spill	Construction	Low	Very low
inadvertent impacts on adjacent habitat or vegetation	Construction	Low	Very low
transport of weeds and pathogens from the site to adjacent vegetation	Construction	Moderate	Low
vehicle strike	Construction / operation	Low	Very low
trampling of threatened flora species	Construction / operation	Low	Very low
rubbish dumping	Construction / operation	Low	Very low
wood collection	Construction / operation	Low	Very low
bush rock removal and disturbance	Construction / operation	Low	Very low
increase in predatory species populations	Construction / operation	Low	Very low
increase in pest animal populations	Construction / operation	Low	Very low
increased risk of fire	Construction / operation	Low	Very low
disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	Construction / operation	Low	Very low
sedimentation and contaminated and/or nutrient rich run-off	Construction	Low	Very low
impacts to aquatic habitat	Construction	Moderate	Low

2.4 Adaptive management for uncertain impacts

Impacts on biodiversity that are uncertain are related to the potential for vehicle strike. The risk of significant impacts associated with vehicle strike on fauna are considered to be negligible following the proposed mitigation measures. A Traffic Management Plan which includes controls to reduce risk of fauna strike such as reduced speed limits will be prepared, and staff and contactors will be alerted to

the risk of vehicle strike on fauna during the site induction. There will be a requirement for all staff and contractors to report any vehicle strike incidents and the site manager will keep a record.

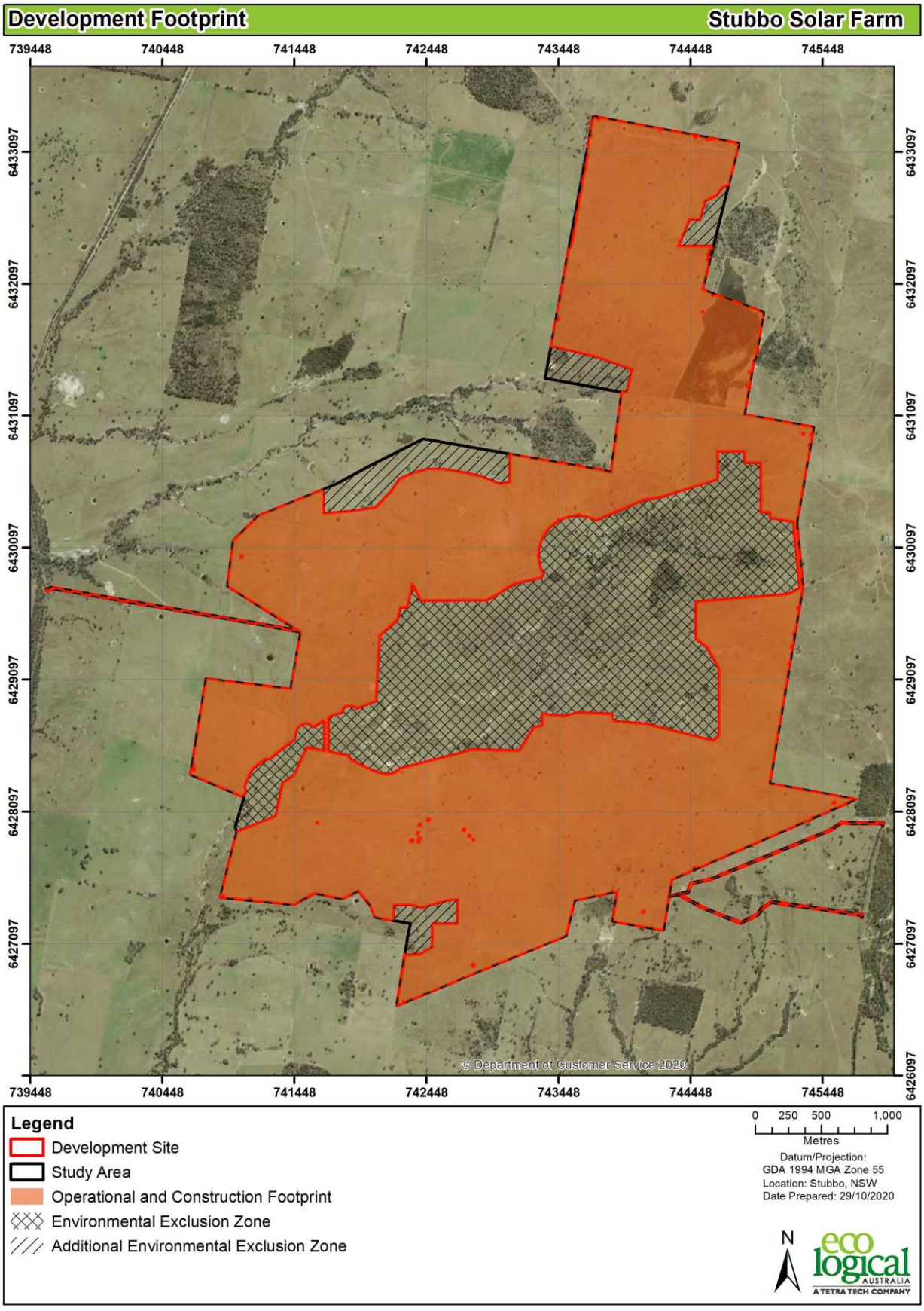

Figure 10: Final project footprint including construction and operation

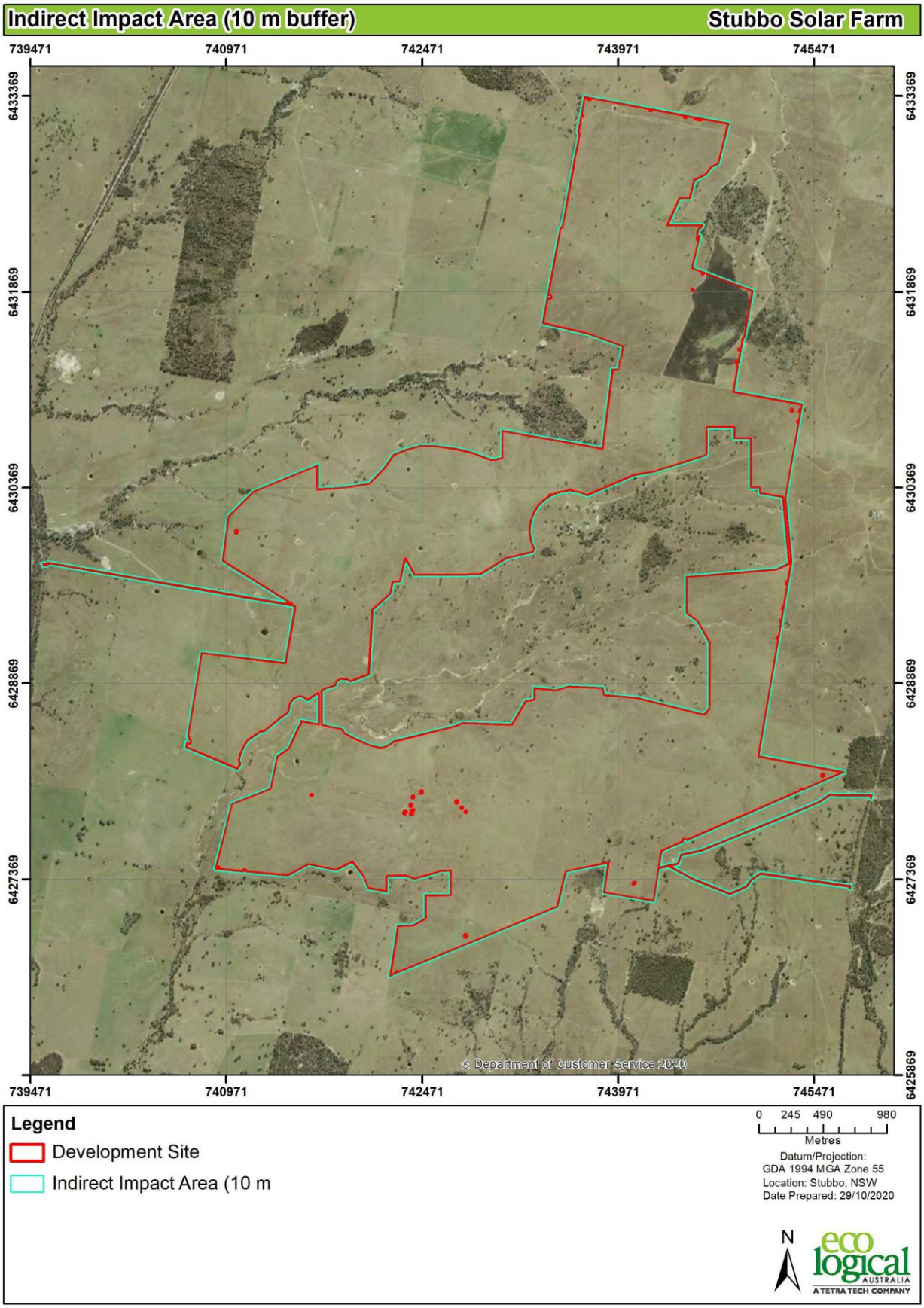

Figure 11: Indirect impact zones

2.5 Impact summary

Following implementation of the BAM and the BAMC, the following impacts have been determined.

2.5.1 Serious and Irreversible Impacts (SAII)

The development has candidate Serious and Irreversible Impacts (SAII) values as outlined in Table 41and shown on Figure 12. Detailed consideration of whether impacts on the candidate TEC are serious and irreversible is included in Section 2.2.6.

Table 41: Serious and Irreversible Impacts Summary

Species / Community	Principle	Direct impact individuals / area (ha)	Summary
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	Principle 1 and 2	Direct impacts will comprise 5.29 ha. Comprising: • 5.12 ha on low condition present as scattered paddock trees among exotic pasture. • 0.17 ha present as moderate to good quality woodland.	**Impacts not considered SAII**

2.5.2 Impacts requiring offsets

The impacts of the development requiring offset for native vegetation are outlined in Table 42 and shown on Figure 13. The impacts of the development requiring offset for threatened species and threatened species habitat are outlined in Table 43 and on Figure 13.

Table 42: Impacts to native vegetation that require offsets

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Western Slopes Grassy Woodlands	Grassy Woodlands	5.29 ha
1770	Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South	Western Slopes Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	0.24 ha

Table 43: Impacts on threatened species habitat that require offsets

Species	Common Name	Direct impact number of individuals / habitat (ha)	NSW listing status	EPBC Listing status
Ninox connivens	Barking Owl	4.4 ha	V	-

2.5.3 Impacts not requiring offsets

There are no impacts to native vegetation that do not require offsets in accordance with BAM Section 10.3.2.2.

2.5.4 Areas not requiring assessment

Category 1 Land does not require assessment. Areas not requiring assessment are shown on Figure 14.

2.5.5 Credit summary

The number of ecosystem credits required for the development are outlined in Table 44. The number of species credits required for the development are outlined in Table 45. A biodiversity credit report is included in Appendix C:.

Table 44: Ecosystem credits required

PCT ID	PCT Name	Vegetation Formation	Direct impact (ha)	Credits required
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Grassy Woodlands	5.29 ha	85
1770	Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South	Dry Sclerophyll Forests (Shrubby sub-formation)	0.24ha	2

Table 45: Species credit summary

Species	Common Name	Direct impact number of individuals / habitat (ha)	Credits required
281 Low	Barking Owl	4.2	64
1770 Low	Barking Owl	0.2	2

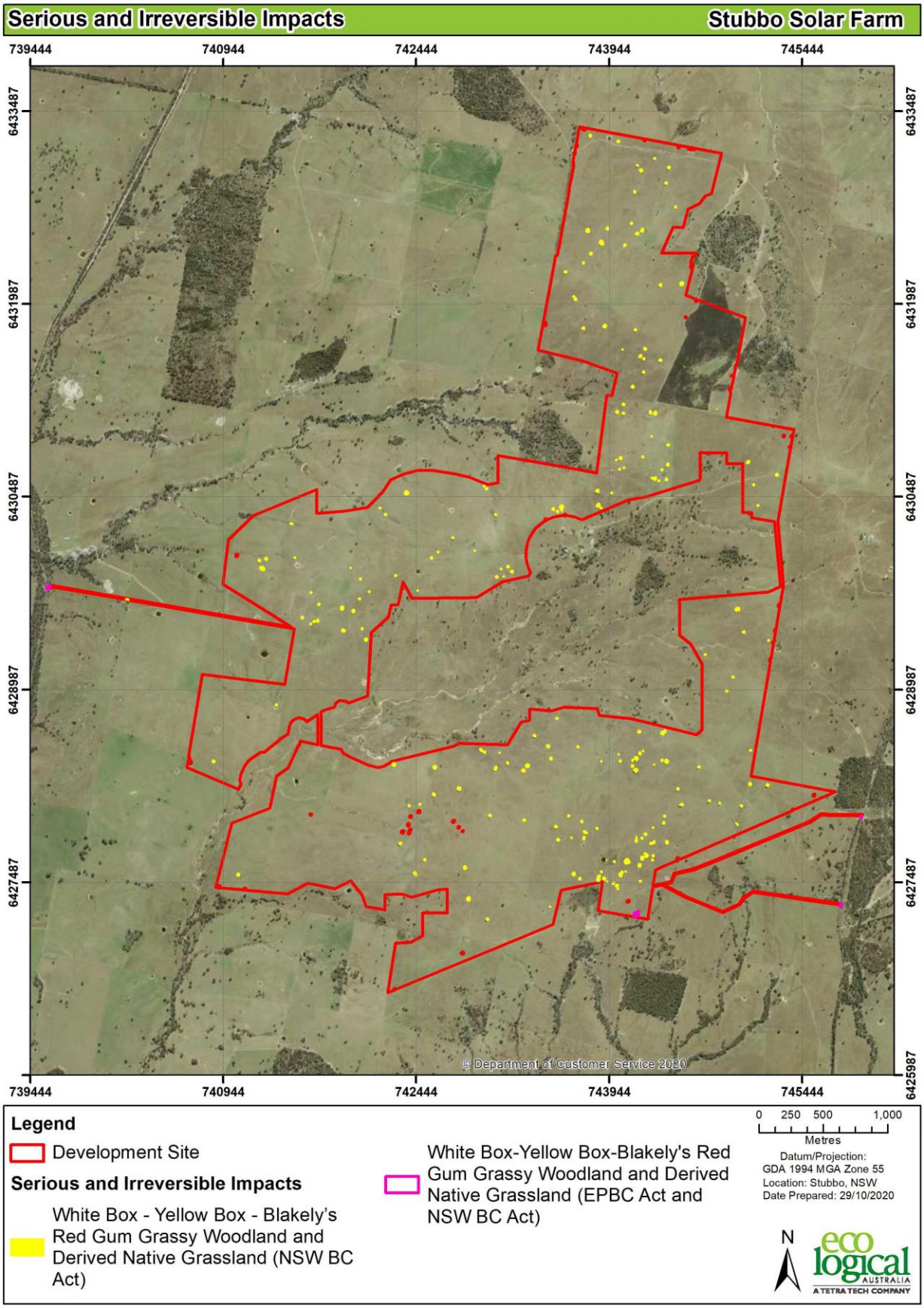

Figure 12: Candidate Serious and Irreversible Impacts

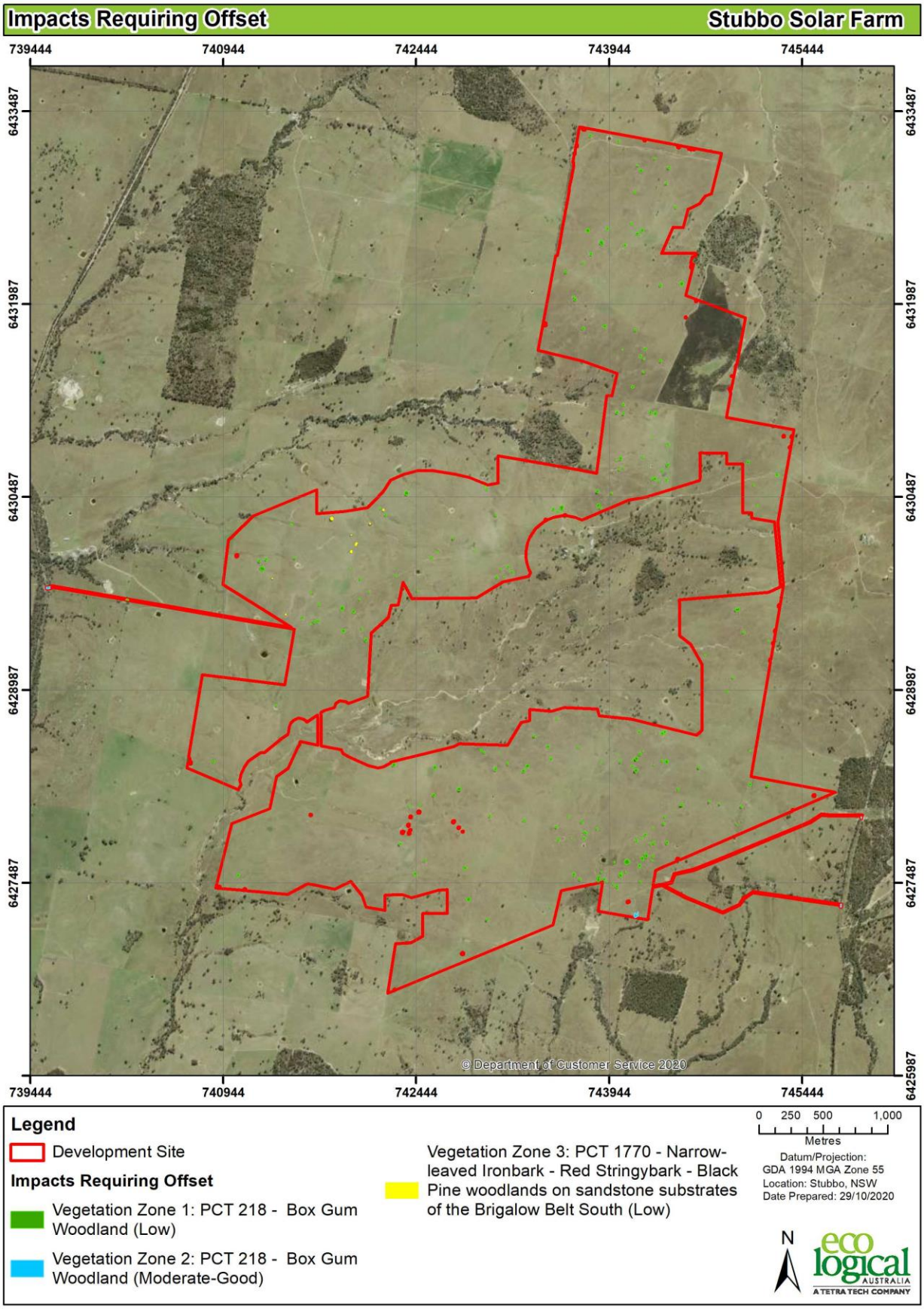

Figure 13: Impacts requiring offset

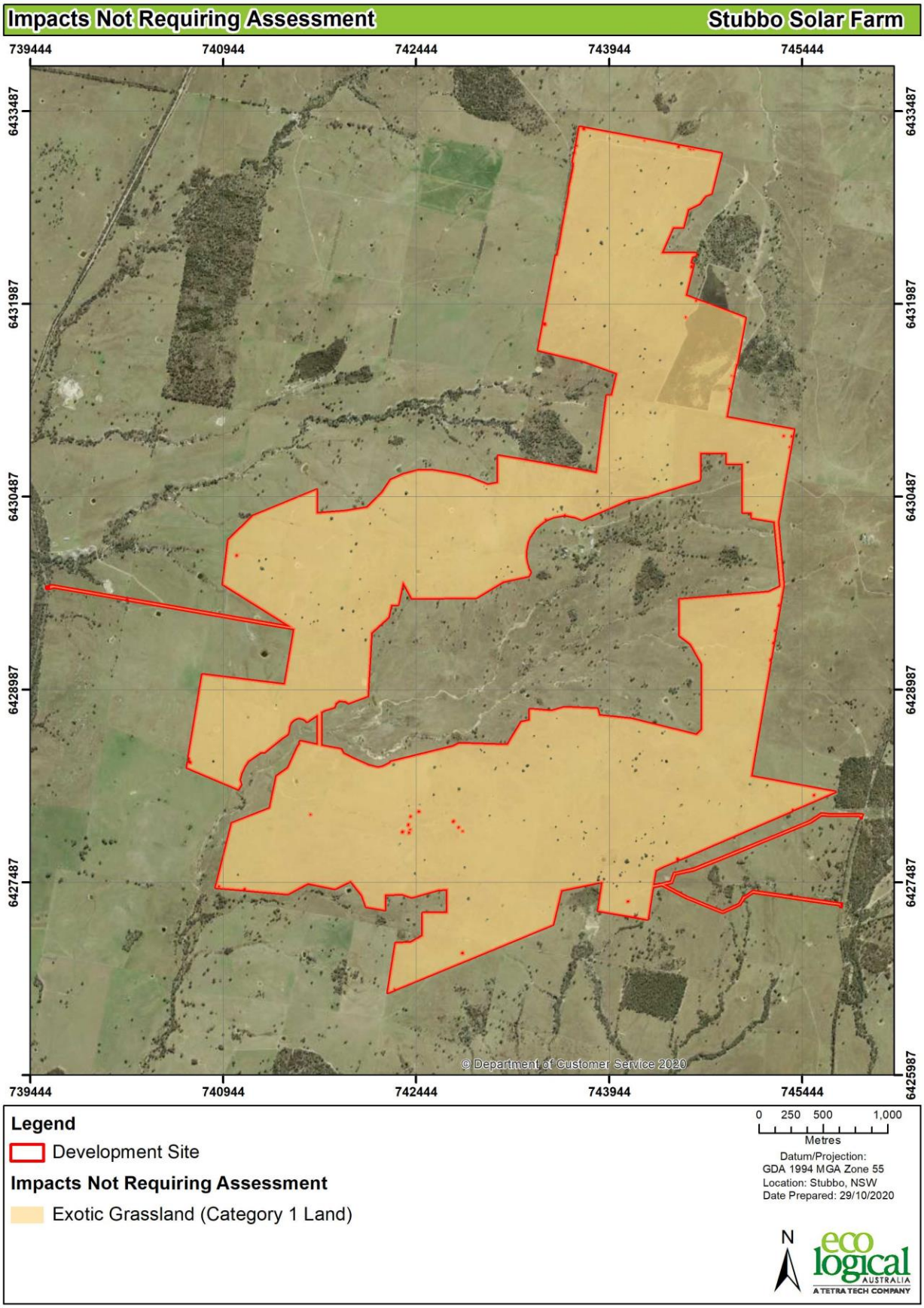

Figure 14: Areas not requiring assessment

2.6 Consistency with other legislation and policy

2.6.1 Environment Protection and Biodiversity Conservation Act (1999)

An assessment of the impacts of the proposed development on MNES was undertaken to determine whether there is the potential for any significant impacts and a referral to the Commonwealth Minister for the Environment is required.

A likelihood of occurrence table including assessment of MNES species is included in Appendix E:. Significant impact assessments have been completed for one ecological community and four species (Appendix F:), with the results summarised in Table 46. Assessments concluded that no significant impacts are likely to occur. Referral under the EPBC Act is not required, however the proponent may still elect to refer the activity for project certainty.

Table 46: Assessment of potential impacts to MNES under the EPBC Act

MNES	Occurrence	Significant assessment
Threatened ecological communities	One TEC is present within the development site. • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered	Significant impact unlikely.
Threatened species	No threatened species listed as MNES were recorded. Three species were considered to have potential to occur: • Regent Honeyeater • Swift Parrot • White-throated Needletail	Significant impact unlikely.
Migratory species	Two migratory species were considered to have potential to occur: • White-throated Needletail • Fork-tailed Swift	Significant impact unlikely.
Wetlands of International Importance	No Wetlands of National Importance are present within or in proximity to the development site.	Significant impact unlikely.

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Appendix A: Definitions

Terminology	Definition
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
BioNet Atlas	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the OEH database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish
Broad condition state:	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Development	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
Development footprint	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials.
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
High threat exotic plant cover	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
Important wetland	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) and SEPP 14 Coastal Wetlands
Linear shaped development	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
Local wetland	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).
NSW (Mitchell) landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.
Operational Manual	The Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM

Terminology	Definition
Patch size	An area of intact native vegetation that: a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or stewardship site.
Proponent	A person who intends to apply for consent to carry out development or for approval for an activity.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5 cm within a vegetation zone.
Remaining impact	An impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.
Retirement of credits	The purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	a development other than a linear shaped development, or a multiple fragmentation impact development
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by OEH and accessible from the BioNet website.
Threatened species	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification.
Vegetation zone	A relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs

Appendix B: Vegetation plot data

Table 47: Plot locations

Plot	PCT	Condition	Zone	Easting	Northing	Bearing
Plot 5	281	Low	55	744237	6427695	90
Plot 6	281	Low	55	741276	6430003	245
Plot 26	281	Low	55	744106	6427352	0
Plot 27	281	Low	55	742479	6428103	215
Plot 29	281	Low	55	744161	6428351	315
Plot 31	281	Low	55	743754	6431804	225
Plot 32	281	Low	55	744285	6430951	320
Plot 33	1770	Low	55	741940	6430054	5
Plot 3	281	Mod_good	55	745094	6427449	280
Plot 7	281	Mod_good	55	743146	6428587	305
Plot 8	281	Mod_good	55	742535	6428610	270
Plot 9	281	Mod_good	55	742742	6428623	72
Plot 10	281	Mod_good	55	743132	6428804	50
Plot 12	281	Mod_good	55	742038	6430432	300
Plot 13	281	Mod_good	55	742955	6430662	55
Plot 15	281	Mod_good	55	743046	6429239	20
Plot 16	281	Mod_good	55	743107	6429797	50
Plot 17	281	Mod_good	55	744949	6429993	330
Plot 20	281	Mod_good	55	743820	6431397	225
Plot 21	281	Mod_good	55	743692	6431393	265
Plot 22	281	Mod_good	55	743500	6431529	240
Plot 25	281	Mod_good	55	744993	6427385	158
Plot 30	281	Planted_windbreak	55	743579	6432609	190
Plot 4	n/a	Category1_land	55	744956	6427996	200
Plot 11	n/a	Category1_land	55	741528	6429407	168
Plot 14	n/a	Category1_land	55	742715	6429650	210
Plot 18	n/a	Category1_land	55	744501	6431165	170
Plot 23	n/a	Category1_land	55	743992	6432517	290
Plot 24	n/a	Category1_land	55	744366	6432506	255
Plot 28	n/a	Category1_land	55	741664	6428670	80

Table 48: Plot composition data

Plot	PCT	Condition	Tree	Shrub	Grass	Forb	Fern	Other
Plot 5	281	Low	1	1	7	5	1	1
Plot 6	281	Low	1	0	5	6	1	0
Plot 26	281	Low	1	1	7	10	1	0
Plot 27	281	Low	1	0	2	4	0	0
Plot 29	281	Low	1	0	4	8	0	0
Plot 31	281	Low	1	0	3	4	0	0
Plot 32	281	Low	1	0	0	4	0	0
Plot 33	1770	Low	1	0	4	3	0	0
Plot 3	281	Mod_good	2	4	5	12	1	1
Plot 7	281	Mod_good	1	0	6	10	1	1
Plot 8	281	Mod_good	1	1	16	16	1	2
Plot 9	281	Mod_good	1	1	6	11	0	0
Plot 10	281	Mod_good	2	2	11	16	1	2
Plot 12	281	Mod_good	1	0	16	15	1	0
Plot 13	281	Mod_good	1	1	4	8	0	0
Plot 15	281	Mod_good	1	0	10	19	1	0
Plot 16	281	Mod_good	1	1	10	15	1	0
Plot 17	281	Mod_good	2	2	7	19	1	2
Plot 20	281	Mod_good	2	0	9	15	1	1
Plot 21	281	Mod_good	1	8	11	16	1	2
Plot 22	281	Mod_good	2	1	6	9	0	0
Plot 25	281	Mod_good	1	1	4	8	0	0
Plot 30	281	Planted_windbreak	3	0	3	5	0	0
Plot 4	n/a	Category1_land	0	0	5	8	0	0
Plot 11	n/a	Category1_land	0	0	4	4	1	0
Plot 14	n/a	Category1_land	0	0	7	3	1	0
Plot 18	n/a	Category1_land	0	0	9	7	1	1
Plot 23	n/a	Category1_land	0	0	8	13	1	0
Plot 24	n/a	Category1_land	0	0	2	7	0	0
Plot 28	n/a	Category1_land	0	0	3	3	0	0

Table 49: Plot structure data

Plot	PCT	Condition	Tree	Shrub	Grass	Forb	Fern	Other
Plot 5	281	Low	20	2	3.5	1.4	0.1	0.2
Plot 6	281	Low	2.0	0.0	6.3	1.9	0.1	0.0
Plot 26	281	Low	10	1	3.7	2.9	0.1	0
Plot 27	281	Low	4.0	0.0	3.1	5.3	0.0	0.0
Plot 29	281	Low	15	0	1.4	2.7	0	0
Plot 31	281	Low	8	0	3.2	0.8	0	0
Plot 32	281	Low	3	0	0	0.4	0	0
Plot 33	1770	Low	5	0	1.7	2.6	0	0
Plot 3	281	Mod_good	20	1.8	4.3	2.2	0.1	0.1
Plot 7	281	Mod_good	8.0	0.0	2.0	1.3	0.5	0.5
Plot 8	281	Mod_good	5	0.1	15.1	9.3	0.3	0.2
Plot 9	281	Mod_good	15	0.1	38.7	14	0	0
Plot 10	281	Mod_good	3.8	0.2	28.9	10.8	0.6	0.2
Plot 12	281	Mod_good	1	0	16.3	12.5	0.2	0
Plot 13	281	Mod_good	10	0.1	1.6	55.7	0	0
Plot 15	281	Mod_good	1	0	38.6	3	2	0
Plot 16	281	Mod_good	2	0.1	24.1	11.3	1	0
Plot 17	281	Mod_good	4.4	0.9	57.4	7.9	1	0.3
Plot 20	281	Mod_good	13	0	29.5	4.7	0.1	0.1
Plot 21	281	Mod_good	6	3.6	24.9	2.6	2	0.2
Plot 22	281	Mod_good	9	0.5	35.8	3.9	0	0
Plot 25	281	Mod_good	4	1	2.7	1	0	0
Plot 30	281	Planted_windbreak	10	0	10.3	2.4	0	0
Plot 4	n/a	Category1_land	0.0	0.0	36.2	1.8	0.0	0.0
Plot 11	n/a	Category1_land	0	0	10.3	20.4	0.2	0
Plot 14	n/a	Category1_land	0	0	3.5	30.2	0.1	0
Plot 18	n/a	Category1_land	0	0	9.7	1	0.2	0.1
Plot 23	n/a	Category1_land	0	0	23.9	2.3	3	0
Plot 24	n/a	Category1_land	0	0	0.2	1.7	0	0
Plot 28	n/a	Category1_land	0	0	11.1	0.3	0	0

Table 50: Plot function data

Plot	PCT	Large trees	Hollow-bearing trees	Litter Cover	Fallen Logs	Tree (5 - 10 cm)	Tree (10 - 20 cm)	Tree (20 - 30 cm)	Tree (30 - 50 cm)	Tree (50 - 80 cm)	Regen (dbh <5cm)	High threat exotic
Plot 5	281	1	0	4.2	0	0	0	0	0	0	1	0.5
Plot 6	281	1	1	15.2	9	0	0	0	0	0	0	0.1
Plot 26	281	0	0	11.6	0	0	0	0	1	0	1	0.2
Plot 27	281	0	0	14	5	0	0	0	1	0	0	0.2
Plot 29	281	2	0	26	10	0	0	0	1	1	0	0.1
Plot 31	281	1	1	34	27	0	0	0	0	1	0	0
Plot 32	281	1	1	4.6	2	0	0	0	0	1	0	0.2
Plot 33	1770	1	1	5.4	0	0	0	0	0	0	0	0.1
Plot 3	281	2	0	25.4	2	1	1	1	1	1	0	0.1
Plot 7	281	1	0	13.6	2	1	1	1	0	0	1	0.0
Plot 8	281	2	3	9.4	30	0	1	1	1	0	1	0.6
Plot 9	281	3	1	14	40	1	1	1	0	0	1	0.1
Plot 10	281	0	0	9	3	1	1	1	1	0	1	0.1
Plot 12	281	1	1	12.4	10	0	0	0	1	1	0	0.1
Plot 13	281	3	3	30	60	0	0	0	1	1	0	0.2
Plot 15	281	0	0	25.2	0	0	0	1	0	0	0	0.2
Plot 16	281	1	1	12.6	41	0	0	0	1	0	0	0.3
Plot 17	281	5	2	23	104	1	1	0	1	1	1	0.1
Plot 20	281	2	0	3	8	1	1	1	1	1	1	0.3
Plot 21	281	0	0	50	0	1	1	1	1	0	1	0
Plot 22	281	0	0	0.6	0	1	1	1	0	0	1	0.1

Plot	PCT	Large trees	Hollow-bearing trees	Litter Cover	Fallen Logs	Tree (5 - 10 cm)	Tree (10 - 20 cm)	Tree (20 - 30 cm)	Tree (30 - 50 cm)	Tree (50 - 80 cm)	Regen (dbh <5cm)	High threat exotic
Plot 25	281	2	1	8.2	39	0	0	0	1	1	0	0.1
Plot 30	281	0	0	34	0	0	1	1	0	0	0	0
Plot 4	n/a	0	0	0.4	0	0	0	0	0	0	0	0.1
Plot 11	n/a	0	0	0	0	0	0	0	0	0	0	0
Plot 14	n/a	0	0	2.2	0	0	0	0	0	0	0	0
Plot 18	n/a	0	0	6	0	0	0	0	0	0	0	0.2
Plot 23	n/a	0	0	7	0	0	0	0	0	0	0	1
Plot 24	n/a	0	0	3	0	0	0	0	0	0	0	0
Plot 28	n/a	0	0	4.4	0	0	0	0	0	0	0	1.1

Note: Flora Species Plot Data attached in MS Excel to BAM Calculator.

Appendix C: Fauna species recorded

Scientific Name	Common Name	BC Act status	EPBC Act Status	Source
Amphibians				
Crinia parinsignifera	Eastern Sign-bearing Froglet			ELA
Crinia signifera	Common Eastern Froglet			ELA
Limnodynastes dumerilii	Eastern Banjo Frog			ELA
Limnodynastes peronii	Striped Marsh Frog			ELA
Limnodynastes tasmaniensis	Spotted Grass Frog			ELA
Litoria peronii	Peron's Tree Frog			ELA
Uperoleia laevigata	Smooth Toadlet			ELA
Birds				
Acanthiza chrysorrhoa	Yellow-rumped Thornbill			ELA
Acanthiza nana	Yellow Thornbill			ELA
Acanthiza reguloides	Buff-rumped Thornbill			ELA
Accipiter novaehollandiae	Grey Goshawk			Red Sand
Aegotheles cristatus	Australian Owlet-nightjar			ELA
Anas gracilis	Grey Teal			ELA
Anas superciliosa	Pacific Black Duck			ELA
Anthus novaeseelandiae	Australasian Pipit			ELA
Aquila audax	Wedge-tailed Eagle			ELA
Cacatua galerita	Sulphur-crested Cockatoo			ELA
Cacatua sanguinea	Little Corella			ELA
Chalcites lucidus	Shining-bronze Cuckoo			ELA
Chenonetta jubata	Australian Wood Duck			ELA
Chthonicola sagittata	**Speckled Warbler**	**V**		**Red Sand**
Cincloramphus mathewsi	Rufous Songlark			ELA
Coracina maxima	Ground Cuckoo-shrike			ELA
Corcorax melanorhamphos	White-winged Chough			ELA
Cormobates leucophaea	White-throated Treecreeper			ELA
Corvus coronoides	Australian Raven			ELA
Corvus mellori	Little Raven			ELA
Corvus orru	Torresian Crow			Red Sand
Coturnix ypsilophora	Brown Quail			ELA
Cracticus nigrogularis	Pied Butcherbird			ELA
Cracticus tibicen	Australian Magpie			ELA
Dacelo novaeguineae	Laughing Kookaburra			ELA

Scientific Name	Common Name	BC Act status	EPBC Act Status	Source
Egretta novaehollandiae	White-faced Heron			ELA
Eolophus roseicapillus	Galah			ELA
Eopsaltria australis	Eastern Yellow Robin			ELA
Falco berigora	Brown Falcon			ELA
Falco cenchroides	Nankeen Kestrel			ELA
Falco longipennis	Australian Hobby			ELA
Falco subniger	**Black Falcon**	**V**		**Red Sand**
Gerygone fusca	Western Gerygone			ELA
Grallina cyanoleuca	Magpie-lark			Red Sand
Hirundo rustica	Welcome Swallow			Red Sand
Malurus cyaneus	Superb Fairy-wren			ELA
Manorina melanocephala	Noisy Miner			ELA
Megalurus timoriensis	Tawny Grassbird			Red Sand
Melithreptus brevirostris	Brown-headed Honeyeater			ELA
Melopsittacus undulatus	Budgerigar			Red Sand
Microeca fascinans	Jacky Winter			Red Sand
Ninox connivens	**Barking Owl**	**V**		**ELA**
Ocyphaps lophotes	Crested Pigeon			ELA
Oriolus sagittatus	Olive-backed Oriole			ELA
Pachycephala pectoralis	Golden Whistler			ELA
Pardalotus punctatus	Spotted Pardalote			ELA
Pardalotus striatus	Striated Pardalote			ELA
Philemon corniculatus	Noisy Friarbird			ELA
Platycercus eximius	Eastern Rosella			ELA
Podargus strigoides	Tawny Frogmouth			Red Sand
Psephotus haematonotus	Red-rumped Parrot			ELA
Rhipidura leucophrys	Willie Wagtail			ELA
Smicrornis brevirostris	Weebill			ELA
Strepera graculina	Pied Currawong			ELA
*Sturnus vulgaris**	Common Starling			ELA
Taeniopygia bichenovii	Double-barred Finch			ELA
Taeniopygia guttata	Zebra Finch			ELA
Tyto javanica	Eastern Barn Owl			ELA
Vanellus miles	Masked Lapwing			Red Sand
Vanellus tricolor	Banded Lapwing			ELA
Mammals				

Scientific Name	Common Name	BC Act status	EPBC Act Status	Source
Macropus giganteus	Eastern Grey Kangaroo			ELA
Macropus rufogriseus	Red-necked Wallaby			Red Sand
*Oryctolagus cuniculus**	European Rabbit			Red Sand
Pseudocheirus peregrinus	Common Ringtail Possum			ELA
*Sus scrofa**	Pig			ELA
Trichosurus vulpecula	Common Brushtail Possum			ELA
Vombatus ursinus	Common Wombat			ELA
*Vulpes vulpes**	Red Fox			ELA
Wallabia bicolor	Swamp Wallaby			Red Sand
Reptiles				
Chelodinia longicollis	Eastern Long-necked Turtle			ELA
Pogona barbata	Eastern Bearded Dragon			ELA
Tilliqua rugosa	Shingleback			ELA
Tilliqua scincoides	Eastern Blue-tongue Lizard			ELA

Notes: This list include species recorded in broader study area than the development site, including the EEZ, roadside reserves and surrounding woodlands. **Bold** = threatened species. *= introduced species.

Appendix D: Biodiversity credit report

BAM Credit Summary Report

Proposal Details

Assessment Id
00022631/BAAS19034/20/00022632

Proposal Name
Stubbo_Solar_Farm

BAM data last updated *
19/11/2020

Assessor Name
Tom Schmidt

Report Created
20/11/2020

BAM Data version *
32

Assessor Number
BAAS19034

BAM Case Status
Finalised

Date Finalised
20/11/2020

Assessment Revision
0

Assessment Type
Major Projects

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South											
3	1770_Low	Not a TEC	17.4	17.4	0.24			High Sensitivity to Potential Gain	1.50		2
										Subtotal	**2**

Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion											
1	281_Low	White Box Yellow Box Blakely's Red Gum Woodland	30.5	30.5	5.1	Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.00	TRUE	78
2	281_Mod_good	White Box Yellow Box Blakely's Red Gum Woodland	76.9	76.9	0.17	Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.00	TRUE	7
										Subtotal	**85**
										Total	**87**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits
Ninox connivens / Barking Owl (Fauna)								
281_Low	30.5	30.5	4.2	Vulnerable	Not Listed	2	False	64
1770_Low	17.4	17.4	0.2	Vulnerable	Not Listed	2	False	2
							Subtotal	**66**

Appendix E: EPBC Act MNES likelihood table

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood	Justification
Central Hunter Valley eucalypt forest and woodland		E	CE	Permian-derived soils, typically medium in fertility, often of medium clay content, although some are sandy.	The ecological community is an open forest or woodland, typically dominated by one or more of the following four eucalypt species: *Eucalyptus crebra* (Narrow-leaved Ironbark), *Corymbia maculata* (Spotted Gum), *E. dawsonii* (Slaty Gum) and *E. moluccana* (Grey Box).	Not present within development footprint.	Landscape characteristics and species composition of native vegetation within the develop site are not consistent with this TEC.
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia		E	E	Central New South Wales through northern and central Victoria into South Australia. In NSW, found in the southern subregions of the Brigalow Belt South bioregion, the eastern subregions of the Darling Riverine Plain bioregion, the NSW South Western Slopes bioregion and the eastern subregions of the Cobar Peneplain bioregion.	Flat to undulating plains, low slopes and rises and, to a lesser extent, drainage depressions and flats. May extend to more elevated hillslopes on the fringes of its range. Often occurs on productive soils derived from alluvial or colluvial materials.	Not present within development footprint.	Species composition of native vegetation within the develop site is not consistent with this TEC.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		CE	CE	Occurs in an arc along the western slopes and tablelands of the Great Dividing Range from Southern Queensland through NSW to central Victoria. In NSW, it occurs in the Brigalow Belt South, Nandewar, New England Tableland, Sydney Basin, NSW North Coast, South Eastern Highlands, South East Corner, NSW South Western Slopes and Riverina Bioregions.	Areas where rainfall is between 400 and 1200 mm per annum, on moderate to highly fertile soils at altitudes of 170 m to 1200 m.	Present	PCT 281 Mod-good (0.17 ha) within the development site is consistent with this TEC. Other areas do not meet the condition thresholds due to the disturbed groundcover.
Commersonia procumbens		V	V	Endemic to NSW, found in the Dubbo-Mendooran-Gilgandra region, the Pilliga and Nymagee areas, the Upper Hunter region, and in Goonoo SCA.	Sandy sites, disturbed habitats such as roadsides, quarry edges and gravel stockpiles. Often found in Eucalyptus dealbata- E. sideroxylon woodland,	Unlikely	Species not recorded in targeted surveys of potential habitat.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood	Justification
					Melaleuca uncinata scrub, and mallee with Calytrix tetragona understorey.		
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	In NSW, recorded mainly on coastal and near coastal ranges north from Victoria to near Forster, with two isolated occurrences inland north-west of Grafton.	Coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest.	Unlikely	No suitable habitat.
Dichanthium setosum	Bluegrass	V	V	In NSW, found on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes.	Cleared woodland, grassy roadside remnants and highly disturbed pasture, on heavy basaltic black soils and red-brown loams with clay subsoil.	Unlikely	No suitable habitat.
Euphrasia arguta		E	CE	In NSW, recently recorded only from Nundle area of the north western slopes and tablelands, from near the Hastings River and from the Barrington Tops.	Eucalypt forest with a mixed grass and shrub understorey, disturbed areas, along roadsides.	Unlikely	No suitable habitat.
Homoranthus darwinioides		V	V	Central tablelands and western slopes of NSW, occurring from Putty to the Dubbo district. Found west of Muswellbrook between Merriwa and Bylong, and north of Muswellbrook to Goonoo SF.	Woodland with shrubby understorey, usually in gravely sandy soils.	Unlikely	Species not recorded in targeted surveys of potential habitat.
Leucochrysum albicans var. tricolor	Hoary Sunray	P	E	In NSW it occurs on the Southern Tablelands and adjacent areas in an area roughly bounded by Albury, Bega and Goulburn.	Grassland, woodland and forest, generally on relatively heavy soils.	Unlikely	No suitable habitat.
Prasophyllum petilum	Tarengo Leek Orchid	E	E	Four sites in NSW: at Boorowa, Captains Flat, Ilford and Delegate. Also	Natural Temperate Grassland, grassy woodland, and Box-Gum woodland.	Unlikely	No suitable habitat.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood	Justification
				experimentally introduced at Bowning Cemetery NSW.			
Swainsona recta	Small Purple-pea	E	E	Queanbeyan and Wellington-Mudgee areas. Historically also recorded at Carcoar, Culcairn and Wagga Wagga.	Grassland, open woodland and open forests dominated by *Eucalyptus blakelyi* (Blakely's Red Gum), *E. melliodora* (Yellow Box), *E. rubida* (Candlebark Gum) and *E. goniocalyx* (Long-leaf Box).	Unlikely	Species not recorded in targeted surveys of potential habitat.
Thesium australe	Austral Toadflax	V	V	In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands.	Grassland on coastal headlands or grassland and grassy woodland away from the coast.	Unlikely	No suitable habitat.
Tylophora linearis		V	E	In NSW, found in the Barraba, Mendooran, Temora and West Wyalong districts in the northern and central western slopes. Records include Crow Mountain near Barraba, Goonoo, Pilliga West, Cumbil, and Eura State Forests, Coolbaggie Nature Reserve, Goobang National Park, and Beni Conservation Area	Dry scrub, open forest, dry woodlands of Eucalyptus fibrosa, Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla and Allocasuarina luehmannii.	Unlikely	No suitable habitat.
Anthochaera phrygia	Regent Honeyeater	CE	CE	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions.	Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of *Casuarina cunninghamiana (*River Oak).	Potential	Wide-ranging species.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood	Justification
Aprasia parapulchella	Pink-tailed Legless Lizard	V	V	In NSW, only known from the Central and Southern Tablelands, and the South Western Slopes.	Sloping, open woodland areas with predominantly native grassy groundlayers, rocky outcrops or scattered, partially-buried rocks.	Unlikely	Species not recorded in targeted surveys of potential habitat.
Apus pacificus	Fork-tailed Swift		M	Recorded in all regions of NSW.	Riparian woodland., swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes.	Potential	Wide-ranging species.
Botaurus poiciloptilus	Australasian Bittern	E	E	Found over most of NSW except for the far north-west.	Permanent freshwater wetlands with tall, dense vegetation, particularly *Typha* spp. (bullrushes) and *Eleocharis* spp. (spikerushes).	Unlikely	No suitable habitat.
Calidris ferruginea	Curlew Sandpiper	E	CE, M	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin.	Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	Unlikely	No suitable habitat.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes.	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	Unlikely	No suitable habitat.
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Qld.	Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Unlikely	No suitable habitat.
Delma impar	Striped Legless Lizard	V	V	In NSW, occurs in the Southern Tablelands, the South West Slopes and possibly on the Riverina.	Natural Temperate Grassland, secondary and modified grassland, open Box-Gum Woodland.	Unlikely	No suitable habitat.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood	Justification
Grantiella picta	Painted Honeyeater	V	V	Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas.	Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	Unlikely	No suitable habitat.
Hirundapus caudacutus	White-throated Needletail		V, M	All coastal regions of NSW, inland to the western slopes and inland plains of the Great Divide.	Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.	Potential	Wide-ranging species.
Lathamus discolor	Swift Parrot	E	CE	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes.	Box-ironbark forests and woodlands.	Potential	Wide-ranging species.
Leipoa ocellata	Malleefowl	E	V	Arid and semi-arid zones. In NSW, populations occur in the south west mallee centred on Mallee Cliffs NP and extending east to near Balranald; in the Scotia mallee west of the Darling River; and in the Goonoo forest near Dubbo. Recorded less recently in the Pilliga forests, around Cobar and Goulburn River NP.	Predominantly mallee communities. Less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands, or other woodlands dominated by Mulga or native Cypress Pine species.	Unlikely	No suitable habitat.
Litoria booroolongensis	Booroolong Frog	E	E	Restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. Several populations have recently been recorded in the Namoi catchment.	Permanent streams with some fringing vegetation cover such as ferns, sedges or grasses.	Unlikely	No suitable habitat.
Motacilla flava	Yellow Wagtail		M	Regular summer migrant to mostly coastal Australia. In NSW recorded Sydney to Newcastle, the Hawkesbury and inland in the Bogan LGA.	Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns.	Unlikely	No suitable habitat.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood	Justification
Myiagra cyanoleuca	Satin Flycatcher		M	In NSW, widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains.	Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies.	Unlikely	No suitable habitat.
Numenius madagascariensis	Eastern Curlew		CE, M	Summer migrant to Australia. Primarily coastal distribution in NSW, with some scattered inland records.	Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	Unlikely	No suitable habitat.
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	Distribution coincides approximately with the Murray Darling Basin; the Pilliga Scrub region is the distinct stronghold for this species.	Mallee, *Allocasuarina luehmannii* (bulloke) and box eucalypt- dominated communities, especially box/ironbark/cypress-pine vegetation.	Unlikely	No suitable habitat.
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	In NSW they occur from the Qld border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit.	Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	Unlikely	No suitable habitat.
Phascolarctos cinereus	Koala	V	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands.	Eucalypt woodlands and forests.	Unlikely	Species not recorded in targeted surveys of potential habitat.
Polytelis swainsonii	Superb Parrot	V	V	In NSW, occurs on inland slopes of the Great Divide and on adjacent plains, especially along the major river-systems.	Box-gum woodland, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest.	Unlikely	Species not recorded in targeted surveys of potential habitat.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood	Justification
Pseudomys novaehollandiae	New Holland Mouse		V	Fragmented distribution across eastern NSW.	Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	Unlikely	No suitable habitat.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria.	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Unlikely	No suitable habitat.
Rhipidura rufifrons	Rufous Fantail		M	Coastal and near coastal districts of northern and eastern Australia, including on and east of the Great Divide in NSW.	Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands.	Unlikely	No suitable habitat.
Rostratula australis	Australian Painted Snipe	E	E	In NSW most records are from the Murray-Darling Basin. Other recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys.	Swamps, dams and nearby marshy areas.	Unlikely	No suitable habitat.
Maccullochella peelii	Murray Cod		V	Throughout most of the Murray Darling Basin with the exception of some localised extinctions. Some translocated populations exist outside the species' natural distribution in impoundments and waterways (Cataract Dam and the Nepean River system in NSW).	Clear rocky streams to slow flowing, turbid rivers and billabongs. Frequently found in the main river channel and larger tributaries; also in floodplain channels when they contain water.	Unlikely	No suitable habitat.
Macquaria australasica	Macquarie Perch	E	E	Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven catchments.	River and lake habitats, especially the upper reaches of rivers and their tributaries.	Unlikely	No suitable habitat.

Appendix F: Assessments of Significance for MNES

The EPBC Act administrative guidelines on significance set out 'Significant Impact Criteria' (DotE 2013) that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of national environmental significance. Matters listed under the EPBC Act as being of national environmental significance include:

- Listed threatened species and ecological communities.
- Listed migratory species.
- Wetlands of International Importance.
- The Commonwealth marine environment.
- World Heritage properties.
- National Heritage places.
- Nuclear actions.
- A water resource, in relation to coal seam gas development and large coal mining development.

Specific 'Significant Impact Criteria' are provided for each matter of national environmental significance except for threatened species and ecological communities in which case separate criteria are provided for species listed as endangered and vulnerable under the EPBC Act.

The following section assesses impacts on MNES against the relevant significant impact criteria. The MNES assessed are:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – CEEC
- Regent Honeyeater – Critically Endangered
- Swift Parrot – Critically Endangered
- White-throated Needletail – Vulnerable; Migratory
- Fork-tailed Swift - Migratory

Table 51: Significant impact assessment for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered Ecological Community – EPBC Act

Criterion	Question	Response
An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:		
1)	reduce the extent of an ecological community	Marginally. The total extent to be impacted is approximately 0.17 ha.
2)	fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	Negligible. The areas likely to be impacted are very small and unlikely to result in a significant increase in fragmentation. Retention of the canopy is proposed, with clearance of shrubs and ground cover proposed.
3)	adversely affect habitat critical to the survival of an ecological community	No. The habitat to be impacted is not considered critical to the survival of the ecological community due to the minimal impacts proposed in the small area proposed for removal.

Criterion	Question	Response
4)	modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	No. The proposed solar farm is unlikely to modify or destroy abiotic factors necessary for the ecological community's survival.
5)	cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	No. The proposed solar farm is unlikely to cause substantial change in the species composition for an occurrence of the community.
6) i	cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: assisting invasive species, that are harmful to the listed ecological community, to become established, or	No. The site is already covered extensively in exotic species, and their extent is unlikely to increase, such that a substantial reduction in the quality or integrity of an occurrence of an ecological community will occur.
6) ii	cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or	No. The community is only present in small, low quality patches within the project area and is unlikely to result in a substantial reduction in the quality or integrity of an occurrence of an ecological community.
7)	interfere with the recovery of an ecological community.	Negligible. The community is unlikely to recover in the area without extensive intervention as there is evidence of large-scale soil disturbance, dating back several decades, ongoing livestock grazing and surrounding areas that are dominated by improved pastures.
Conclusion	**Is there likely to be a significant impact?**	**No.** Considering the limited extent and low condition of the ecological community within the development site and much larger areas to be retained in surrounding areas, impacts resulting from the proposed solar farm are unlikely to constitute a significant impact to this MNES.

Table 52: Species profiles – Swift Parrot and Regent Honeyeater

Overview	Swift Parrot	Regent Honeyeater
EPBC Act status	Critically Endangered	Critically Endangered
BC Act status	Endangered	Critically Endangered
Threat abatement plan	Yes (Feral Cats)	Yes (Feral Cats)
Recovery plan	Yes	Yes
Habitat and ecology	Migratory species that only breeds in Tasmania and migrates to the south-eastern mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes where it feeds in Box-ironbark forests and woodlands.	Nomadic species that uses eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of *Casuarina cunninghamiana (*River Oak).
Extent of local occurrence	Potential to use trees within the development site for foraging on occasion. The development site does not contain potential breeding habitat.	Potential to use trees within the development site for foraging on occasion. The development site does not contain potential breeding habitat.
Impacts	5.53ha of potential foraging habitat will be removed.	5.53ha of potential foraging habitat will be removed.

Table 53: Significant impact assessment – Swift Parrot and Regent Honeyeater

Criterion	Question	Swift Parrot	Regent Honeyeater
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:			
1)	Lead to a long-term decrease in the size of a population	The removal of 5.53 ha of potential seasonal foraging habitat is unlikely to lead to a long-term decrease in the size of the population of Swift Parrot.	The removal of 5.53 ha of potential seasonal foraging habitat is unlikely to lead to a long-term decrease in the size of the population of Regent Honeyeater.
2)	Reduce the area of occupancy of the species	The removal of 5.53 ha of potential seasonal foraging habitat is unlikely to reduce the area of occupancy for Swift Parrot. Adjacent habitat within the study area will be retained.	The removal of 5.53 ha of potential seasonal foraging habitat is unlikely to reduce the area of occupancy for Regent Honeyeater. Adjacent habitat within the study area will be retained.
3)	Fragment an existing population into two or more populations	Fragmentation of the population will not result from the proposed activity.	Fragmentation of the population will not result from the proposed activity.
4)	Adversely affect habitat critical to the survival of a species	The study area does not contain habitat listed as critical to the survival of Swift Parrot.	The study area does not contain habitat listed as critical to the survival of Regent Honeyeater.

Criterion	Question	Swift Parrot	Regent Honeyeater
5)	Disrupt the breeding cycle of a population	No	No
6) i	Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The removal of 5.53 ha of potential seasonal foraging habitat is unlikely to result in the species decline.	The removal of 5.53 ha of potential seasonal foraging habitat is unlikely to result in the species decline.
6) ii	Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Invasive species are unlikely to become established above that already in existence.	Invasive species are unlikely to become established above that already in existence.
7)	Introduce disease that may cause the species to decline	Disease is unlikely to be introduced.	Disease is unlikely to be introduced.
8)	Interfere with the recovery of the species	The removal of 5.53 ha of potential seasonal foraging habitat is unlikely to interfere with the species recovery.	The removal of 5.53 ha of potential seasonal foraging habitat is unlikely to interfere with the species recovery.
Conclusion	**Is there likely to be a significant impact?**	No. The proposed activity is unlikely to have a significant impact on Swift Parrot as the impacts are restricted to a small area of low quality potential seasonal foraging habitat and much larger areas of higher quality habitat will remain in the locality.	No. The proposed activity is unlikely to have a significant impact on Regent Honeyeater as the impacts are restricted to a small area of low quality potential seasonal foraging habitat and much larger areas of higher quality habitat will remain in the locality.

Table 54: Species profile - White-throated Needletail

Overview	Comment
EPBC Act status	Vulnerable
BC Act status	Not listed
Threat abatement plan	No
Recovery plan	No
Habitat and ecology	Migratory swift that breeds in the northern hemisphere and migrates to Australia during summer. Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.

Overview	Comment
Extent of local occurrence	Potential to forage over the development site. Species does not breed in Australia.
Impacts	Potential to forage aerially over the entire development site. Removal of 5.53 ha of woodland foraging habitat.

Table 55: Significant impact assessment – White-throated Needletail

Criterion	Question	Response - White-throated Needletail
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
1)	Lead to long-term decrease in the size of an important population of a species	The removal of 5.53 ha of foraging habitat is unlikely to lead to a long-term decrease in the size of the important population of White-throated Needletail.
2)	Reduce the area of occupancy of an important population	The removal of 5.5 ha of foraging habitat is unlikely to reduce the area of occupancy for the important population of White-throated Needletail. Adjacent habitat within the study area will be retained.
3)	Fragment an existing important population into two or more populations	Fragmentation of the important population will not result from the proposed activity.
4)	Adversely affect habitat critical to the survival of the species	Habitat critical to the survival of the White-throated Needletail is not likely to be impacted.
5)	Disrupt the breeding cycle of an important population	No breeding habitat will be impacted.
6) i	Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The removal of 5.53 ha of potential seasonal foraging habitat is unlikely to result in the species decline.
6) ii	Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Invasive species are unlikely to become established above that already in existence.
7)	Introduce disease that may cause the species to decline	Disease is unlikely to be introduced.
8)	Interfere substantially with the recovery of the species	The removal of 5.53 ha of foraging habitat is unlikely to interfere with the species recovery.
Conclusion	**Is there likely to be a significant impact?**	No. The proposed activity is unlikely to have a significant impact on White-throated Needletail as the impacts are restricted to a small area of low-quality seasonal foraging habitat. Large areas of suitable habitat for this wide-ranging species will be retained.

Table 56: Migratory species significant impact thresholds – White-throated Needletail and Fork-tailed Swift

Species	Significant impact thresholds (DotE 2015)		Important habitat (DotE 2015)
	Area of habitat	Ecologically significant proportion of the population	
Fork-tailed Swift (*Apus pacificus*)	NA	1,000	A variety of woodland and forest types. The species is predominantly aerial.
White-throated Needletail (*Hirundapus caudacutus*)	NA	100	A variety of woodland and forest types. The species is predominantly aerial

Table 57: Significant impact assessment – Migratory species - White-throated Needletail and Fork-tailed Swift

Criterion	Question	Response
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:		
1)	substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	5.53 ha of woodland habitat will be removed. This is unlikely constitute substantial modification of important habitat for either of the listed migratory species.
2)	result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or	The proposed activity is unlikely to result in invasive species establishing in an area of important habitat for any of the listed migratory species.
3)	seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The proposed activity is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population for either of the listed migratory species. Both species are mostly aerial and would not breed within the development site.
Conclusion	**Is there likely to be a significant impact?**	No. The proposed activity is unlikely to have a significant impact on listed migratory species as it will not impact on important habitat, an ecologically significant proportion of the population or seriously disrupt the lifecycle for an ecologically significant proportion of the population for these species.

Appendix G: EPBC Act Protected Matters Search

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

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

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

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

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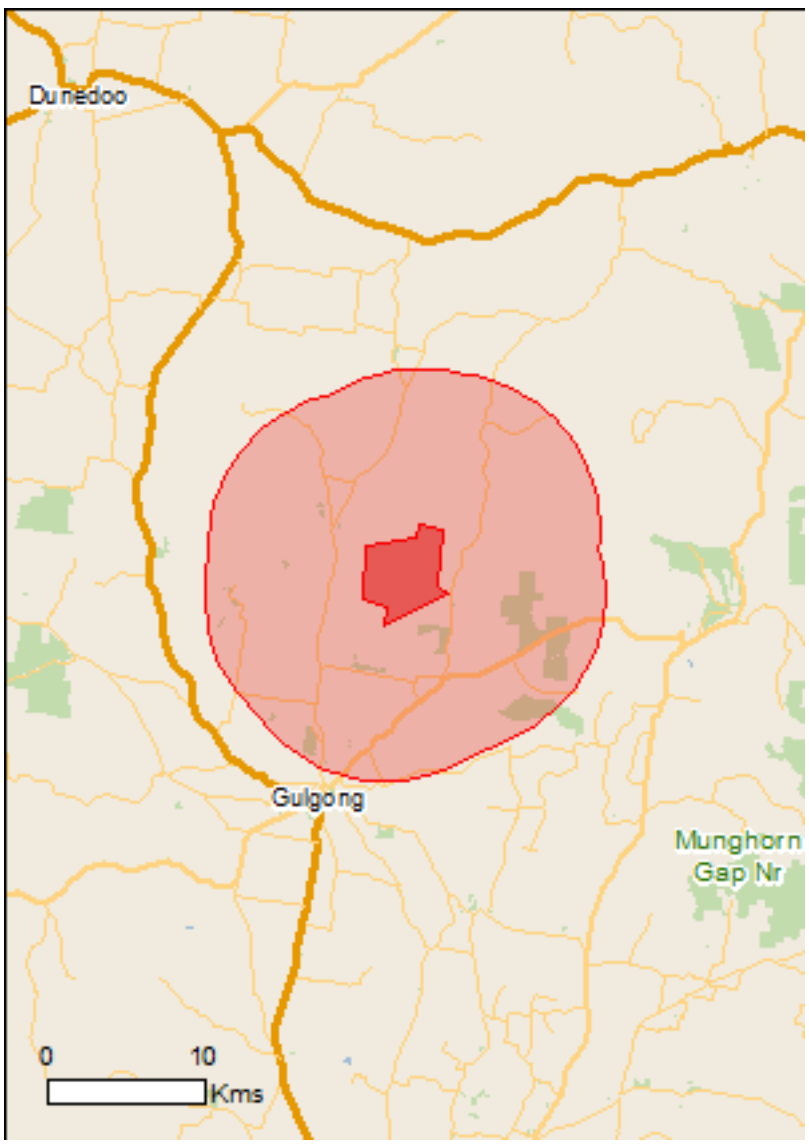

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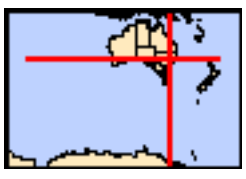

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	5
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	33
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:	None
Regional Forest Agreements:	None
Invasive Species:	32
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	800 - 900km upstream
Hunter estuary wetlands	150 - 200km upstream
Riverland	800 - 900km upstream
The coorong, and lakes alexandrina and albert wetland	900 - 1000km upstream
The macquarie marshes	200 - 300km 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
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community may occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely 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

Name	Status	Type of Presence
		area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Galaxias rostratus Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat likely to occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to 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
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Androcalva procumbens [87153]	Vulnerable	Species or species habitat may occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Homoranthus darwinioides [12974]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Leucochrysum albicans var. tricolor Hoary Sunray, Grassland Paper-daisy [56204]	Endangered	Species or species habitat likely to occur within area
Prasophyllum petilum Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Swainsona recta Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may 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 likely to occur within area
Delma impar Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land - Commonwealth Trading Bank of Australia

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
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

Name	Threatened	Type of Presence
		area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		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
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within

Name	Status	Type of Presence
		area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-32.239893 149.558382,-32.239893 149.558382,-32.235247 149.588423,-32.229438 149.588938,-32.231326 149.603529,-32.259347 149.600611,-32.262831 149.606963,-32.278071 149.570055,-32.269073 149.570914,-32.265154 149.556494,-32.239893 149.558382

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-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
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-Australian Government, Department of Defence
Forestry Corporation, NSW
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-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

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

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

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