APPENDIX D BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT (BDAR)

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Oxley Solar Farm

February 2021

Project Number: 19-489

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ACRONYMS AND ABBREVIATIONS

BAM	Biodiversity Assessment Method
BAM-C	BAM Calculator
BC Act	Biodiversity Conservation Act 2016
BCD	Biodiversity Conservation Division
BDAR	Biodiversity Development Assessment Report
BS Act	Biosecurity Act 2015
BOM	Australian Bureau of Meteorology
BOS	Biodiversity Offset Scheme
Cwth	Commonwealth
DoAWE	Department of Agriculture, Water and the Environment
DPIE	(NSW) Department of Planning, Industry and Environment
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
ha	hectares
km	kilometres
m	Metres
MNES	Matters of National environmental significance under the *EPBC Ac*t (c.f.)
NSW	New South Wales
OSD	Oxley Solar Development Pty Ltd
TEC	Threatened Ecological Community

EXECUTIVE SUMMARY

NGH has prepared this BDAR for the Oxley Solar Farm. The purpose of this BDAR was to address the requirements of the BAM and determine appropriate avoidance, minimisation, mitigation and offset requirements for the proposal. It has been prepared by accredited BAM assessors and uses a precautionary approach to address uncertainty.

In this BDAR, biodiversity impacts have been assessed through comprehensive mapping and assessment, completed in accordance with the BAM. Targeted surveys were undertaken over four survey periods:

- 20th August -22nd August 2019
- 25th November – 29th November 2019
- 4th May – 8th May 2020
- 28th September – 30th September 2020

Key results included:

- Impacts to approximately 87 ha of native vegetation will generate ecosystem credits for the project. This includes:
    - 86.7 ha of Box Gum Woodland TEC
    - 20 hollow bearing trees would be removed by the proposal.
- Three ecosystem credit species were detected within the development site during field surveys. Offsets for these species are included in the ecosystem credit requirement for the project:
    - Glossy Black- Cockatoo *Calyptorhynchus lathami*
    - Little Eagle *Hieraaetus morphnoides*
    - Square-tailed Kite *Lophoictinia isura*
- 5 species credit species were assumed to occur as survey effort could not confidently rule them out. They will generate an offset requirement:
    - Tusked Frog *Adelotus brevis* (assumed present)
    - Glandular Frog *Litoria subglandulosa* (assumed present)
    - Southern Myotis *Myotis Macropus* (assumed present)
    - Hawkweed *Picris evae* (assumed present)
    - Austral toadflax *Thesium australe* (assumed present)

The credit requirement has therefore been defined as:

Zone ID	PCT ID	PCT name	Ecosystem credits required
1	84_Riparian	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	1
2	510_Woodland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	186
3	510_Derived Native Grassland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	7
4	567_Woodland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	73
5	567_Derived Native Grassland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	947
6	84_Sedgeland	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	6

Species Credit Species	Species credits required
Tusked Frog *Adelotus brevis* (Endangered population in the Nandewar and New England Tableland Bioregions)	12
Glandular Frog *Litoria subglandulosa*	12
Southern Myotis *Myotis macropus*	220
Hawkweed *Picris evae*	186
Austral toadflax *Thesium australe*	910

Avoidance measures were considered first and secondarily, mitigation measures have been outlined to reduce the impacts to biodiversity. The residual impacts will be offset.

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

(a) Retiring credits under the Biodiversity Offsets Scheme, or

(b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or

(c) Funding a biodiversity action that benefits the threatened entity impacted by the development.

The BDAR includes assessment of EPBC Act listed entities. The evaluation concluded significant impacts are not anticipated and therefore referral and offsets for EPBC Act listed entities is not considered warranted.

1 INTRODUCTION

The proposed Oxley Solar Farm is classified as State Significant Development (SSD) under the State and Regional Development State Environmental Planning Policy (SEPP). This Biodiversity Development Assessment Report (BDAR) assesses the impacts of the proposed Oxley Solar Farm (the proposal) according to the NSW Biodiversity Assessment Methodology (BAM), as required by the Secretary's Environmental Assessment Requirements (SEARs) for the proposal. NGH has prepared this report on behalf of the proponent, Oxley Solar Development Pty Ltd.

The following terms are used in this document, as required for a BDAR:

- **Subject land** – all lots that would be affected by the proposal.
- **Development footprint** – The area of land that is directly impacted by the proposal, including, the solar array, perimeter fencing, access roads, transmission line easement, bushfire management setbacks and temporary areas used to store construction materials. It has been delineated within the development site based on an indicative infrastructure layout, allowing sufficient buffers for changes to the layout that will occur during the detailed design phase. Detailed design would occur pending project approval.
- **Development site** – The broader area of land that may be affected by the proposal and to which the BAM is applied, in consideration of potential indirect impacts.
- **Buffer area** – Land extending 1500m out from the development site, used to assess native vegetation extent and other landscape features.

1.1 THE PROPOSAL

The proposed Oxley Solar Farm involves the construction, operation and decommissioning of a ground-mounted PV solar array. Approximately 225MW (AC) of renewable energy would be generated and supplied directly to the national electricity grid. The Oxley Solar Farm would provide enough clean, renewable energy for about 81,000 average NSW homes while displacing approximately 400,000 metric tons of carbon dioxide annually. It would also assist the NSW and Commonwealth Governments to meet Australia's renewable energy targets.

The Oxley Solar Farm development site was selected after an extensive review of alternative sites by the proponent. The development site has been evaluated in terms of the Large Scale Solar Energy Guideline for SSD 2018 (DPIE) which provides recommendations regarding selection of suitable development sites and areas of constraint that should be identified. Once the broader site was selected, the development footprint was refined iteratively, in tandem with environmental assessment and consultation with relevant government agencies, the community and other stakeholders. This process ensures the proposal has responded appropriately to the site's constraints.

Of the 895.5 ha development site, the development footprint would represent approximately 287.2 ha which would be developed for the solar farm and associated infrastructure. Two existing TransGrid 132kV transmission lines run parallel to each other within the northern section of the development site and would be used to connect the solar farm to the national electricity grid.

Key Infrastructure components of the proposal include:

- Approximately 715,000 PV solar panels mounted on either fixed or tracking systems, both of which are considered feasible:
    - Fixed-tilted structures in a north orientation; or

    - East-west horizontal tracking systems.
- Approximately 45 PCU composed of two inverters, a transformer and associated control equipment to convert DC energy generated by the solar panels to 33kV AC energy.
- Steel mounting frames with driven or screwed pile foundations.
- An onsite 132kV substation containing two transformers and associated switchgear to facilitate connection to the national electricity grid via the existing 132kV transmission line onsite.
- Underground power cabling to connect solar panels, combiner boxes and PCUs.
- Underground auxiliary cabling for power supplies, data services and communications.
- Buildings to accommodate a site office, indoor 33kV switchgear, protection and control facilities, maintenance facilities and staff amenities.
- About 1km of access track off Waterfall Way to the site which would require construction to the proposed onsite substation.
- Site access along Silverton Road to Gara Road.
- Internal access tracks for construction and maintenance activities.
- An energy storage facility with a capacity of up to 30MWh (i.e. 30 MW power output for one hour) and comprising of lithium ion batteries with inverters.
- Perimeter security fencing up to 2.3m high.
- Native vegetation planting to provide visual screening onsite and for specific receivers.

The construction phase of the proposal would take about 12 – 18 months. The peak construction period would be a shorter period of about 6 months. Approximately 350 workers would be required during construction.

The solar farm is anticipated to be operational for about 30 years. Around five fulltime equivalent operations and maintenance staff and service contractors would operate the facility.

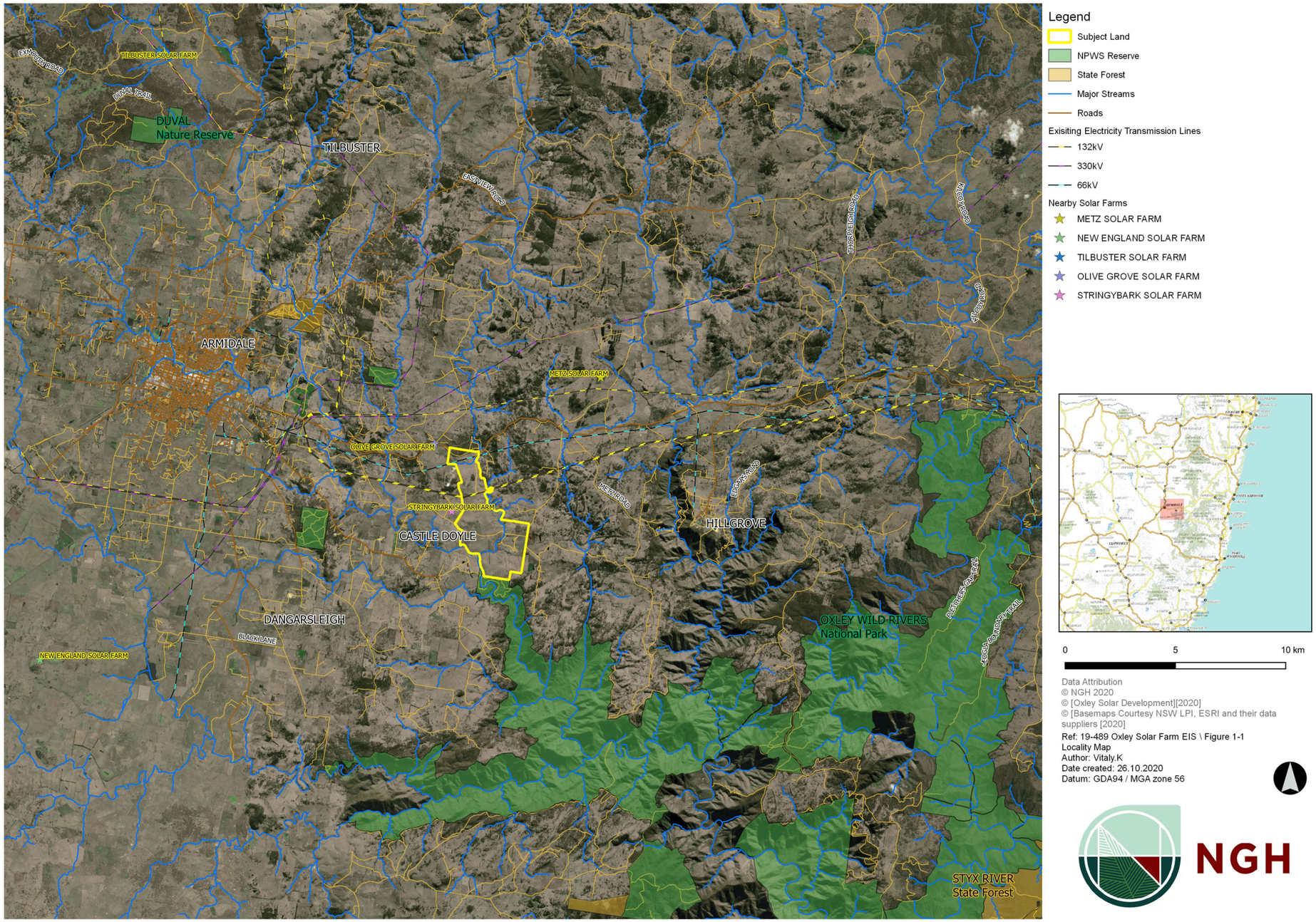
At the end of the project's life, when the solar farm is no longer considered viable, all above ground infrastructure, with the possible exception of the onsite substation, would be removed. Any cabling more than 500mm underground may also be left in place as it would not impact future agricultural activities following rehabilitation of the site. Similarly access tracks may be left in place, depending on the future use of the site.

1.2 THE SUBJECT LAND

1.2.1 Site location

The site proposed for development is located on the southern side of Waterfall Way, approximately 14 kilometres (km) south-east of Armidale (Figure 1-1), in the New England region of NSW. This region has been identified as an optimal Renewable Energy Zone (REZ) in which to develop new electricity generation projects, supported by existing transmission strength and capacity (AEMO, 2018). The New England North West is the second highest solar penetration region in NSW (DPIE, 2017).

The land immediately surrounding the development site includes agricultural land, predominantly large lot agricultural enterprises but also includes a, landfill, other renewable energy projects and reserves including travelling stock reserves and national park. The Oxley Wild Rivers National Park is adjacent to the southern boundary of the development site. The park contains World Heritage listed Gondwana rainforest, historic sites and waterfalls. It is a popular for recreational activities including walking, camping, bike or and horse riding and fishing. Figure 1-1 shows the locality map.



Legend

- Subject Land
- NPWS Reserve
- State Forest
- Major Streams
- Roads

Exisiting Electricity Transmission Lines

- 132kV
- 330kV
- 66kV

Nearby Solar Farms

- METZ SOLAR FARM
- NEW ENGLAND SOLAR FARM
- TILBUSTER SOLAR FARM
- OLIVE GROVE SOLAR FARM
- STRINGYBARK SOLAR FARM

0 5 10 km

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Ref: 19-489 Oxley Solar Farm EIS \ Figure 1-1
Locality Map
Author: Vitaly.K
Date created: 26.10.2020
Datum: GDA94 / MGA zone 56

NGH

Figure 1-1 Locality map

1.2.2 Subject land

The proposal includes free hold, Council and Crown land. The owners of the subject land are outlined below. The subject land comprises approximately 1,048 ha.

Table 1-1 Affected lots associated with the proposed Oxley Solar Farm.

Referred to in the EIS	Proposed infrastructure	Lots and DP	Owner	Existing use	Ownership arrangements
Development site and development footprint	All proposed solar farm infrastructure including solar arrays, connection infrastructure, battery storage, internal roads and ancillary infrastructure.	Lot 5 DP253346	Currently owned by one private landowner (involved landowner).	Agriculture.	OSD would purchase this land.
		Lot 6 DP625427	Currently owned by one private landowner (involved landowner).	Agriculture.	OSD would purchase this land.
		Lot 2 DP1206469	Currently owned by one private landowner (involved landowner).	Agriculture.	OSD would purchase this land.
		Lot 7003 & 7004 DP1060201	Crown Land	Road easement Travelling stock reserve	OSD would lease or purchase this land.
Connection	Connection to existing Transmission lines.	Lot 5 DP253346.	One private landowner (involved landowner).	Agriculture.	Easement would be established.
Site access	Up to 1km of access track between Waterfall Way south towards the solar farm and associated substation.	Lot 2 DP1206469	Currently owned by one private landowner (involved landowner).	Agriculture	Easement would be established.
		Lot 7003 & 7004 DP1060201	Crown Land	Road easement Travelling stock reserve	Easement would be established.

1.2.3 Development Site

The area of land within Subject Land subject to potential direct and indirect impacts from the proposal. The development site is approximately 895.5 ha. The development site is the area surveyed for this assessment.

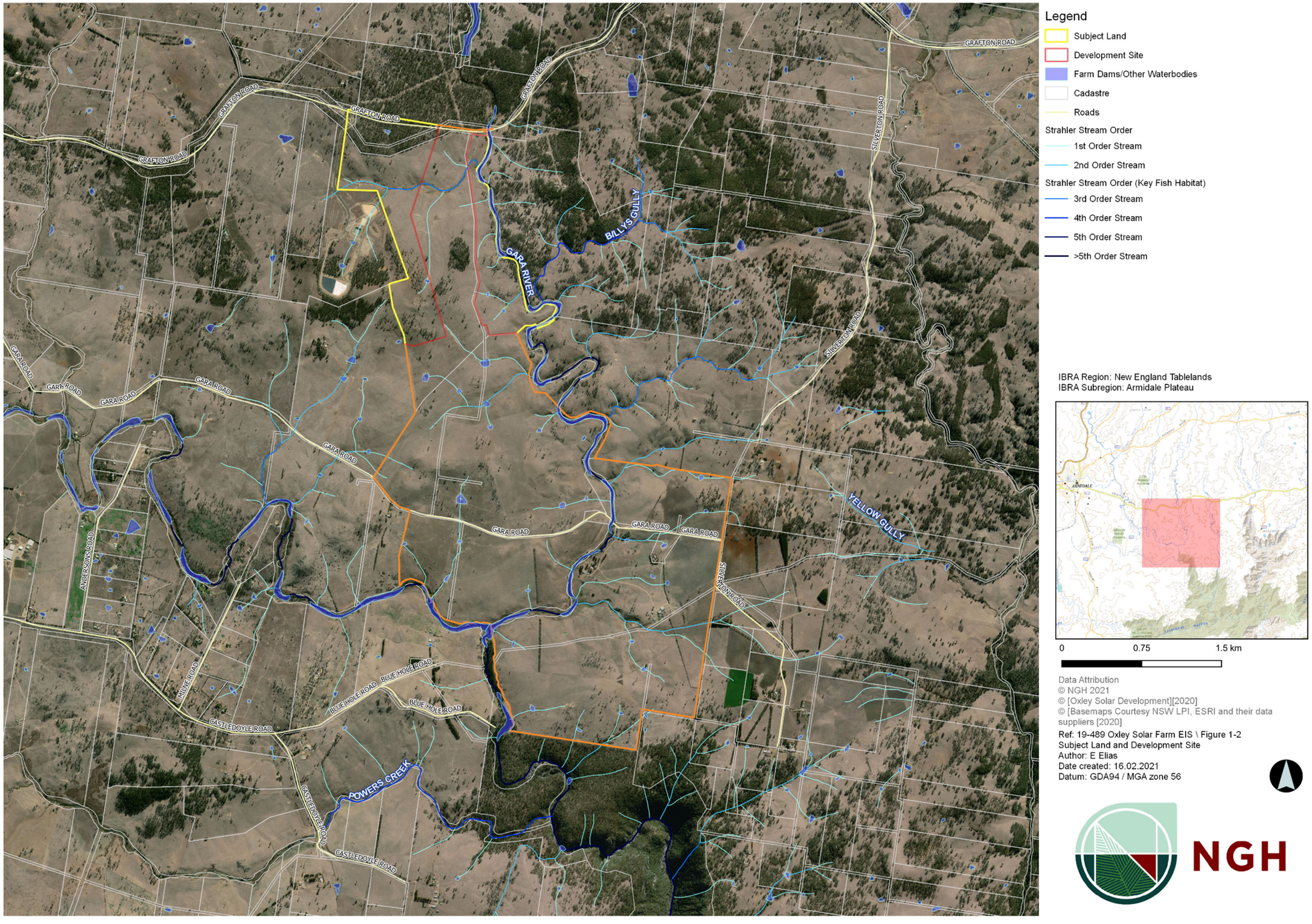
1.2.4 Development Footprint

The final infrastructure layout would be determined as part of commercial tendering process, as such, some necessary flexibility is included in the proposal description and development footprint. The

development footprint assessed in this BDAR represents the maximum impact areas that would be required. The development footprint is approximately 287.2 ha.

The subject land and development site are shown in Figure 1-2.

The subject land, development site and development footprint are shown in Figure 1-3.



Legend

- Subject Land
- Development Site
- Farm Dams/Other Waterbodies
- Cadastre
- Roads

Strahler Stream Order

- 1st Order Stream
- 2nd Order Stream

Strahler Stream Order (Key Fish Habitat)

- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream

IBRA Region: New England Tablelands
IBRA Subregion: Armidale Plateau

0 0.75 1.5 km

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Ref: 19-489 Oxley Solar Farm EIS \ Figure 1-2
Subject Land and Development Site
Author: E Elias
Date created: 16.02.2021
Datum: GDA94 / MGA zone 56

NGH

Figure 1-2 Subject land and development site

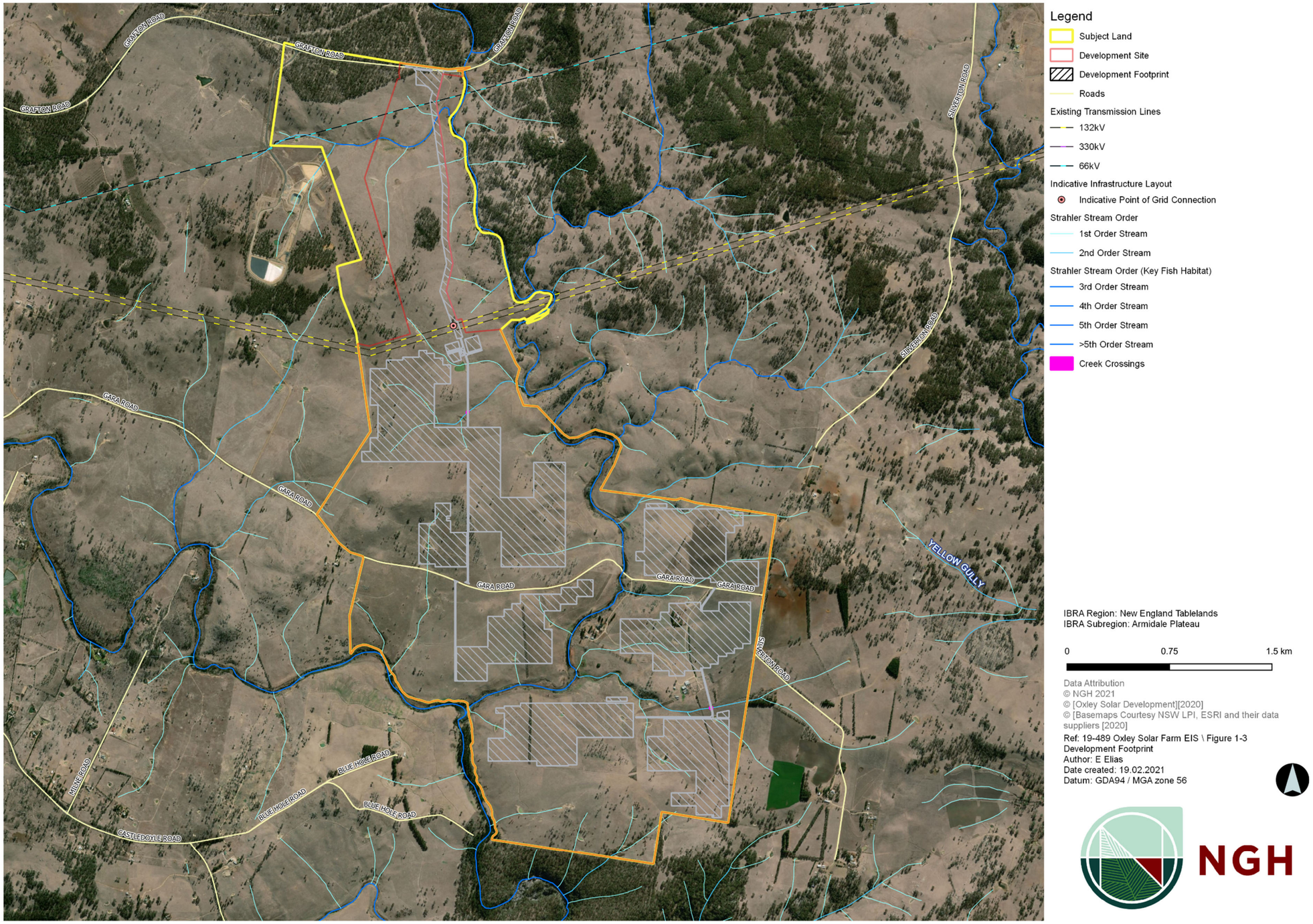


Figure 1-3 Development Footprint

1.2.5 Site description

Of the 895.5 ha development site, the development footprint would represent approximately 287.2 ha which would be developed for the solar farm and associated infrastructure.

The development site comprises mostly of paddocks on foot slopes and hills, most of which has been historically cleared for agricultural purposes such as cropping and stock grazing. Patches of woodlands are also evident throughout the site.

Key features of the development site include:

- Woodlands and hollow bearing trees of high conservation value.
- Areas of woodland and derived native grassland with moderate conservation value
- Agricultural/cropping land
- Thirty-four (34) dams
- One ephemeral watercourse and approximately 20 other tributaries.
- Rocky outcrops

1.3 STUDY AIMS

The aim of this BDAR is to address the requirements of the BAM, as required in the SEARs, which are summarised in Table 1-2 below.

Table 1-2 Biodiversity SEARS for Oxley Solar Farm

Secretary's Environmental Assessment Requirement	Where addressed
The BDAR must address the following specific issues:	
1. Biodiversity impacts related to the proposed development are to be assessed in accordance with Section 7.9 of the Biodiversity Conservation Act 2017 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.	**This BDAR**
2. 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 6-10**
3. The BDAR must include details of the measures proposed to address the offset obligation as follows: • **The total number and classes of biodiversity credits required to be retired for the development/project.** • **The number and classes of like-for-like biodiversity credits proposed to be retired.** • **The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules.**	**Section 10**

Secretary's Environmental Assessment Requirement	Where addressed
• **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.**	
4. The BDAR must be submitted with all spatial data associated with the survey and assessment as per Appendix 11 of the BAM.	**Provided separately**
5. 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.	**Appendix C**

No specific considerations for any threatened species, populations or communities were specified in the SEARs or by the Biodiversity Conservation Division (BCD) of the Department of Planning, Industry and Environment (DPIE).

1.4 SOURCE OF INFORMATION USED IN THE ASSESSMENT

The following information sources were used in the development of this BDAR:

- Australian Government's Species Profiles and Threats (SPRAT) database http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

  NSW Threatened Species Profiles http://www.environment.nsw.gov.au/threatenedspeciesapp/ and www.environment.nsw.gov.au/AtlasApp/UI_Modules/

- Department of Primary Industries (DPI) profiles of threatened species, population, and ecological communities
- Commonwealth Department of Agriculture, Water and the Environment Protected Matters Search Tool

  Accessed online at http://environment.gov.au/epbc/protected-matters-search-tool

- Australia's IBRA Bioregions and sub-bioregions. Accessed October 2019 http://environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 3
- NSW OEH's Biodiversity Assessment Method (BAM) calculator (http://www.environment.nsw.gov.au/bbccapp/ui/mynews.aspx)
- NSW OEH's BioNet threatened biodiversity database

  Accessed online via login at http://www.bionet.nsw.gov.au/

- OEH BioNet Vegetation Classification Database (OEH 2017)

  Accessed online via login at http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx

- OEH VIS Mapping

  Accessed online at http://www.environment.nsw.gov.au/research/VISmap.htm

- Office of Environment and Heritage (OEH) (2017). Biodiversity Assessment Method
- NSW Government SEED Mapping

  https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU

- NSW Biodiversity Values Map
  https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap

- Aerial imagery of historical land use (Sourced from Google Earth and Spatial Services Delivery)
- 2017 Land Use Dataset (Australian Land Use and Management (ALUM) Classification Version 7 (Office of Environment and Heritage (OEH), 2017)
- NSW Woody vegetation extent and Foliage Projective Cover (FPC) 2011 (OEH, 2015)
- Sensitive regulated and vulnerable regulated lands on the Native Vegetation Regulatory Map portal
- Vegetation Map for the Norther River CMA (VIS_ID 524) (Eco Logical 2005)

2 LANDSCAPE FEATURES

2.1 IBRA BIOREGIONS AND SUBREGION

Interim Biogeographic regionalisation for Australia (IBRA) Bioregions are geographically distinct bioregions based on common climates, geology, landforms and native vegetation. There are 89 IBRA bioregions within Australia. The development site falls within the NSW New England Tablelands IBRA Bioregion. The New England Tablelands Bioregion's Landscapes are characterised by a stepped plateau of hills and plains occurring in elevations between 600m and 1500m and support a wide range of open forests and woodlands.

The development site occurs within the Armidale plateau IBRA subregion and this was entered into the BAM Calculator (BAM-C) for the proposal.

The Armidale plateau subregion is characterised by fine grained Permo-Carboniferous sedimentary rocks, granites and multiple tertiary basalt flows. Landforms are characterised by undulating to hilly plateaus at elevations of ~1100m; Stepped landscapes where basalt flows and broad valleys are present, with steeper areas found to the east at the head of Great Escarpment gorges. Soils are typically characterised by geological or landscape features;

- Texture contrast soils on granites and sedimentary rocks.
    - Mellow and well drained on upper slopes
    - Harsh and poorly drained on lower slopes
- Variable deep black earths to stony loams in valley floors on basalt.
- Deep, dark loamy alluvium in swampy valleys.

The Armidale plateau subregions vegetation communities occupy suitable landscapes such as:

- Open ribbon gum forest and woodland with snow gum and black sallee on basalt.
- Yellow box, Blakely's red gum, rough-barked apple, apple box on sedimentary
- Silver-top stringybark, New England stringybark on dry aspects, Blakely's red gum, yellow box and apple box on moist, well-drained slopes; and
- New England peppermint with ribbon gum on flats.

2.2 NSW LANDSCAPE REGIONS AND AREA

The development site falls across three Mitchell Landscapes. These are:

- Dingo Spur Meta-sediments
- Uralla Basalts and Sands
- Moonbi – Walcha Granites

The dominant Mitchell Landscape within the development site, Moonbi – Walcha, was entered into the BAM-C for the proposal. Refer to Figure 2-1.

2.3 NATIVE VEGETATION

An assessment of native vegetation in the 1500 m buffer area was undertaken using aerial imagery, State Vegetation Mapping and field assessments. Approximately 1456 ha of native vegetation occurs in the

surrounding 1500 m buffer area. This constitutes approximately 44% of the buffer area. Broad-leaved Stringybarks are the dominant canopy species observed in higher areas of the subject land. Lower lying areas, proximal to watercourses tend to have a higher proportion of the Yellow Box and Blakely's Red Gum, as well as on the road verge to the north. Dominant species within riparian areas includes sporadic Blakey's Red Gum and Yellow Box with occasional Apple Box. The shrub layer is predominantly comprised of Tantoon within these patches. The majority of the grassland areas throughout the subject land have been subject to historic heavy grazing, whilst still maintaining a native understorey of tussock grasses, some native forbs and regenerating shrubs.

2.4 CLEARED AREAS

An assessment of cleared areas in the 1500 m buffer area was undertaken using aerial imagery, State Vegetation Mapping (DPIE 2019) and field assessments. Approximately 1819 ha occurs as cleared areas within the 1500 m buffer around the development site. This constitutes approximately 56% of the buffer area.

Cleared areas in and adjacent to the development site primarily consist of flat and undulating agricultural land that has been historically and heavily modified, with sparse patches of fragmented vegetation remaining in areas. The cleared areas are primarily utilised for cropping and modified pastures for stock (sheep and cattle).

2.5 RIVERS AND STREAMS

The Development site is located directly east of the Commissioners waters and is traversed by the Gara River. 34 1st and 2nd order tributaries of Commissioners waters and the Gara River also traverse the Proposal Site. The Gara River and one of its adjoining tributaries within the Development site are listed as areas of high biodiversity value under the *Biodiversity Conservation Regulation 2017* (BC Regulation).

34 man-made dams exist within the development site, 28 within Lot 5 DP 253346, 5 within Lot 2 DP 1206469 and 1 within Lot 6 DP 625427. 17of the 34 dams would be retained.

2.6 WETLANDS

An EPBC protected matters search completed on the 29th September 2019 identified no wetlands of international importance. No Ramsar wetlands would be impacted by the proposal.

The Armidale Dumaresq Environmental Plan (LEP) 2012 does not map or list any wetlands.

2.7 CONNECTIVITY FEATURES

Oxley Wild Rivers National Park occurs immediately south of the site and provides important regional connectivity. The development site itself is largely cleared of native overstorey and provides little connectivity at a local level. The exception to this is the Gara River corridor which is intended to be avoided where possible by the development. Refer to Figure 1-3.

2.8 AREAS OF GEOLOGICAL SIGNIFICANCE

As above, the development site lies directly north of the Oxley Wild Rivers National Park which is listed as an area of geological significance in the New England region of NSW and is part of the Gondwana Rainforests of Australia World Heritage Area. The areas landscape is highly defined by its geology – resulting in steep, deep

gorges and when running, fast flowing rivers. The geology of the area is characterised by metamorphosed sediments and volcanics and intensively deformed metamorphosed sandstones, siltstones, conglomerates and tuffs.

No karsts, caves, crevices or cliffs or other areas of geological significance occur in or adjacent to the development site.

2.9 AREAS OF OUTSTANDING BIODIVERSITY VALUE

No areas of Outstanding Biodiversity Value (AOBV) occur within the development site.

2.10 SITE CONTEXT COMPONENTS

Method applied

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

Percent Native Vegetation Cover

An assessment of native vegetation in the 1500 m buffer area was undertaken using aerial imagery, State Vegetation Mapping and field assessments. The 1500 m buffer area around the development site comprises as area of 3275 ha. As determined by GIS mapping from aerial imagery, approximately 1456 ha of native vegetation occurs in the 1500 m buffer area. This constitutes approximately 44% of the buffer area.

Refer to Figure 2-2.

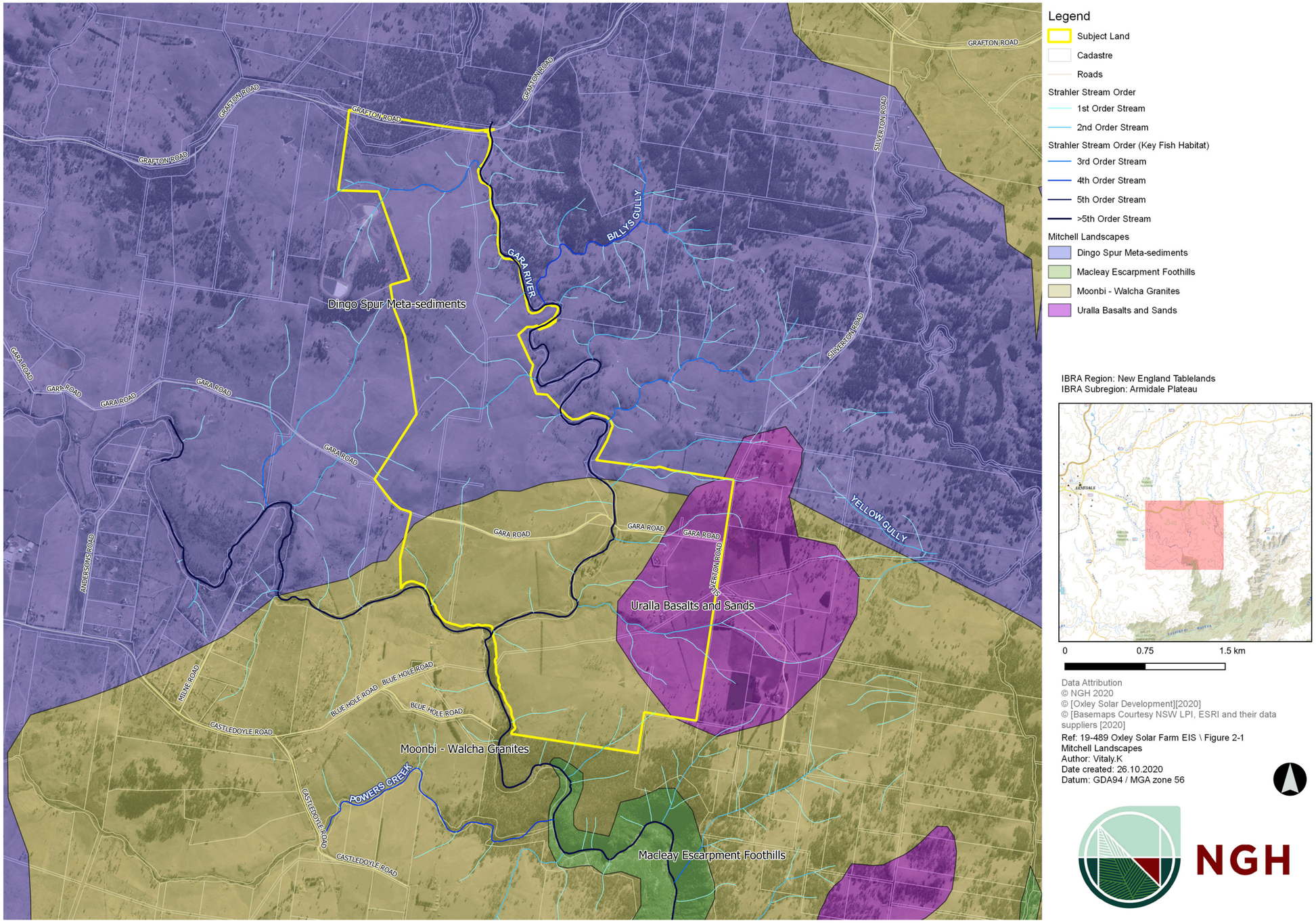
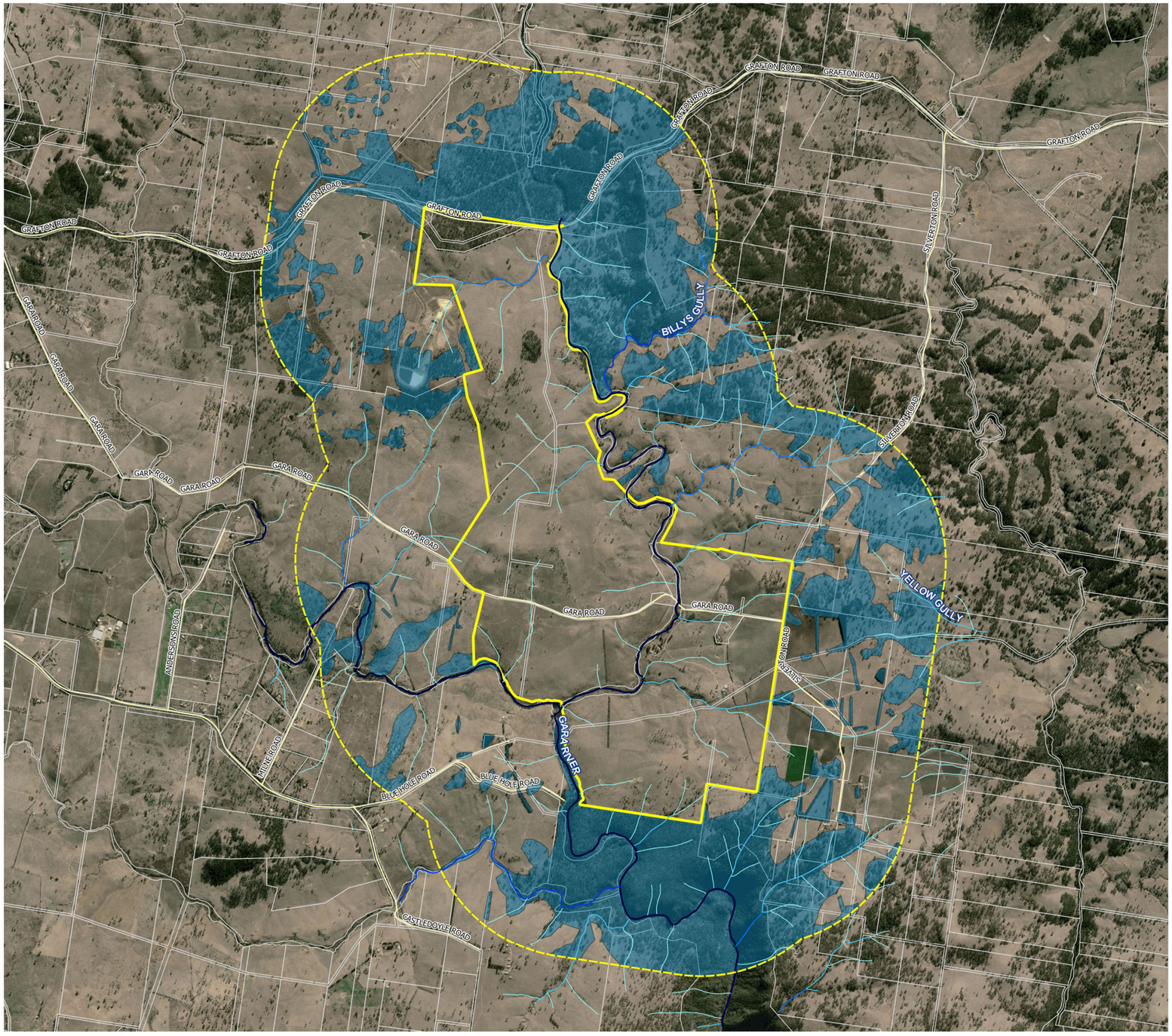


Figure 2-1 Mitchell landscapes



Legend

- Subject Land
- 1500m Buffer Area
- Native Vegetation Extent
- Roads

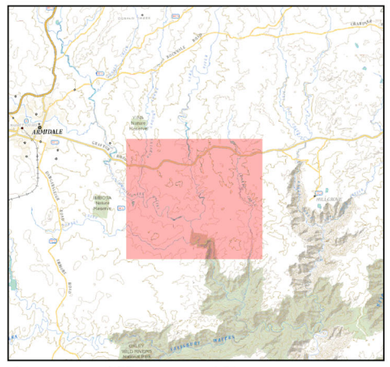
Strahler Stream Order

- 1st Order Stream
- 2nd Order Stream

Strahler Stream Order (Key Fish Habitat)

- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream

IBRA Region: New England Tablelands
IBRA Subregion: Armidale Plateau



0 0.75 1.5 km

Ref: 19-489 Oxley Solar Farm EIS \ Figure 2-2
Native Vegetation Extent within 1500m Buffer Area
Author: Vitaly.K
Date created: 26.10.2020
Datum: GDA94 / MGA zone 56

NGH

Figure 2-2 Native vegetation extent within 1500m buffer area

3 NATIVE VEGETATION

3.1 NATIVE VEGETATION EXTENT

About 439.2 ha of native vegetation is present within the development site, constituting approximately 49% of the development site. This is comprised of:

- Approximately 332.9 ha of grasslands, comprised of a combination of both native and exotic flora was evident in similar condition class throughout site. Generally dominated by Snow Grass *Poa sieberiana*, Paddock Lovegrass *Eragrostis leptostachya*, and Slender Rat's Tail Grass *Sporobolus creber* once drought conditions subsided.
- Approximately 30.7 ha of riparian and floodplain vegetation (FV) that is often inundated is located along the Gara River. This vegetation is comprised of scattered trees including Blakely's Red Gum *Eucalyptus blakelyi* and Yellow box *Eucalyptus melliodora,* with Tantoon *Leptospermum polygalifolium* found clumped around the creek line. Groundcover species are comprised of both wet species and dry species of grasses further up slope including Blady Grass *Imperata cylindrica,* Snow Grass *Poa sieberiana,* Kangaroo Grass *Themeda triandra.*
- Approximately 34.7 ha of grassy woodland vegetation dominated by Blakely's Red Gum *Eucalyptus blakelyi* and Yellow Box *Eucalyptus melliodora* occupied the roadside vegetation along Waterfall Way, with patches re-occurring towards the South toward Oxley Wild Rivers National Park.
- Approximately 51 ha of Broad-leaved Stringy Bark open forest occupies the hills of the agricultural paddocks. This area is subject to degradation from exotic flora and stock use.

Much of the development site is highly influenced by the presence of non-native vegetation. Large cropping areas were cleared or fallowed during the surveys, with persistent drought conditions limiting cropping opportunities. Traditionally, wheat, canola, and grazing feed production dominates the land use within the development site and broader region. The more natural paddocks are dominated by Slender Rat's Tail Grass *Sporobolus creber*, Snow Grass *Poa sieberianna*, and Paddock Lovegrass *Eragrostis leptostachya*. There is high weed incursion due to the varying land use of site, Saffron Thistle *Catharmus lanatus*, African Lovegrass *Eragrostis curvula* and Paspalum *Paspalum dilatatum* are common exotic grasses observed.

3.2 LAND CATEGORY ASSESSMENT

As stated within BC Act s6.8(3), the biodiversity assessment is to exclude the assessment of any clearing of native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of the *Local Land Services Act 2013* (LLS Act). This excludes any impacts prescribed by the regulations under section 6.3. Additionally, in accordance with section 2.3.1.1 of the BAM, biodiversity values that do not need to be assessed include: *(d) biodiversity values associated with the assessment of the impacts of any clearing of native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of the LLS Act), other than the additional biodiversity impacts in accordance with clause 6.1 of the BC regulation*.

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

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

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

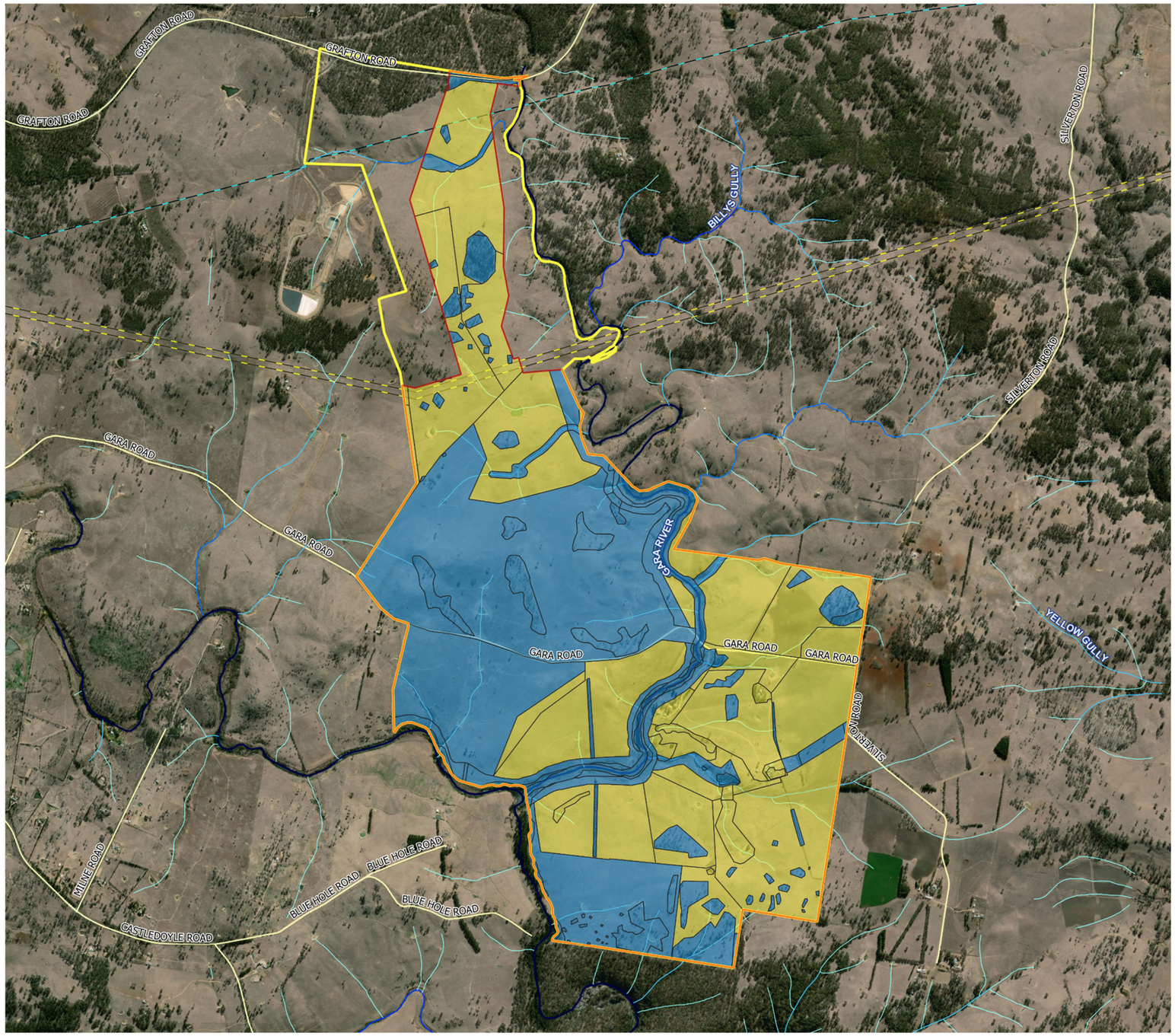
- Legally cleared at or since 1 January 1990 (Woody vegetation only).
- Significantly disturbed or modified since 1990 (Non-woody vegetation).

Approximately 517.2 ha of land within the subject land has been determined to meet the definition of Category 1- exempt land. Furthermore, 456 ha of Category 1-excempt land fall within the Development Site.

Based on the above data sources, there is evidence to suggest that large areas of the development site have been under regular rotational cropping or pasture improvement prior to 1990. This is supported by recent and historical imagery, as well as 2017 Land Use Mapping data. These areas include mapped areas such as:

- Exotic – Areas of cropping and horticultural plantings.
- Irrigation Dams and Channels.
- Residential – Residential buildings containing exotic plantings and non-local native species.
- Infrastructure – Roads, dwellings and agricultural infrastructure.
- River – Aquatic areas of the Gara River

These areas have been excluded from the BAM assessment, except where prescribed impacts are relevant and discussed in Section 7.3. Where in doubt, or where data sources were conflicting, a precautionary approach has been implemented for areas deemed inconclusive in terms of determining historical land use.



Legend

- Subject Land
- Development Site
- Roads
- Native Vegetation within Development Site

Areas Not Requiring Assessment

- Category 1 Land

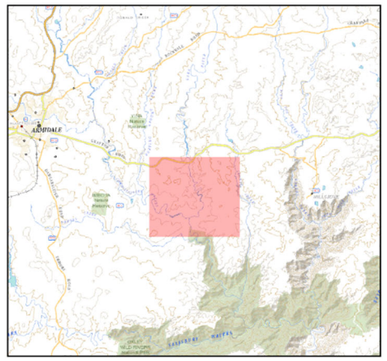
Strahler Stream Order

- 1st Order Stream
- 2nd Order Stream

Strahler Stream Order (Key Fish Habitat)

- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream

IBRA Region: New England Tablelands
IBRA Subregion: Armidale Plateau



0 0.75 1.5 km

Ref: 19-489 Oxley Solar Farm EIS \ Figure 3-1
Category 1 Land Excluded from the BAM Assessment
Author: E Elias
Date created: 22.02.2021
Datum: GDA94 / MGA zone 56

NGH

Figure 3-1 Category 1 land excluded from the BAM assessment

3.3 PLANT COMMUNITY TYPES (PCTS)

3.3.1 Methods to assess PCTs

Review of existing information

A search was undertaken of the OEH BioNet Vegetation Classification Tool (BioNet) database and the NSW SEED Mapping Portal to assess existing vegetation mapping information within the development site. Relevant mapping of the development site was contained within the Vegetation Map for the Norther River CMA (VIS_ID 524) (Eco Logical 2005). This identified numerous Forest Ecosystems (FE) that may occur within, and adjacent to the development site. These are summarised below.

- FE 330: New England Stringy Bark- Peppermint
- FE 196: Broad-leaved Stringy Bark
- FE 163: Yellow Box – Blakely's Red Gym
- FE 35: Dry Grassy Stringy Bark
- FE 120: River Oak

Field surveys and personnel

Vegetation mapping, Vegetation Integrity Plots (VIPs) and targeted threatened flora and fauna surveys were undertaken by numerous ecologists between August 2019 and October 2020. Personnel involved in the surveys include:

- Mitch Palmer - Principal Ecologist and Botanist (BAM Assessor BAAS 17051)
- Aleksei Atkin – Senior Fauna Ecologist (BAM Assessor BAAS 17093)
- Elijah Elias – Ecologist
- Daniel Perkovic – Ecologist
- Martin Kim – Environmental Consultant
- Sarah Downey – Ecologist
- Michelle Patrick – Ecologist
- Teah Wills – Graduate Ecologist

Floristic surveys

The subject land was broadly surveyed for stratification purposes in August 2019 and September 2020, with plot data collected in November 2019, May 2020. The required number of vegetation integrity plots of 20 m by 50 m were established in each vegetation zone. Data was collected on the composition, structure and function of the vegetation (provided separately with spatial files).

3.3.2 Limitations

A thorough search of the development site was undertaken were possible to do so in accordance with the BAM, and relevant threatened flora and fauna guidelines. However, there is potential for some flora species not to be recorded during the survey due to the timing of the survey (outside optimal survey periods) and the prevailing dry conditions. In particular, inconspicuous or geophytic species, which typically flower outside of the completed surveyed periods (i.e. December and February) may not have been recorded. The drought conditions may have reduced the abundance and cover of forbs and grasses. Initial rapid assessment points, collection of VIPs and targeted threatened flora and fauna surveys were undertaken in August and November

2019, during a season of prolonged drought in the region. The drought conditions presented difficult conditions for confirmation of many groundcover species, where they were present, with little or no floristic features or material evident for confident identification. Although abundance of native species may be affected in some instances, native cover is considered to be lower generally in comparison to an average condition. However, as canopy species were largely unaffected by the drought conditions, and common, more readily identifiable shrub and groundcover species were evident, PCT determination and assessment of their overall condition, considering the drought conditions, were considered to have a high confidence and considered adequate.

Additional VIPs and targeted threatened flora and fauna surveys were undertaken in May and September 2020 following substantial rainfall in the preceding month, increasing confidence in the representation of the data collected. Regardless, a precautionary approach has been taken as to the likelihood of the presence of suitable habitat. Therefore, flora and fauna species unlikely to be detected during the time of the survey and drought conditions, are considered to be assessed adequately. Details of these surveys are included below.

3.3.3 PCTs identified on the development site

Following the surveys and analysis of the data collected, three (3) PCTs were identified within the development site, these are:

- PCT 84: River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
- PCT 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion

Descriptions of the PCTs identified are provided below.

Table 3-1 Description of PCT 84 within the development site.

River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion		
Vegetation formation	Forested Wetlands	
Vegetation class	Eastern Riverine Forests	
Vegetation type	PCT ID	84
	Common Community Name	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
Approximate extent within the development site	30.7 ha of this PCT occurs within the development site. This is comprised of 28.0 ha as Riparian vegetation 2.7 ha as sedgeland vegetation	
Species relied upon for PCT identification	Species name	Relative abundance
	Blakely's Red Gum *Eucalyptus blakelyi*	5%
	Yellow Box *Eucalyptus Melliodora*	2%
	Black Tee Tree *Melaleuca bracteata*	2%
	Tantoon *Leptospermum polygalifolium*	2%
	Blady Grass *Imperata cylindrica*	10%
	Spiny-headed Mat-rush *Lomandra longifolia*	2%
	Snow Grass *Poa sieberiana*	20%
	Weeping Grass *Microleana stipoides*	5%
Justification of evidence used to identify the PCT	PCT 84 was identified with a presence of regenerating Blakely's Red Gum *Eucalyptus blakelyi* and Yellow Box *Eucalpytus melliodora* both diagnostic to the PCT. The shrub layer is sparse containing Black Tea Tree *Melaleuca bracteata, and* Tantoon *Leptospermum polygalifolium*. The ground cover is dense comprised of both native and exotic species. Typical observed native groundcovers included Blady Grass *Imperata cylindrica*, Snow Grass *Poa sieberina*, Spiny-head Mat-rush *Lomandra longifolia*. The native species were entered into the VIS database with two (2) PCTs being possible. These are: PCT 84: River Oak- Rough-barked Apple – reg gum – box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion PCT 78: River Red Gum riparian tall woodland/ open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	

River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	
	PCT 84 was considered the best match for the PCT based on the following criteria present in the community: • Located within the Armidale Plateau IBRA Subregion • Plant species listed above are more characteristic to this PCT • Suitable landscape position
TEC Status	No Associated TEC
Estimate of percent cleared within NSW	Estimated 40% cleared within NSW
Examples	 

Table 3-2 Description of PCT 510 within the development site.

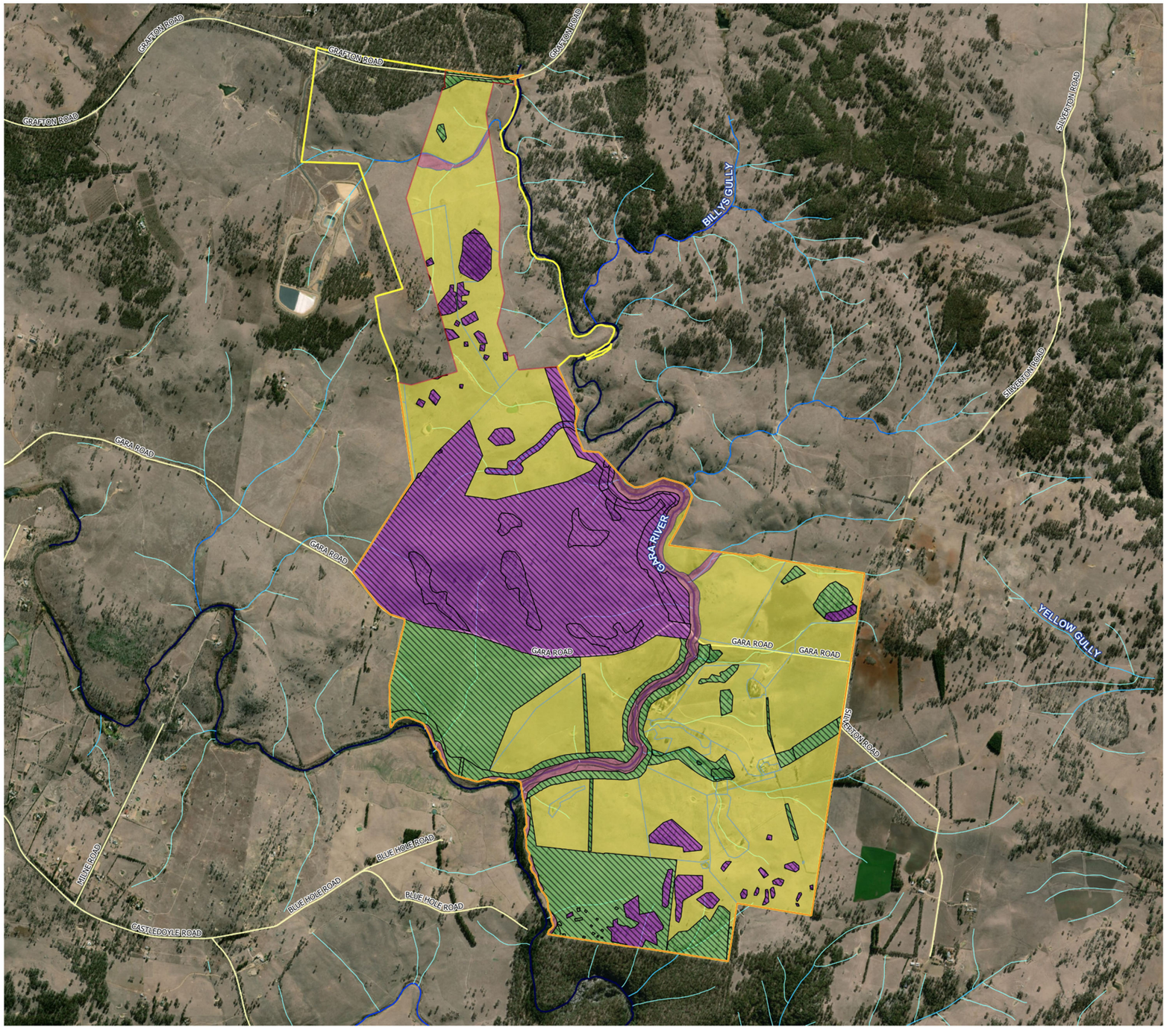
Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion		
Vegetation formation	Grassy Woodlands	
Vegetation class	New England Grassy Woodlands	
Vegetation type	PCT ID	510
	Common Community Name	Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
Approximate extent within the development site	161.3 ha of this PCT occurs within the development site. This is comprised of 126.6 ha of Derived Native Grassland 34.7 ha of Woodland	
Species relied upon for PCT identification	Species name	Relative abundance
	Blakey's Red Gum *Eucalyptus blakelyi*	15%
	Yellow Box *Eucalyptus melliodora*	20%
	Apple Box *Eucalyptus bridgesiana*	5%
	Snow Grass *Poa sieberiana*	10%
	Kangaroo Grass *Themeda triandra*	10%
	Barbed Wire Grass *Cymbopogon refractus*	<1%
	Purrple Wire Grass *Aristida ramosa*	2%
	Commo Everlasting *Chrysocephalum apiculatum*	2%
Justification of evidence used to identify the PCT	VIS database was used to assess the native species and resulted with 4 possible options, these were: 567: Broad-leaved Stringybark – Yellow Box shrub/grass open forest of the New England Tableland Bioregion 568: Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion 510: Blakey's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion 704: Blakey's Red Gum- Yellow Box grassy open forest or woodland of the New England Tableland Bioregion PCT 510 was considered the best match for the PCT based on the following criteria present in the community: • Dominated by Yellow Box *Eucalyptus melliodora* and Blakey's Red gum *Eucalyptus blakelyi*, ruled out PCT 567 and 568	

Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	
	• Species listed above most characteristic to this PCT • Suitable landscape position • Grassy woodland form rather than open forest
TEC Status	Associated with the TEC White Box Yellow Box Blakely's Red Gum Woodland (BC-CEEC) Associated with the TEC White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC – CEEC)
Estimate of percent cleared within NSW	Estimated 79% cleared within NSW.
Examples	

Table 3-3 Description of PCT 567 within the development site.

Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion		
Vegetation formation	Grassy Woodlands	
Vegetation class	New England Grassy Woodlands	
Vegetation type	PCT ID	567
	Common Community Name	Broad-leaved Stringybark – Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Approximate extent within the development site	247.3 ha of this PCT occurs within the development site. This is comprised of 196.3 ha of Derived Native Grassland 51 ha of Woodland	
Species relied upon for PCT identification	Species name	Relative abundance
	Broad-leaveed Stringybark *Eucalyptus caliginosa*	30%
	Yellow Box *Eucalyptus melliodora*	10%
	Blakey's Red Gum *Eucalyptus blakelyi*	15%
	Peach Heath *Lissanthe strigossa*	<1%
	Native Blackthorn *Bursaria spinosa*	<1%
	Purrple Wire Grass *Aristida ramosa*	<1%
	Snow Grass *Poa sieberiana*	<1%
	Kangaroo Grass *Themeda triandra*	<1%
Justification of evidence used to identify the PCT	The native species were put into the VIS database with a 4 PCTs deemed possible, these are: 567: Broad-leaved Stringybark – Yellow Box shrub/grass open forest of the New England Tableland Bioregion 568: Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion 510: Blakey's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion 704: Blakey's Red Gum- Yellow Box grassy open forest or woodland of the New England Tableland Bioregion PCT 567 was considered the best match for the PCT based on the following criteria present in the community: • Dominated by Broad-leaved Stingybark *Eucalyptus caliginosa* which ruled out PCT 510 and 704 • Yellow Box *Eucalyptus melliodora* was sub dominant in canopy	

Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	
	• Plant species listed above were most characteristic to this PCT • Suitable landscape position
TEC Status	Associated with the TEC White Box Yellow Box Blakely's Red Gum Woodland (BC-EEC)
Estimate of percent cleared within NSW	Estimated 62% cleared within NSW
Examples	



Legend

- Subject Land
- Development Site
- Roads

Strahler Stream Order

- 1st Order Stream
- 2nd Order Stream

Strahler Stream Order (Key Fish Habitat)

- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream

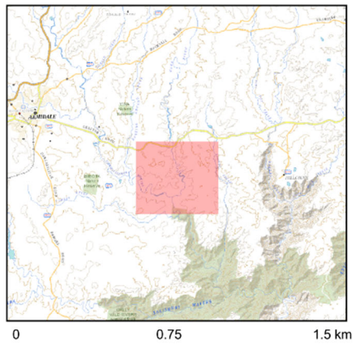
PCTs

- 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
- 84: River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
- Category 1 Land

TECs

- White Box Woodland CEEC

IBRA Region: New England Tablelands
IBRA Subregion: Armidale Plateau



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Ref: 19-489 Oxley Solar Farm EIS \ Figure 3-2
PCTs and TECs at the Development Site
Author: E Elias
Date created: 16.02.2021
Datum: GDA94 / MGA zone 56

NGH

Figure 3-2 PCTs and TECs at the development site

3.4 VEGETATION INTEGRITY ASSESSMENT

3.4.1 Vegetation zones and survey effort

Previous vegetation mapping, collection of rapid assessment points, and detailed floristic plots have been used to assist the delineation of vegetation zones. Three (3) PCTs were identified in the development site. Each PCT was stratified into zones representing a similar broad condition state. These zones were based on the overstorey condition, understorey condition, and observed land management practices as described in Table 3-4 and shown in Figure 3-3.

Given numerous changes in development design, more VIPs were conducted throughout the broader area than required by the BAM. A total of 27 VIPs were required by the BAM as per the latest design update, given the area of the zones within the development site, with a total of 48 VIPs competed throughout the surveys. VIPs that fell outside the final development site were ignored and not entered into the BAM – C. Furthermore, in instances where an excess VIPs were conducted for single zones, those with higher integrity scores were chosen to be entered into the BAM-C. Conditions of VIPs varied as a large proportion of plots were conducted during drought conditions, hence surveys at later dates in similar areas produced higher yield and results. Plots ignored did however provide further evidence and confidence for PCT identification. An additional VIP was required for PCT 84 Sedgeland due to an increase in the development site in the latest design update. No additional VIP data was recorded during the surveys for this zone; hence the additional plot was entered with a benchmark vegetation integrity score.

The required 27 VIPs were entered into the BAM-C to generate the relevant ecosystem and species credit species requiring assessment (Case 00022439/Revision 0). A new BAM case revision (Case 00022439/ Revision 4) reflects those zones and species impacted, with the relevant credit and offset obligation generated (Appendix C).

3.4.2 Paddock trees

Numerous paddock trees were observed within the development site. Each paddock tree was assigned the PCT from which it is most likely derived. Threatened species that would use the paddock trees are assumed to be the same threatened species predicted by the BAM Calculator to utilise the PCTs and zones identified within the development site (Table 3-4). All paddock trees were mapped in the field using a handheld GIS Tablet and were visually assessed from the ground to determine whether any hollows were present. The Diameter at Breast Height (DBH) of the tree was assessed and assigned a paddock tree class relevant to the large tree benchmark for the associated PCT as per the BAM-C. For the purposes of this assessment, paddock trees were included in the relevant woodland vegetation zone of the associated PCT.

Table 3-4 Vegetation zones at the development site

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (# plots)	Patch size (ha)	Photos of BAM Plots
1	84	**Riparian** PCT 84 occurs in the riparian vegetation that follows the Gara River within the development site. The PCT is comprised of small *Eucalyptus blakelyi* and *Eucalyptus melliodora* in parts with shurbs such as Tantoon *Leptospermum polygalifolium* and Black Tee Tree *Melaleuca bracteata* prevalent throughout the creekline. The ground stratum is dominated by a mix of native and exotic species. Snow Grass *Poa sieberiana*, Barbed Wire Grass *Cybopogon refractus*, Spiny-head Mat-rush *Lomandra longifolia*, and Blady Grass *Imperata cylindrica* are common natives observed with Cobblers Pegg *Bidens pilosa*, Paspalum *Paspalum dilatatum*, and Blackberry *Rubus fruticosus* common high threat exotics.	28	4	100+	

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (# plots)	Patch size (ha)	Photos of BAM Plots
2	510	**Woodland** This zone primarily occurs in the northern region of site along the road corridor of Waterfall Way. Standing patches were also evident along Gara Road. It is generally comprised of a dense canopy dominated by Blakey's Red Gum *Eucalyptus blakelyi* and Yellow Box *Eucalyptus melliodora* with a predominantly native grassy understory including but not limited to; Snow Grass *Poa sieberiana*, Kangaroo *Themeda triandra,* and Barbed Wire Grass *Cymbopogon refractus.* Native regenerating midstorey species were evident in the northern patches as they were not subjected to consistent grazing.	34.7	4	100+	

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (# plots)	Patch size (ha)	Photos of BAM Plots
3	510	**Derived Native Grassland** This zone occurs south of Gara Road in southern portion of the subject land. The PCT is comprised of a mix of native and exotic grasses and has been subjected to consistent grazing. Native grasses include Slender Rat's Tail *Sporobolus creber*, Snow Grass *Poa sieberiana*, and Kangaroo Grass Themeda triandra, with Paspalum *Paspalum dilatatum* being a common exotic grass observed.	126.6	6	100+	

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (# plots)	Patch size (ha)	Photos of BAM Plots
4	567	**Woodland** This zone primarily occurs in the northern portion of the subject land towards Gara Road, with patches evident throughout all of site. It is generally comprised of a dense canopy dominated by Broad-leaved stringybark *Eucalyptus calginosa.* with sub dominant Yellow Box *Eucalyptus melliodora* and Blakey's Red Gum *Eucalyptus blakelyi*. A native grassy understory of Snow Grass *Poa sieberiana*, and *Aristida ramosa*, with scattered Kangaroo *Themeda triandra.* Most stands have regenerating midstorey species such as Native Blackthorn *Bursaria spinosa*, and Peach Heath *Lissanthe strigossa*. With some supporting a dense midstorey.	51	5	100+	

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (# plots)	Patch size (ha)	Photos of BAM Plots
5	567	**Derived Native Grassland** This zone primarily occurs to the north of Gara Road and is comprised of a similar native grass composition to its woodland version, however lacks a canopy. Sparse regenerating native shrubs are also evident in parts.	196.3	6	100+	

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (# plots)	Patch size (ha)	Photos of BAM Plots
6	84	**Sedgeland** The small extent of this zone occurs in the northern portion of the subject land in the form of a drainage line that links to the riparian vegetation of the Gara River. It is comprised of similar grass species as its riparian vegetation version, however, lacks a mid-storey and canopy.	2.7	2	100+	

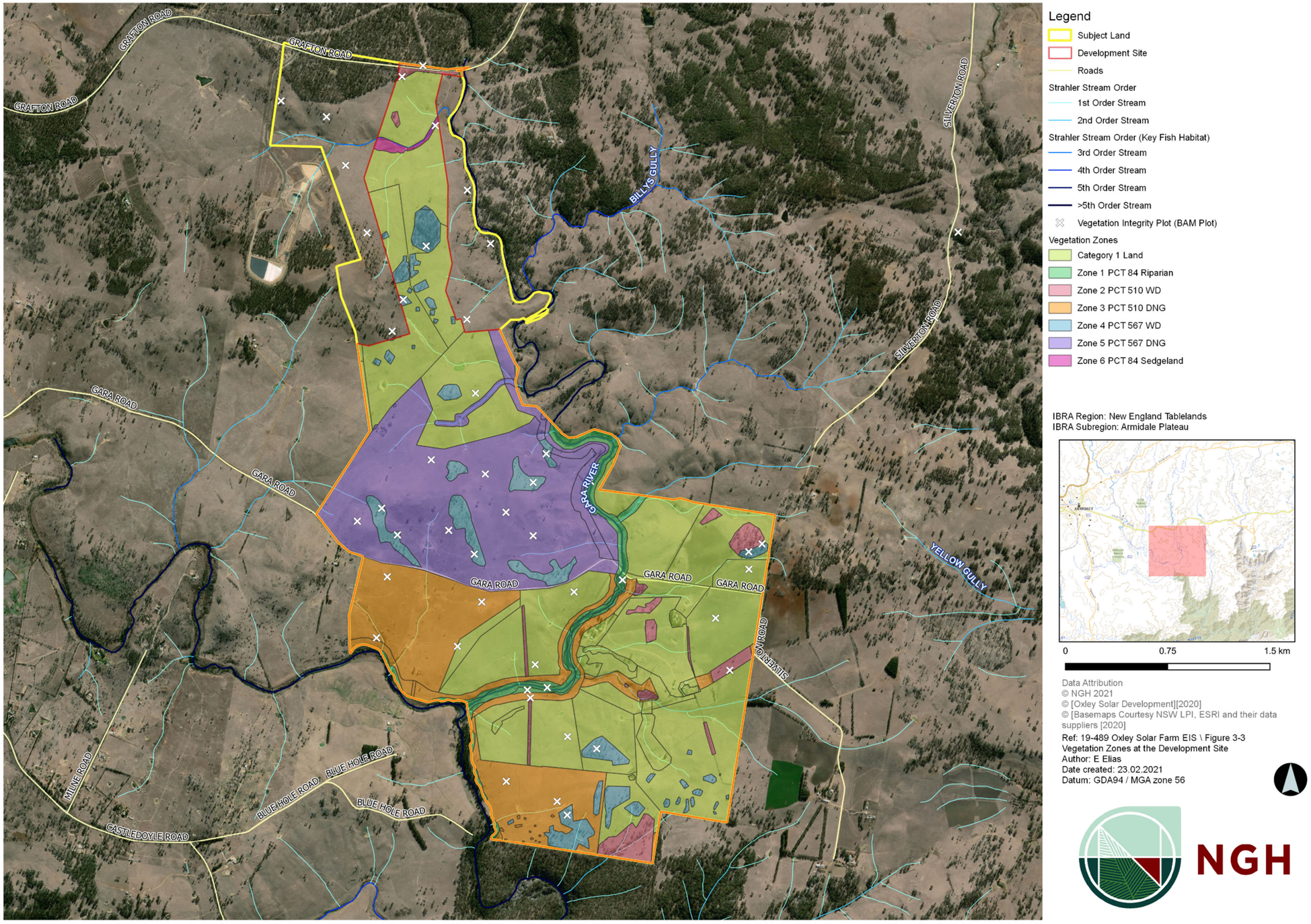


Figure 3-3 Vegetation zones at the development site

3.4.3 Vegetation integrity assessment results

The results of the vegetation integrity assessment are provided in Table 3-5.

Table 3-5 Current vegetation integrity scores for each vegetation zone within the development site

Zone ID	PCT/Zone	Composition score	Structure score	Function score	Vegetation Integrity Score
1	84_Riparian	45.8	74.1	36.4	49.8
2	510_Woodland	63.7	66.1	77.8	69.0
3	510_DNG	23.5	56.9	14.1	26.6
4	567_Woodland	29.6	32.9	54.9	37.7
5	567_DNG	21.0	47.5	15.0	24.6
6	84_Sedgeland	82.2	83.5	64.9	76.4

4 THREATENED SPECIES

4.1 ECOSYSTEM CREDIT SPECIES

The ecosystem credit species listed below were returned by the calculator as being associated with the PCTs present within the development site. These species are assumed to occur on the development site and contribute to ecosystem credits.

Three ecosystem credit species were observed or detected within the development site during field surveys. These include:

- Glossy Black- Cockatoo *Calyptorhynchus lathami*
- Little Eagle *Hieraaetus morphnoides*
- Square-tailed Kite *Lophoictinia isura*

Table 4-1 Ecosystem credit species predicted by the BAM-C

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Fauna			
Barking Owl ***Ninox connivens***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Black-chinned Honeyeater (eastern subspecies) ***Melithreptus gularis gularis***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Black-necked Stork ***Ephippiorhynchus asiaticus***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Endangered	Not listed
Brown Treecreeper (eastern subspecies) ***Climacteris picumnus victoriae***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Diamond Firetail ***Stagonopleura guttata***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Dusky Woodswallow ***Artamus cyanopterus cyanopterus***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Eastern False Pipistrelle ***Falsistrellus tasmaniensis***	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Flame Robin ***Petroica phoenicea***	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Glossy Black-Cockatoo ***Calyptorhynchus lathami***	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Greater Broad-nosed Bat ***Scoteanax rueppellii***	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Grey-headed Flying-fox ***Pteropus poliocephalus***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Vulnerable
Hoary Wattled Bat ***Chalinolobus nigrogriseus***	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Hooded Robin (south-eastern form) ***Melanodryas cucullata cucullata***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Koala ***Phascolarctos cinereus***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Vulnerable

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Large Bent-winged Bat ***Miniopterus orianae oceanensis***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Little Eagle ***Hieraaetus morphnoides***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Little Lorikeet ***Glossopsitta pusilla***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Masked Owl ***Tyto novaehollandiae***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Painted Honeyeater ***Grantiella picta***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Vulnerable
Powerful Owl ***Ninox strenua***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Regent Honeyeater ***Anthochaera phrygia***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Critically Endangered	Critically Endangered

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Scarlet Robin ***Petroica boodang***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Speckled Warbler ***Chthonicola sagittata***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Spotted Harrier ***Circus assimilis***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Spotted-tailed Quoll ***Dasyurus maculatus***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Endangered
Square-tailed Kite ***Lophoictinia isura***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Swift Parrot ***Lathamus discolor***	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Endangered	Critically Endangered
Turquoise Parrot ***Neophema pulchella***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Varied Sittella ***Daphoenositta chrysoptera***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed

Common Name	Associated PCT	NSW Listing Status	National Listing Status
White-bellied Sea-Eagle ***Haliaeetus leucogaster***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Yellow-bellied Glider ***Petaurus australis***	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed
Yellow-bellied Sheathtail-bat ***Saccolaimus flaviventris***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed

4.2 SPECIES CREDIT SPECIES

4.2.1 Species credit species to be assessed

The BAM Calculator predicted the following 34 species credit species to occur at the development site (Table 4-2). A desktop assessment was undertaken for habitat constraints and geographic restrictions to determine which species would be included or excluded for further targeted surveys in the development site.

Five species were excluded as species credit species due to two lacking suitable habitat and one falling outside the known geographic breeding range. These species were hence excluded from further assessment and include:

1. Eastern Pygmy-possum
2. Large-eared Pied Bat
3. Barrington Tops Ant Orchid
4. Swift Parrot
5. Large Bent-winged Bat

Table 4-2 Candidate species credit species requiring assessment

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Bertya ingramii **Narrow-leaved Bertya**	Cliffs, escarpments and rocky areas.	Very high 3.00	Endangered	Endangered	Rocky areas within development site	**Included**	Habitat components on site
Boronia granitica **Granite Boronia**	Within 50 m of rocky areas.	High 2.0	Vulnerable	Endangered	Rocky areas within development site	**Included**	Habitat components on site
Burhinus grallarius **Bush Stone-curlew**	Fallen/standing dead timber including logs.	High 2.0	Endangered	Not listed	Fallen timber in woodland areas within development site	**Included**	Habitat components on site
Callitris oblonga **Pygmy Cypress Pine**	Grows in sand along watercourses in shrubland and open woodland in granite country; it also occurs in drier sites, including exposed ridges.	High 2.0	Vulnerable	Vulnerable	Watercourses and open woodland in granite within development site	**Included**	Habitat components on site
Eucalyptus magnificata **Northern Blue Box**	Grassy open forest or woodland on shallow, sandy or loamy soils	High 2.0	Endangered	Not listed	Open forest or woodland within development site	**Included**	Habitat components on site
Calyptorhynchus lathami **Glossy Black-Cockatoo (Breeding)**	Living or dead tree with hollows greater than 15 cm diameter and greater than 5 m above ground.	High 2.0	Vulnerable	Not listed	Suitable hollow bearing trees within the development site.	**Included**	Habitat components on site
Cercartetus nanus **Eastern Pygmy-possum**	Broad range of habitats from rainforest through sclerophyll forest and woodland to heath, but in most areas woodlands and heath are preferred.	High 2.0	Vulnerable	Not listed	Woodlands within development site	**Excluded**	No suitable habitat within development footprint
Chalinolobus dwyeri **Large-eared Pied Bat**	Cliffs or within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops or crevices. Or within two kilometres of old mines or tunnels.	Very High 3.0	Vulnerable	Vulnerable	Rocky areas with overhangs, escarpments, outcrops or crevices within development site	**Excluded**	No suitable breeding habitat within the development site

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Chiloglottis platyptera **Barrington Tops Ant Orchid**	Grows in moist areas in tall open eucalypt forest with a grassy understorey, and also around rainforest edges.	High 2.0	Vulnerable	Not listed	Eucalypt forest with grassy understory within development site	**Excluded**	Habitat components not on site
Dichanthium setosum **Bluegrass**	Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Occurs in disturbed areas such as cleared woodland and disturbed pasture.	High 2.0	Vulnerable	Vulnerable	Disturbed pasture within development site	**Included**	Habitat components on site
Eucalyptus nicholii **Narrow-leaved Black Peppermint**	Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock.	High 2.0	Vulnerable	Vulnerable	Dry grassy woodland, on shallow soils of slopes and ridges within development site	**Included**	Habitat components on site
Diuris pedunculata **Small Snake Orchid**	Grows on grassy slopes or flats. Often grows on peaty soils in moist areas.	High 2.0	Endangered	Endangered	Grassy slopes or flats within development site	**Included**	Habitat components on site
Grevillea beadleana **Beadle's Grevillea**	Within 200m of cliffs, escarpments and rocky areas.	High 2.0	Endangered	Endangered	Rocky areas within development site	**Included**	Habitat components on site
Haloragis exalata subsp. velutina **Tall Velvet Sea-berry**	Grows in damp places near watercourses. Also occurs in woodland on the steep rocky slopes of gorges.	High 2.0	Vulnerable	Vulnerable	Damp areas surrounding watercourses within development site	**Included**	Habitat components on site
Litoria subglandulosa **Glandular Frog**	May be found along streams in rainforest, moist and dry eucalypt forest or in subalpine swamps.	Very High 3.0	Vulnerable	Not listed	Dry eucalypt forests within development site	**Included**	Habitat components on site
Hoplocephalus bitorquatus **Pale-headed Snake**	Shelters in tree hollows and loose bark in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest.	High 2.0	Vulnerable	Not listed	Dry eucalypt forests and woodlands within development site	**Included**	Habitat components on site

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Lathamus discolor* Swift Parrot *(breeding)	On the coast and southwest slopes in areas with abundant flowering eucalypts or lerp. Feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, and White Box.	Very high 3.0	Endangered	Critically Endangered	Favoured flowering eucalypts and lerp tree species within development site	**Excluded**	Development site outside of breeding range
***Lophoictinia isura* Square-tailed Kite**	Timbered habitats including dry woodlands and open forests, particularly timbered watercourses.	Moderate 1.50	Vulnerable	Not listed	Dry woodlands and open forests within development site	**Included**	Habitat components on site
***Miniopterus orianae oceanensis* Large Bent-winged Bat**	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	Very High 3.0	Vulnerable	Not listed	Foraging habitat in the form of waterbodies (Gara River and farm dams)	**Excluded**	Habitat components not within development site
***Myotis macropus* Southern Myotis**	Hollow Bearing Trees within 200 m of riparian zone. Bridges, caves or artificial structures within 200 m of riparian zone.	High 2.0	Vulnerable	Not listed	Woodlands containing hollow-bearing trees within 200m of waterbodies (Gara River and farm dams)	**Included**	Habitat components on site
***Ninox connivens* Barking Owl**	Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground.	High 2.0	Vulnerable	Not listed	Suitable hollow bearing trees within development site	**Included**	Habitat components on site
***Ninox strenua* Powerful Owl**	Living or dead trees with hollow greater than 20cm diameter	High 2.0	Vulnerable	Not listed	Suitable hollow bearing trees within development site	**Included**	Habitat components on site
***Petaurus norfolcensis* Squirrel Glider**	Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart).	High 2.0	Vulnerable	Not listed	Suitable hollow bearing trees within development site	**Included**	Habitat components on site

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Petrogale penicillata **Brush-tailed Rock-wallaby**	Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff-lines	Very High 3.0	Endangered	Vulnerable	Steep slopes, boulder piles, rock outcrops within development site	**Included**	Habitat components on site
Phascolarctos cinereus **Koala**	Temperate, subtropical and tropical eucalypt woodlands and forests where suitable food trees grow, of which there are more than 70 eucalypt species and 30 non-eucalypt species that are particularly abundant on fertile clay soils.	High 2.0	Vulnerable	Vulnerable	Eucalypt woodlands and forests within development site	**Included**	Habitat components on site
Picris evae **Hawkweed**	Main habitat is open Eucalypt forest including a canopy of Eucalyptus melliodora, E. crebra, E. populnea, E. albens, Angophora subvelutina, Allocasuarina torulosa, and/or Casuarina cunninghamiana with a Dichanthium grassy understory.	High 2.0	Vulnerable	Vulnerable	Open Eucalypt forest with suitable canopy trees within development site	**Included**	Habitat components on site
Pteropus poliocephalus **Grey-headed Flying-fox**	Range of vegetation communities including rainforest, open forest, and closed and open woodland. Roost sites usually near water, including lakes, rivers, and coastlines. Breeding Camps	High 2.0	Vulnerable	Vulnerable	Open forest, closed and open woodland and water bodies within the development site	**Included**	Habitat components on site
Swainsona sericea **Silky Swainson-pea**	Box-gum woodland in southern tablelands and South West Slopes. Sometimes in association with cypress pines.	High 2.0	Vulnerable	Not listed	Box-gum woodland within	**Included**	Surveys required

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
***Thesium austral* Austral Toadflax**	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	Moderate 1.50	Vulnerable	Vulnerable	Grassland and grassy woodland within development site	**Included**	Habitat components on site
***Tyto novaehollandiae* Masked Owl**	Living or dead trees with hollows greater than 20 cm diameter.	High 2.0	Vulnerable	Not listed	Suitable hollow bearing trees within development site	**Included**	Habitat components on site
***Anthochaera phrygia* Regent Honeyeater**	Temperate woodlands and open forests of the inland slopes of south-east Australia, in particular dry open forest, woodland, Box-Ironbark woodland, and riparian forests of River Sheoak.	Very high 3.0	Critically Endangered	Critically Endangered	Dry open forest, woodland and Box-Ironbark woodland within development site	**Included**	Habitat components on site
***Hieraaetus morphnoides* Little Eagle**	Nest trees – live (occasionally dead) large old trees within vegetation. Paddock trees can provide important breeding habitat.	Moderate 1.50	Vulnerable	Not listed	Suitable nest trees within development site	**Included**	Habitat components on site
***Haliaeetus leucogaster* White-bellied Sea-Eagle**	Living or dead mature trees within suitable vegetation. Within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	High 2.0	Vulnerable	Not listed	Suitable nest trees and waterbodies within development site	**Included**	Habitat components on site
***Adelotus brevis* - endangered population Tusked Frog population in the Nandewar and New England**	Rainforests, wet forests and flooded grassland and pasture. They are usually found near creeks, ditches and ponds, and call while hidden amongst vegetation or debris.	Very high 3.0	Endangered population	Not listed	Flooded grassland and pasture and water bodies present within development site	**Included**	Habitat components on site

4.2.2 Inclusions and exclusions based on habitat features

As per the BAM Operational Manual - Stage 1, an assessor must consider species recorded on or near the subject land even if they are not predicted by the BAM-C. As of 21 September 2020, within 10 km of the development site, BioNet contains records of the following NSW threatened species not predicted by the BAM-C to occur within the development site:

- White-throated Needletail *Hirundapus caudacutus* (1 record)
- Peppered Tree Frog *Litoria piperata*

The two species listed above have been added to the predicted ecosystem credit species list within the BAM-C for the proposal.

The Large Bent-winged Bat *Miniopterus orianae oceanensis* and the Large-eared Pied Bat *Chalinolobus dwyeri* have been excluded as a species credit species as the development site lacks the habitat requirements for breeding as there are no maternity caves on site.

4.2.3 Exclusions based on habitat quality

Under Section 6.4.1.17 of the BAM, a species credit species can be considered unlikely to occur on a development site (or within specific vegetation zones) if following field assessment it is determined that the habitat is substantially degraded such that the species is unlikely to utilise the development site (or specific vegetation zones). These species are identified below, along with justification regarding the habitats present and why it was excluded from one or more zones.

Table 4-3 Species credit species excluded based on habitat quality

Species credit species	Habitats present	Reason for exclusion
Lathamus discolor ***Swift Parrot*** ***(Breeding)***	Zones 2 and 4	Although foraging may occasionally occur and would incur ecosystem credits, the species breeds in Tasmania and is therefore excluded as a species credit species.
Cercartetus nanus **Eastern Pygmy-possum**	Zones 2 and 4	The majority of the woodland patches are substantially degraded, being isolated patches within an agricultural landscape. These woodland patches are comprised of an overstory of Eucalypts with a mix of native and exotic groundcovers. There are minimal understory shrubs in these sites and they lack any nectar rich shrubs such as Banksias and Callistemon which are an important food source for the Eastern Pygmy Possum.
Chiloglottis platyptera **The Barrington Tops Orchid**	Zones 2 and 4	Grows in moist areas in tall open eucalypt forest with a grassy understory, and also around rainforest edges. Habitat components not on site

4.2.4 Candidate species requiring confirmation of presence or absence

The species listed in Table 4-4 are those that are considered to have habitats present at the development site. Surveys have been conducted for these species and the results are summarised in Table 4-4. Details of the survey methodologies and results are provided for each species. Targeted survey locations are mapped below. Species polygons have been defined for the species present on the site or assumed to occur in accordance with the BAM.

Table 4-4 Summary of species credit species surveyed at the development site

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count within development footprint
Fauna				
Adelotus brevis - endangered population Tusked Frog population in the Nandewar and New England Tableland Bioregions	3.0	Assumed present	Assumed present.	0.03 PCT 84 Riparian (Zone 1) 0.21 PCT 84 Sedgeland (Zone 6)
***Anthochaera phrygia* Regent Honeyeater (Breeding)**	3.00	Surveyed August and November 2019, and May and September 2020.	No	Nil
***Burhinus grallarius* Bush Stone-curlew**	2.00	Surveyed August and November 2019	No	Nil
***Calyptorhynchus lathami* Glossy Black-Cockatoo (Breeding)**	2.00	Surveyed August and November 2019, and May and September 2020.	Yes. Present on site in August 2019, within the development site.	Nil
***Haliaeetus leucogaster* White-bellied Sea-Eagle (Breeding)**	2.00	Surveyed August and November 2019, and May and September 2020.	No	Nil
***Hieraaetus morphnoides* Little Eagle (Breeding)**	1.50	Surveyed August and November 2019, and May and September 2020.	Yes. Present in August 2019, within the development site.	Nil
***Hoplocephalus bitorquatus* Pale-headed Snake**	2.00	Surveyed August and November 2019, and May and September 2020.	No	Nil
***Litoria subglandulosa* Glandular Frog**	3.00	Assumed present	Assumed present.	0.03 PCT 84 Riparian (Zone 1) 0.21 PCT 84 Sedgeland (Zone 6)

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count within development footprint
Lophoictinia isura **Square-tailed Kite** ***(Breeding)***	1.50	Surveyed August and November 2019, and May and September 2020.	Yes. Identified within the development site.	Nil
Myotis macropus **Southern Myotis**	2.00	Assumed present	Assumed present.	4.9 ha of PCT 510 Woodland (within 200m of a waterbody) (Zone 2) 2.7 ha of PCT 567 Woodland (within 200m of a waterbody) (Zone 4)
Ninox connivens **Barking Owl (Breeding)**	2.00	Surveyed August and November 2019, and May and September 2020.	No	Nil
Ninox strenua **Powerful Owl (Breeding)**	2.00	Spotlight and Call Playback surveys conducted in August and November 2019.	No	Nil
Petaurus norfolcensis **Squirrel Glider**	2.00	Spotlight and Call Playback surveys conducted in August and November 2019.	No	Nil
Petrogale penicillata Brush-tailed Rock-wallaby	3.00	Surveyed August and November 2019, and May and September 2020.	No	Nil
Phascolarctos cinereus **Koala (Breeding)**	2.00	Spotlight and Call Playback surveys conducted in August and November 2019. Additional terrestrial surveys conducted in May and September 2020.	No	Nil
Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	2.00	Surveyed August and November 2019, and May and September 2020.	No	Nil
Tyto novaehollandiae **Masked Owl (Breeding)**	2.00	Surveyed August and November	No	Nil

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count within development footprint
		2019, and May and September 2020.		
Flora				
Bertya ingramii **Narrow-leaved Bertya**	3.00	Surveyed August and November 2019, and May and September 2020.	No	Nil
Boronia granitica **Granite Boronia**	2.00	Surveyed August and November 2019, and May and September 2020.	No	Nil
Callitris oblonga **Pygmy Cypress Pine**	2.00	Surveyed August and November 2019, and May and September 2020.	No	Nil
Dichanthium setosum **Bluegrass**	2.00	Threatened species transects conducted in May 2020.	Yes. Identified within the development site (habitat excluded from the development footprint)	Nil
Diuris pedunculata **Small Snake Orchid**	2.00	Threatened species transects conducted in October 2020, within survey window. Reference population was surveyed prior and were flowering.	No	Nil
Eucalyptus magnificata **Northern Blue Box**	2.00	Surveyed August and November 2019, and May and September 2020.	No	Nil
Eucalyptus nicholii **Narrow-leaved Black Peppermint**	2.00	Surveyed August and November 2019, and May and September 2020.	No	Nil
Grevillea beadleana **Beadle's Grevillea**	2.00	Surveyed August and November 2019, and May and September 2020.	No	Nil
Haloragis exalata subsp. velutina **Tall Velvet Sea-berry**	2.00	Surveyed August and November 2019, and May and September 2020.	No	Nil

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count within development footprint
Picris evae **Hawkweed**	2.00	Assumed present Survey period Nov-Feb as per the BAM.	Assumed present	5.4 ha of 510 Woodland
Swainsona sericea **Silky Swainson-pea**	2.00	Threatened species transects conducted in October 2020	No	Nil
Thesium australe **Austral Toadflax**	1.50	Assumed present Survey period Nov-Feb as per the BAM.	Assumed present	0.6 ha of 510 DNG 76.9 ha of 567 DNG 5.4 ha of 510 Woodland 3.9 ha of 567 Woodland

Survey programs undertaken

Targeted surveys were undertaken over four survey periods:

- 20th August -22nd August 2019
- 25th November – 29th November 2019
- 4th May – 8th May 2020
- 28th September – 30th September 2020

General vegetation mapping, plot-based surveys and targeted threatened flora and fauna surveys, in accordance with relevant guidelines, where undertaken for relevant species in their suitable habitat. Survey methods included:

- NSW Guide to Surveying Threatened Plants (OEH 2018)
- Species credit threatened bats and their habitats (OEH 2018)
- Draft Threatened biodiversity survey and assessment (OEH 2004)
- Flora Species with Specific Survey Requirements (OEH2018)
- Survey guidelines for Australia's threatened birds (DEWHA, 2010)
- Survey guidelines for Australia's threatened reptiles (DSEWPaC, 2011)

Field surveys undertaken in November 2019 were completed during drought conditions, however, May and October 2020 surveys were conducted following improving conditions and substantial rainfall, increasing adequacy and representation of survey effort. Random meander searches and opportunistic searches were also undertaken across the development site, in conjunction with transects, to support adequacy of survey, in addition to the application of the precautionary principle.

4.2.5 Weather

Weather conditions recorded for these dates from the Bureau of Meteorology (BOM) at the Armidale Weather (**ID:** 056037) Station are presented below.

Table 4-5 Weather summary

Survey Date	Maximum temperature (°C)	Minimum temperature (°C)	Relative Humidity (RH)	Rainfall (mm) on survey date, preceding 14 days	Max wind gust (km/h)	Survey
20th August 2019	16.1	6.0	-	0mm, 7mm	-	Flora and fauna surveys
21st August 2019	14.5	3.2	-	0mm, 7mm	-	Flora and fauna surveys
22nd August 2019	15.4	4.3	-	0mm, 7mm	-	Flora and fauna surveys
26th November 2019	30.7	11.0	52	0.4mm, 17.8mm	WNW 65km/h	Flora and fauna surveys
27th November 2019	28.7	7.2	45	2.8mm, 18.2mm	-	Flora and fauna surveys
28th November 2019	30.0	8.0	60	0mm, 21mm	NNW 48km/h	Flora and fauna surveys
29th November 2019	30.6	14.9	59	0mm, 21mm	WNW 54km/h	Flora and fauna surveys
4th May 2020	17.0	-3.7	82	0mm, 9.4mm	W 28km/h	Flora and fauna surveys
5th May 2020	16.5	0.2	82	0mm, 9.4mm	E 37km/h	Flora and fauna surveys
6th May 2020	18.3	4.1	93	0mm, 9.4mm	ENE 28km/h	Flora and fauna surveys
7th May 2020	18.6	-0.9	91	0mm, 9.4mm	WNW 26km/h	Flora and fauna surveys
8th May 2020	18.7	-1.1	95	0mm, 9.4mm	WNW 33km/h	Flora and fauna surveys
28th September 2020	17.4	-1.5	65	0mm,13.4mm	ENE 30km/h	Flora and fauna surveys
29th September 2020	18.5	4.3	69	0mm,13.4mm	ENE 35km/h	Flora and fauna surveys
30th September 2020	17.0	3.6	7	0mm,13.4mm	NNW 33km/h	Flora and fauna surveys

4.2.6 Candidate species survey and results

Diurnal avifauna (Regent Honeyeater, Glossy Black-Cockatoo, Swift Parrot, Square-tailed Kite (breeding), Little Eagle (breeding), White-bellied Sea-Eagle)

SURVEY EFFORT

A woodland bird census was completed at dusk on 20th and 21st of August 2019, as well as the 26th of November 2019. This comprised of two 20 minute surveys at multiple tree hollow locations within the development site, for a total of two hours over three days. Opportunistic surveys carried out over multiple site visits include traversing the site by car and on foot. Paddock trees and remnant trees were surveyed for evidence of nests.

SURVEY RESULTS

Little Eagle was observed on numerous occasions during the August 2019 surveys opportunistically. On the 20th August 2019 one Little Eagle was identified, with two (2) Little Eagles observed in a similar area of the development site on the 21st August 2019. However, in accordance with the BioNet survey guidelines, no 'signs of breeding' were identified.

Breeding habitat is live (occasionally dead) large old trees within suitable vegetation AND the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy (BioNet). As such, vegetation within the development site is considered unlikely to facilitate the breeding of the species currently, and therefore no species polygon has been created nor are credits required for offset under species credits.

A single Square-tailed Kite was observed opportunistically during November surveys. Similarly, to the guidelines of the Little Eagle, no 'signs of breeding' were observed. As such, vegetation within the development site is considered unlikely to facilitate the breeding of the species currently, and therefore no species polygon has been created nor are credits required for offset under species credits.

Five (5) Glossy Black-Cockatoos (2 male and 3 female) were observed roosting in shrubs along the Gara River in the southern portion of site during August 2019 surveys. However, in accordance with the BioNet survey guidelines, no 'signs of breeding' were observed within the development site. This includes but is not limited to:

- Begging birds of any age or sex
- Lone adult males identified during mating season (April to August, as per the BAM), or
- An occupied nest

Additionally, no evidence of 'Actual Nest Trees' were identified within the development site, as per the definition on BioNet. Considering this, vegetation within the development site is considered unlikely to facilitate the breeding of the species, and therefore no species polygon has been created nor are credits required for offset under species credits.

Nocturnal avifauna (Barking Owl (breeding), Masked Owl (breeding), Powerful Owl (breeding), Bush-stone Curlew)

SURVEY EFFORT

Targeted surveys were completed on the nights of 20th and 21st August 2019 for a total of 6 person hours. A 100 watt spotlight was used from a slow-moving vehicle for visual searches along remnant vegetation,

grassland and isolated paddock trees. Spotlight searches were conducted on foot by 2 Ecologists in dense woodland areas. Call playback of the calls of each species was played from a megaphone at two locations, followed by a period of listening for responses.

SURVEY RESULTS

No threatened birds were seen or heard during the survey. One (1) wild domestic cat (*Felis catus*) was observed during spotlight searches in a medium sized Broad-leaved Stringybark *Eucalyptus caliginosa* in a dense woodland area.

Nocturnal Mammals (Squirrel Glider)

SURVEY EFFORT

Targeted surveys were completed on the nights of 20th and 21st August 2019 for a total of 6 person hours. A 100 watt spotlight was used from a slow-moving vehicle for visual searches along remnant vegetation, grassland and isolated paddock trees. Spotlight searches were conducted on foot by 2 Ecologists in dense woodland areas. Call playback of the Squirrel Glider calls in addition to the nocturnal avifauna above was played from a megaphone at two locations, followed by a period of listening for responses.

SURVEY RESULTS

No threatened mammals were seen or heard during the survey. One (1) wild domestic cat (*Felis catus*) was observed during spotlight searches in a medium sized Broad-leaved Stringybark *Eucalyptus caliginosa* in a dense woodland area.

Flying-foxes and Microbats (Grey-headed Flying-fox, Southern Myotis)

SURVEY EFFORT

Surveys for Grey-headed Flying-fox breeding camps were undertaken within the woodland and creek line areas during the November 2019 surveys. Targeted surveys for Southern Myotis were unable to be undertaken.

SURVEY RESULTS

No Grey-headed Flying-fox camps were identified during the survey.

As no targeted surveys were completed for the Southern Myotis, presence within the development site is assumed. As the Southern Myotis are dependent on waterbodies, and may utilise hollows for roosting. All areas of woodland vegetation within 200m of the Gara River or from any farm dam is considered suitable habitat for the Southern Myotis and Large-eared Pied Bat. A 200 m buffer was therefore calculated around these areas to determine the threatened species polygon. The main sources of water within the development site are Gara River and the 34 farm dams.

Reptiles (Glandular Frog (Litoria subglandulosa), Pale-headed Snake (*Hoplocephalus bitorquatus), Tusked Frog (Adelotus brevis)*

SURVEY EFFORT

Opportunistic surveys were conducted during vegetation, habitat tree, and paddock tree surveys during August and November 2019, and May and September 2020. Herpetological searches were conducted during November 2019. Spotlight searches were conducted in August and November 2019.

SURVEY RESULTS

Opportunistic surveys did not identify any of the species listed above. As no targeted searches were conducted for the Tusked Frog and the Glandular Frog, presence within the development site has been assumed. The Gara River will only be marginally impacted directly from the proposal, with farm dams on the project not providing adequate vegetation coverage to be suitable habitat. The Gara River and riparian vegetation were mapped for their species polygon.

The Pale-headed Snake was not detected during November 2019 herpetological surveys, spotlight surveys or opportunistically throughout the additional surveys. It is considered that the Pale-headed snake is unlikely to utilise the development footprint as habitat for breeding.

Koala

SURVEY EFFORT

Targeted surveys were completed on the nights of 20th and 21st August 2019 for a total of 6 person hours. A 100 watt spotlight was used from a slow-moving vehicle for visual searches along remnant vegetation, grassland and isolated paddock trees. Spotlight searches were conducted on foot by 2 Ecologists in dense woodland areas. Call playback was played from a megaphone at two locations, followed by a period of listening for responses.

Opportunistic surveys were conducted during vegetation, habitat tree, and paddock tree surveys during August and November 2019, and May and September 2020.

SURVEY RESULTS

No koalas or signs of koalas were seen over the 16 survey days on site. It is considered that an adequate coverage or the development site in addition to the number of survey days on site without koala evidence suggests they unlikely to occur.

Threatened Forbs and Grasses (Blue Grass (Dicanthium setosum), Silky Swainsona-pea (Swainsona sericea), Small Snake Orchid (Diuris pedunculata), Hawkweed (Picris evae), Austral Toadflax (Thesium australe)

SURVEY EFFORT

Threatened species 5 m transects were conducted in suitable habitat areas during May 2020 surveys for Blue Grass *Dicanthium setosum.* Transects were conducted along Silverton Road (which was previously part of the development site) as well as suitable areas within the current development site. Transects for *D.setosum* totalled approximately 10 person hours.

Threatened species 5 m transects were conducted in suitable habitat areas during September 2020 surveys for Small Snake Orchid *Diuris pedunculata* and Silky Swainson-Pea *Swainsona sericea*. Transects were conducted along Silverton Road (which was previously part of the development site) as well as suitable areas within the current development site. Transects for *D.pedunculata* and *S.sericea* totalled approximately 12 person hours.

Targeted searches for Hawkweed *Picris evae* and Austral Toadflax *Thesium asutrale* were unable to be undertaken during the specified period (November to February) as per the BAM.

SURVEY RESULTS

Diacanthium setosum was identified within the development site during targeted threatened species transects during May 2020. The paddock was of significantly better quality than the surrounding Category 1 paddocks, and thus was used for the species polygon.

The Small Snake Orchis *Diuris pedunculata* and the Silky Swainson-Pea *Swainsona sericea* were not detected during targeted searches.

Figure 4-1 Dicanthium setosum identified on site in May 2020

Threatened shrubs and trees (Narrow-leaved Bertya (Bertya ingramii), Granite boronia (Boronia granitica), Pygmy Cypress Pine (Callitris oblonga), Northern Blue Box (Eucalyptus magnificata), Narrow-leaved Black Peppermint (Eucalyptus nicholii), Beadle's grevillea (Grevillea beadleana), Tall Velvet Sea-Berry (Haloragis exalata subsp. velutina)

SURVEY EFFORT

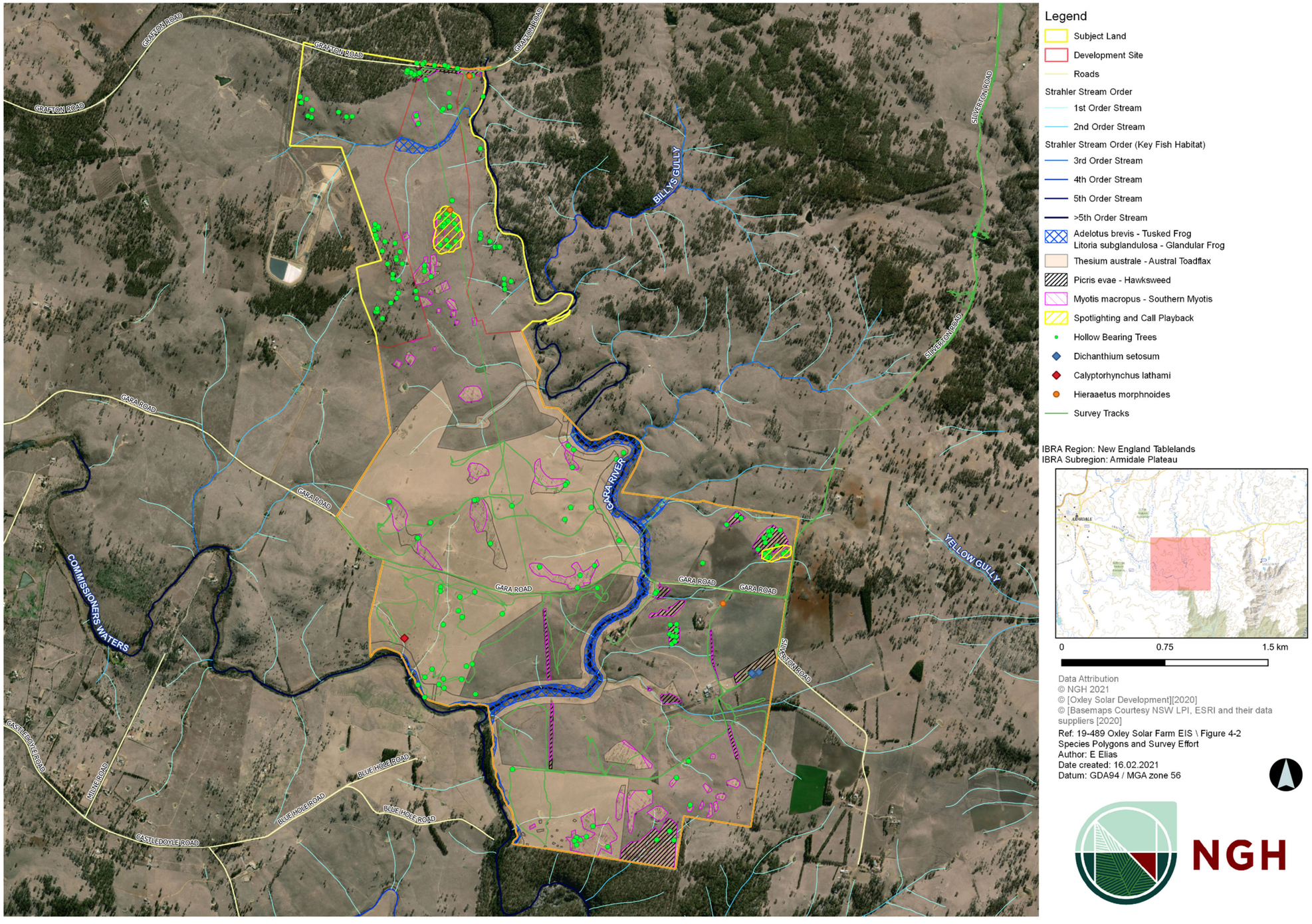
Opportunistic searches were undertaken for the species listed above during the August and November 2019, and May and September 2020 surveys. All species listed above have no specific survey period as per the BAM.

SURVEY RESULTS

No species listed above were detected during the 16 survey days on site.

4.2.7 Further survey recommendations

No additional survey is recommended.



Legend

- Subject Land
- Development Site
- Roads

Strahler Stream Order

- 1st Order Stream
- 2nd Order Stream

Strahler Stream Order (Key Fish Habitat)

- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream
- Adelotus brevis - Tusked Frog
  Litoria subglandulosa - Glandular Frog
- Thesium australe - Austral Toadflax
- Picris evae - Hawksweed
- Myotis macropus - Southern Myotis
- Spotlighting and Call Playback
- Hollow Bearing Trees
- Dichanthium setosum
- Calyptorhynchus lathami
- Hieraaetus morphnoides
- Survey Tracks

IBRA Region: New England Tablelands
IBRA Subregion: Armidale Plateau

0 0.75 1.5 km

Data Attribution
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Ref: 19-489 Oxley Solar Farm EIS \ Figure 4-2
Species Polygons and Survey Effort
Author: E Elias
Date created: 16.02.2021
Datum: GDA94 / MGA zone 56

NGH

Figure 4-2 Species polygons and survey effort

4.3 ADDITIONAL HABITAT FEATURES RELEVANT TO PRESCRIBED BIODIVERSITY IMPACTS

4.3.1 Occurrences of karst, caves, crevices and cliffs

As verified by the field surveys, there are no occurrences of karst, caves, crevices, or cliffs in the development site.

4.3.2 Occurrences of rock

Large rocky outcrops and boulders occur throughout the development site, particularly in areas surrounding the Gara River.

These occurrences of rock are considered to constitute potential habitat for the Brush-tailed Rock Wallaby, a species credit species predicted to occur by the BAM-C.

As verified by the field surveys, surface rock was evident within the development site particularly on the slopes and hills within the paddocks.

4.3.3 Occurrences of human made structures and non-native vegetation

The subject land contains several residences and small structures, including storage sheds, associated with current land use. Generally, there are small areas of landscape plantings containing exotic species such as Radiata Pine *Pinus radiata*.

There is no existing infrastructure such as rail bridges and culvert structures within the development site.

Non-native vegetation within the development site consists of both cleared paddocks and cropping areas, as well as areas used for horticultural purposes. Although these areas may allow for the movement of threatened fauna throughout the broader landscape, and potentially foraging habitat for threatened microbats on occasion, it is not considered that threatened fauna species would utilise areas of non-native vegetation regularly for foraging or breeding and would only be utilised for transient use. Paddock trees were observed within areas of cropping that may utilised by threatened fauna species. No threatened species are considered to rely on the non-native vegetation within the development site.

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

The Development site is located directly east of the Commissioners waters and is traversed by the Gara River which is the main watercourse within the subject land. The Gara River traverses east to west in the Southern portion of the subject land and is categorised as a sixth order stream (Strahler). Additionally, 34 first and second order tributaries of Commissioners waters traverse the subject land. The Gara River and one of its adjoining tributaries within the Development site are listed as areas of high biodiversity value under the *Biodiversity Conservation Regulation 2017* (BC Regulation). The Gara River is considered key fish habitat (NSW Department of Primary Industries (Fisheries).

Most of the watercourses within the subject land are ephemeral in nature and would only contain flowing water during and shortly after rainfall events. The Gara River had evident water however, lacked flow and was semi stagnant during the August and November 2019 surveys. This improved considerably following heavy rainfall events to good flow with numerous riffles and deep pools observed throughout the subject land in May and

September 2020 surveys. The Gara River is predominantly fenced off and cannot be accessed by stock (cattle and sheep), however would receive runoff from surrounding cultivated land. Dams however, can be accessed by stock throughout the subject land.

There is only one known water crossing within the development site via a small wooden bridge. The major river within the development site, the Gara River, supports native riparian vegetation. There is however a moderate abundance of exotic flora such as Willows *Salix* sp., Greater Beggar's Pegg *Bidens subalternans* and Paspalum *Paspalum dilatatum*. This generally supports habitat for a range of commonly occurring waterbirds such as Spoonbills, Egrets as well as disturbance resistant turtle and amphibian species.

5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC Act protected matters report was undertaken on the subject land (10 km buffer of the development site) to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the development site (Appendix E). Relevant to biodiversity these include:

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

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

5.1 WETLANDS OF INTERNATIONAL IMPORTANCE

No wetlands of international importance were identified from the protected matters report.

5.2 THREATENED ECOLOGICAL COMMUNITIES

Three (3) threatened ecological communities were identified from the protected matters report. One (1) of these were confirmed as present within the development site:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered)

Two (2) additional communities were not present within the site:

- Lowland Rainforest of Subtropical Australia (Critically Endangered)
- New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands (Critically Endangered)

5.3 THREATENED SPECIES

Excluding marine species, 39 threatened species encompassing ten (10) birds, eight (8) mammals, seventeen (17) plants, two (2) amphibians, and two (2) reptiles were identified from the protected matters report. Of these, six (6) are considered to have the potential to utilise the habitats at the development site:

1. *Dichanthium setosum* Bluegrass – Vulnerable
2. *Lathamus discolor* Swift Parrot – Critically Endangered
3. *Rostratula australis* Australian Painted Snipe – Endangered
4. *Dasyurus maculatus maculatus* Spot-tailed Quoll – Endangered
5. *Petrogale penicillata* Brush-tailed Rock-wallaby – Vulnerable
6. *Phascolarctos cinereus* Koala – Vulnerable

5.4 MIGRATORY SPECIES

Excluding marine species, fourteen (14) migratory species were identified from the protected matters report. Of these, five (5) are considered to have potential to utilise habitats such as the Gara River for foraging which runs through the development site. However, the development footprint would have limited impact on this area. The migratory species considered as having potential to utilise the development site include:

- *Ardea alba* Great Egret – Migratory
- *Ardea ibis* Cattle Egret – Migratory
- *Gallinago hardwickii* Latham's Snipe – Migratory
- *Merops ornatus* Rainbow Bee-eater – Migratory
- *Tringa nebularia* Common Greenshank – Migratory

6 AVOID AND MINIMISE IMPACTS

6.1 AVOIDING AND MINIMISING IMPACTS ON NATIVE VEGETATION AND HABITAT

6.1.1 Site selection

The proponent has reviewed a large number of sites within NSW on which to build a solar farm before selecting the Oxley Solar farm development site. The proposed sites were considered in accordance with DPIE's Large Scale Solar Energy Guideline for SSD 2018, which provides recommendations regarding selection of suitable development sites and areas of constraint that should be identified. While it would have been possible to construct and operate the solar farm at some of the sites investigated, OSD considers the Oxley solar farm development site to be the most suitable for the construction of a solar farm.

The development site's evaluation in terms of the Large Scale Solar Energy Guideline for SSD 2018 (DPIE) described in Table 6-1 below.

Table 6-1 Evaluation of preferable conditions associated with the development site.

Preferable Site Condition	Observation
Optimal solar resources	The development site is located within the New England North West REZ which is the second highest solar penetration region in NSW (DPIE, 2017). The site has high solar exposure measuring 10MJ/m^2 (June) to 28MJ/m^2 (December) (BOM, 2020).
Suitable land	The development site is located within the New England North West REZ and the following suitable land characteristics: • Mostly undulating land with some flat area. • The land is not mapped as Biophysical Strategic Agricultural Land (BSAL). • The site has no exploration or mining leases. • The site has already been cleared and heavily disturbed by grazing. • The site is comprised of large lots under relatively few landholdings and these are available for purchase, pending project approval.
Capacity to rehabilitate	Proposal would involve minimal site disturbance and has potential to improve land by giving the site a rest from grazing. Once the solar farm reaches the end of its operational life, the site can be remediated to its existing condition so that grazing and occasional cropping can be resumed.
Community support	Community consultation has been undertaken as part of the proposal and feedback has been considered. There is substantial community support in the region for renewable projects. The community expressed the following positives about the proposal: • Economic benefits • Business opportunities • Revegetation potential, • Benefits of renewable energy

Preferable Site Condition	Observation
Proximity to electrical network	Two existing 132kV transmission lines traverses the site which means the that the connection to the high voltage network can be made onsite without the need to construct any transmission lines. It also reduces the distribution loss factor risk. The development site is also located approximately 9km from the Armidale 330/132 kV substation which has been identified as a connection opportunity and as such, a suitable location for connecting new energy generation.
Connection capacity	The development site is located within the New England North West REZ. AEMO identified the New England region of NSW as an optimal REZ development area, supported by existing transmission strength and capacity. The ability to connect to the high voltage network via a 132kV transmission line which traverses the site brings significant benefits as the network has the capacity to absorb the total output of the solar farm and deliver it anywhere in the network.

6.1.2 Proposal planning phase

Avoiding higher constraint areas

Once the broader site was selected, the development footprint was refined iteratively, in tandem with the environmental assessments and consultation with relevant government agencies, the community and other stakeholders. This process ensures the proposal responds appropriately to the site's constraints to produce the most justifiable proposal. The layout has been developed to avoid higher quality areas of native vegetation onsite including:

- 37.3 ha of PCT 567 Woodland
- 120.1 ha of PCT 567 DNG
- 29.2 ha of PCT 510 Woodland
- 126 ha PCT 510 DNG

Technology options

The critical components of a solar farm include:

- Solar panels to generate DC electricity from sunlight.
- Inverters to convert the DC electricity into AC electricity.
- Energy storage facility

Photovoltaic solar technology was chosen because it is cost-effective, low profile, durable and flexible regarding layout and siting. It is a proven and mature technology which is readily available for broad scale deployment at the site. In terms of its impacts on biodiversity, PV solar installation creates minimal ground disturbances. Solar array mounts are either pile driven or on small footings, retaining the natural ground cover largely intact beneath the array. Ancillary infrastructure has relatively small areas of disturbance for cabling, permitter access tracks and transmission infrastructure.

Precautionary assessment

The largest area of impact is due to the solar array. However, it is noted that the impacts of shading on groundcover species composition over the long term is largely unknown. Solar panels will cause extensive shading over the site. 43% percent of the development footprint is derived native grassland. It is not known

whether shading would lead to a change in groundcover species composition so in taking a precautionary approach, it is assumed to be removed rather than modified, in this assessment.

7 IMPACTS UNABLE TO BE AVOIDED

7.1 DIRECT IMPACTS

The construction and operational phases of the proposal has the potential to impact biodiversity values at the site that cannot be avoided. This would occur through direct impacts such as habitat clearance and installation and existence of infrastructure.

Table 7-1 Potential impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	Consequence
Direct impacts				
Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks)	87 ha of Native Vegetation	Regular	Construction	Direct loss of native flora and fauna habitat Potential impacts of additional clearing outside the proposed development footprint Injury and mortality of fauna during clearing of fauna habitat and habitat trees Disturbance to stags, fallen timber, and bush rock
Displacement of resident fauna	Unknown	Regular	Construction, operation	Direct loss of native fauna Decline in local fauna populations
Injury or death of fauna	Unknown	Regular	Construction	Direct loss of native fauna Decline in local fauna populations
Removal of habitat features e.g. HBTs	20 HBTs	Regular	Construction	Direct loss of native fauna habitat

Nature of impact	Extent	Frequency	Duration and timing	Consequence
	14 waterbodies			Injury and mortality of fauna during clearing of habitat features
Shading by solar infrastructure	70% of Solar array area	Regular	Operational Phase: Long-term	Indirect impacts of altered light (i.e. shading) on derived native grasslands which could lead to altered species composition and cover abundance. Modification of native fauna habitat. Potential loss of ground cover resulting in unstable ground surfaces and sedimentation of adjacent waterways.
Existence of permanent infrastructure (Fencing)	Perimeter of site	Regular	Operational Phase: long-term	Reduced fauna movements across landscape due to fencing. Collision risks to birds and microbats due to fencing.

7.1.1 Changes in vegetation integrity scores

The changes in vegetation integrity scores as a result of clearing are documented for each vegetation zone are shown below. For the purpose of this BDAR, it is assumed that there will be total removal/modification of all vegetation zones, leading to future scores of zero.

Table 7-2 Current and future vegetation integrity scores for each vegetation zone within the development site

Zone ID	PCT/Zone	EEC and/or threatened species habitat?	Area (ha)	Area Impacted (ha)	Current vegetation Integrity Score	Future vegetation Integrity Score
1	84_Riparian	Nil.	28	0.03	49.8	0
2	510_Woodland	White Box Yellow Box Blakey's Red Gum Woodland	34.7	5.4	69.0	0
3	510_DNG	White Box Yellow Box Blakey's Red Gum Woodland	126.6	0.6	26.6	0
4	567_Woodland	White Box Yellow Box Blakey's Red Gum Woodland	51	3.9	37.7	0
5	567_DNG	White Box Yellow Box Blakey's Red Gum Woodland	196.3	76.9	24.6	0
6	84_Sedgeland	Nil.	2.7	0.2	76.4	0

7.1.2 Loss of species credit species habitat or individuals

The loss of species credit species habitat or individuals as a result of clearing is documented in Table 7-3.

Table 7-3 Summary of species credit species loss at the development footprint

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost
Myotis macropus **Southern Myotis**	2.00	4.9 ha in Zone 2: PCT 510 Woodland (within 200m of waterbody) 2.7 ha in Zone 4: PCT 567 Woodland (within 200m of waterbody)
Picris evae **Hawkweed**	2.00	5.4 ha of PCT 510 Woodland (Zone 2)
Thesium australe **Austral Toadflax**	1.50	5.4 ha of PCT 510_Woodland (Zone 2) 0.5 ha of PCT 510_DNG (Zone 3) 3.9 ha of PCT 567_Woodland (Zone 4) 76.9 ha of PCT 567_DNG (Zone 5)

7.1.3 Loss of hollow-bearing trees

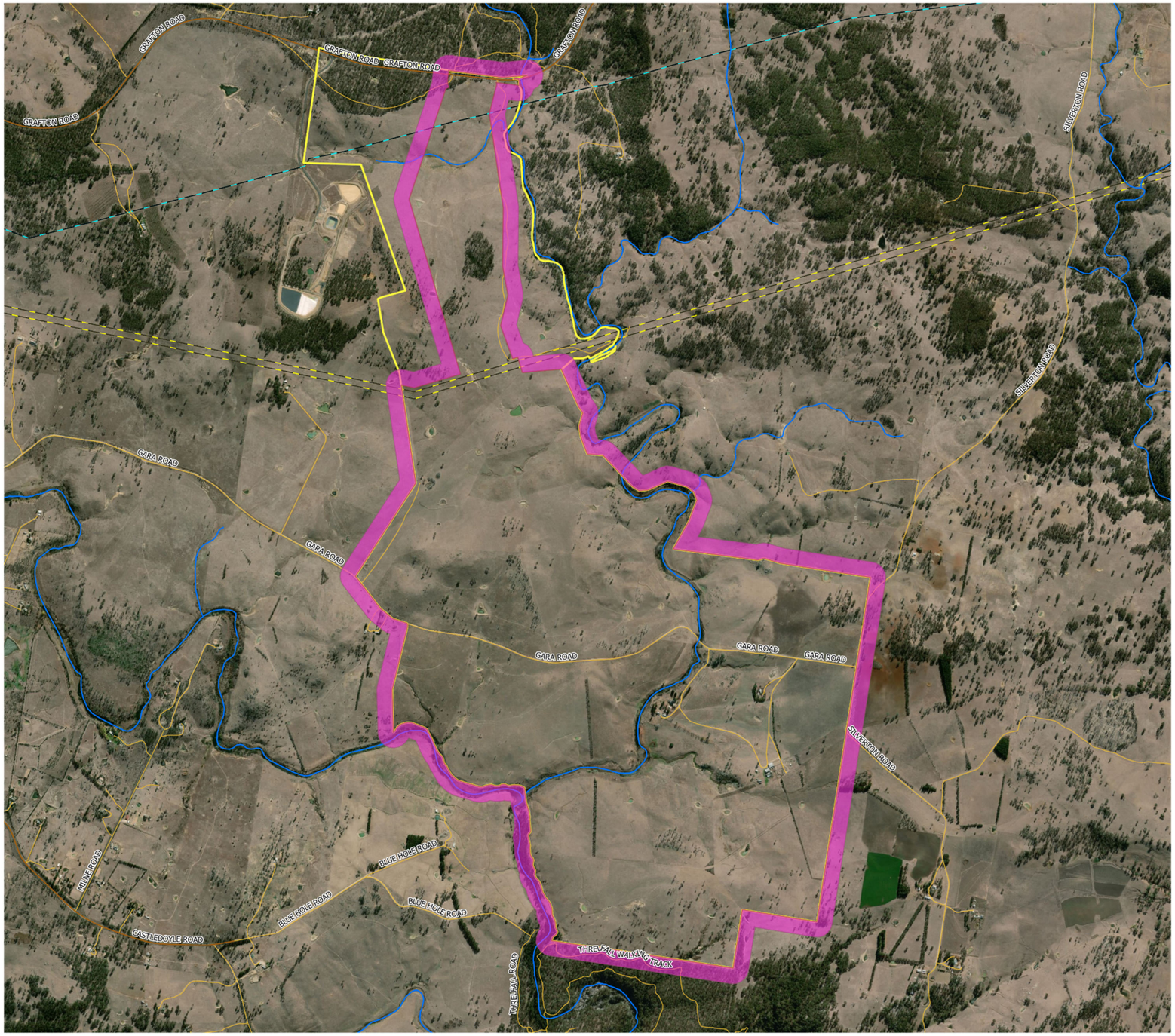
31 hollow bearing trees (HBTs) were recorded inside the development footprint.

Table 7-4 Hollow bearing trees that would be removed and associated vegetation

ZONE	PCT ID	HBTs within zone
1	84_Riparian	0
2	510_WD	12
3	510_DNG	0
4	567_WD	5
5	567_DNG	3
6	84_SEDGELAND	0
TOTAL		**20**

7.2 INDIRECT IMPACTS

Indirect impacts of the proposal include soil and water contamination, creation of barriers to fauna movement, or the generation of excessive dust, light or noise. The table below shows the type, frequency, intensity, duration and consequence of the direct and indirect impacts of the proposal. The zone of indirect impact is mapped below.



Legend

- Subject Land
- Development Site
- Roads
- Indirect Impact Zone

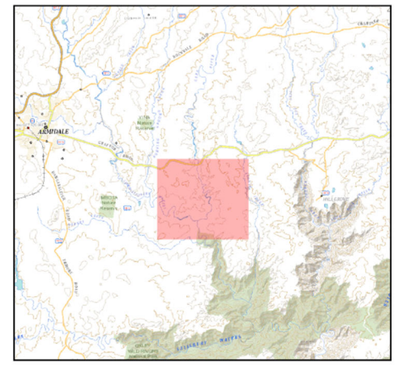
Strahler Stream Order

- 1st Order Stream
- 2nd Order Stream

Strahler Stream Order (Key Fish Habitat)

- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream

IBRA Region: New England Tablelands
IBRA Subregion: Armidale Plateau



0 0.75 1.5 km

Ref: 19-489 Oxley Solar Farm EIS \ Figure 7-1
Indirect Impact Zone
Author: E Elias
Date created: 16.02.2021
Datum: GDA94 / MGA zone 56

NGH

Figure 7-1 Indirect impact zone

Table 7-5 Potential indirect impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Inadvertent impacts on adjacent habitat or vegetation	Unknown	Rare	Construction Phase: Short-term	• PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion • PCT 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	• Direct loss of native flora and fauna habitat • Injury and mortality of fauna during clearing of fauna habitat and habitat trees • Disturbance to stags, fallen timber, and bush rock • Increased edge effects
Reduced viability of adjacent habitat due to edge effects	Unknown	Constant	Operational Phase: Long-term	• PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion • PCT 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion • Glossy-black Cockatoo • Square-tailed Kite • Little Eagle • Southern Myotis • Large-eared Pied Bat	• Further degradation of TECs. • Loss of native flora habitat • Loss of connectivity between remnant PCT 567 and PCT 510 within and around development footprint; and • Reduced genetic diversity within isolated populations • Loss of potential breeding and foraging habitat

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Reduced viability of adjacent habitat due to noise, dust or light spill	Unknown	Rare	Operational Phase: Short-term	• PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion • PCT 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion • Glossy-black Cockatoo • Square-tailed Kite • Little Eagle • Southern Myotis • Large-eared Pied Bat	• May alter fauna activities and/or movements • Loss of foraging or breeding habitat • Inhibit the function of plant species, soils and dams
Transport of weeds and pathogens from the site to adjacent vegetation	Unknown	Irregular	Construction & Operational Phase: Long-term	• PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion • PCT 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	• Degradation of TEC onsite through future weed invasion
Increased risk of starvation, exposure and loss of shade or shelter	Unknown	Rare	Construction & Operational Phase: Long-term	• Glossy-black Cockatoo • Square-tailed Kite • Little Eagle • Southern Myotis • Large-eared Pied Bat	• Loss of foraging habitat • Exposure to predators when moving between segmented patches of vegetation; and • Loss of access to water (loss of dams)
Loss of breeding habitats	31 number of HBTs	Constant	Construction Phase: Long-term	• Glossy-black Cockatoo • Square-tailed Kite • Little Eagle • Southern Myotis • Large-eared Pied Bat	• Loss of potential breeding habitat including fallen and hollow logs at height; • Loss of vegetation close to water: and • Increased pressure and competition for remaining HBT resources from native and exotic hollow dependent fauna

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Increase in pest animal populations	Development footprint	Regular	Long term	• PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion • PCT 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion • Glossy-black Cockatoo • Square-tailed Kite • Little Eagle • Southern Myotis • Large-eared Pied Bat	• Solar arrays may provide potential habitat for pest species like rabbits and foxes to take refuge under panels.
Bush rock removal and disturbance	TBA	One off	Long term	• Little Eagle	• Loss of potential foraging habitat
Earthworks and mobilisation of sediments	Unknown	Regular	Construction	• PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion • PCT 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	• Erosion and sediment deposition pollution on downstream habitats; and • Alternation of surface watercourses (isolating high biodiversity value communities).

7.3 PRESCRIBED IMPACTS

The following prescribed biodiversity impacts are relevant to the proposal:

- Impacts of the development on the connectivity of different areas of habitat of threatened species that facilitates the movement of these species across their range
- Impacts of the development on movement of threatened species that maintains their life cycle
- Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation.
- Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities
- Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC

These are discussed in detail below and the necessary information required by Section 9.2 of the BAM provided.

7.3.1 Impacts of development on the habitat of threatened species or ecological communities associated with rocks

No breeding habitat/maternity caves were identified for the Large Bent-wing Bat or Large-eared Pied Bat, due to the lack cracks, cliffs, and crevices within the development site.

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

There are numerous agricultural and residential buildings within the development site, however none fall within the development footprint and would be impacted by the proposal. Furthermore, there are no human made culverts present within the development site.

7.3.3 Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation

Minor portions of the development footprint contain areas of non-native vegetation which did not require assessment under the BAM. Most areas consisted of ploughed paddocks being sown with canola and oats. These areas are not expected to provide any unique habitat opportunities for any of the candidate species assessed.

7.3.4 Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

Box-gum woodland is currently highly fragmented through the development site due to historical land use with small clumps and isolated paddock trees remaining. More connected and better condition box-gum woodland occurs on the northern boundary of the development site on the Waterfall Way road verge and the lower slopes out of the development site within the National Park. Connectivity of the woodland would still be maintained through these areas with only minimal clearing occurring in the north for site access. The loss of numerous paddock trees and smaller patches within the development

footprint would result in minor loss of connectivity for more transient, agile and disturbance tolerant species. These areas occur predominantly as canopy species with sporadic native mid storey and a mixed native and exotic ground cover. They typically lack the more complex vegetative structure of the larger patches of vegetation to the north, on the road verge, and to the south, outside of the development site that would not be impacted. Thus, ensuring that species that rely of box-gum woodland as well as genetic variation would be maintained and not considered to significantly increase fragmentation of the box-gum woodland.

The remnant Box Gum Woodland habitat provides connectivity for threatened woodland birds such as Regent Honeyeater, Speckled Warbler, Brown Treecreeper, Varied Sittella, Little Lorikeet, Swift Parrot, Hooded Robin, Black-chinned Honeyeater, Turquoise Parrot, Scarlet Robin, Flame Robin, Grey-crowned Babbler and Diamond Firetail. Where hollow-bearing trees are present there are key breeding habitat opportunities for Barking Owl, Powerful Owl, Masked Owl, and Squirrel Glider. These patches of woodland have been subjected to a history of clearing and farming and are fragmented. This has resulted in these patches becoming isolated and less viable, especially for terrestrial fauna such as Koalas and the Spotted-tail Quoll. The degree of impact on these already fragmented patches is not seen to pose a substantial impact on any threatened species.

The derived native grasslands and paddock trees and woodland habitat provide habitat for threatened birds of prey like the White-bellied Sea Eagle, Little Eagle and Square-tailed Kite, especially around areas containing large dams and around the Gara River.

The proposal is therefore not likely to disrupt the movement of these species and would not have a substantive impact on their bioregional persistence.

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

For migratory threatened species that may move across the landscape, retained and avoided vegetation across the site will maintain connectivity across the landscape to facilitate movement in an north-south direction. The Gara River corridor would be impacted minimally and would be suitable as a movement corridor. Larger woodland patches would also be retained providing ‘steppingstone’ refuges for mobile species in an existing highly cleared environment. Due to the cleared and fragmented landscape within the development site the proposal is not likely to disrupt the movement of any other threatened species that maintains their lifecycle.

7.3.6 Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including subsidence or upsidence resulting from underground mining or other development)

The construction of the proposal would involve a range of activities that would disturb soils and potentially lead to sediment laden runoff affecting local waterways during rainfall events. These potential impacts are unlikely to significantly impact water quality with the implementation of recommended mitigation measures including erosion and sedimentation controls. The use of fuels and other chemicals on site during construction poses a risk of surface water contamination in the event of a spill. Mitigation measures to implement spill management procedures would minimise impacts to waterways and hydrological processes.

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

An increase in vehicle traffic during construction and required maintenance may slightly increase the risk of vehicle strike on threatened species occurring in or near the development site. As most machinery will be large it is likely to travel at lower speeds thus lowering the incidence of vehicle strikes.

Fencing may act as a barrier to the movement and may funnel species into transport corridors.

Mitigation measures will be implemented to enforce a site speed. With the recommended mitigation measures, it is therefore not likely that vehicles associated with the proposal will have a substantive impact on any species.

7.4 IMPACTS TO BIODIVERSITY VALUES THAT ARE UNCERTAIN

The majority of the development footprint (around 70%) will consist of solar panels. The impacts of shading and diversion of rainfall runoff from the panels themselves is largely unknown. For the purpose of this BDAR report, the entire development footprint is assumed to be removed however, as the indicative layout shows, substantial peripheral areas are likely to be unimpacted and it is likely that a number of perennial native species will persist underneath the solar arrays. Certainly, only a minor proportion of the seed bank will be impacted, given the limited excavation proposed.

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

7.5 IMPACTS TO MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC Act habitat assessment (Appendix F) evaluation was undertaken for species predicted to occur within the broader study locality (10 km radius). An EPBC Act Assessments of Significance (AoS) (Appendix G) was completed for each species and TECs that has a moderate to high likelihood of presence within the development site or was recorded during the surveys (Appendix G). This included:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered
- *Dichanthium setosum* Bluegrass – Vulnerable
- *Lathamus discolor* Swift Parrot – Critically Endangered
- *Rostratula australis* Australian Painted Snipe – Endangered
- *Dasyurus maculatus maculatus* Spot-tailed Quoll – Endangered
- *Petrogale penicillata* Brush-tailed Rock-wallaby – Vulnerable
- *Phascolarctos cinereus* Koala - Vulnerable
- *Ardea alba* Great Egret – Migratory
- *Ardea ibis* Cattle Egret – Migratory
- *Gallinago hardwickii* Latham's Snipe – Migratory
- *Merops ornatus* Rainbow Bee-eater – Migratory
- *Tringa nebularia* Common Greenshank – Migratory

Approximately 4.87 ha of CEEC White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland meeting the threshold for consideration as the EPBC Act listed form of the community occurs within the development site, occurring as a portion of vegetation zone 2 (PCT 510 Woodland). Of that, approximately 0.6 ha would be impacted by the development footprint, within the north of the development footprint in association with the Grafton Road intersection.

Additionally, the EPBC Act Referral Guidelines for the Koala (DoE 2014) have been addressed below.

The summary in Table 7-6 below concludes significant impacts are not anticipated and therefore referral is not recommended.

Table 7-6: Summary of Assessments of significance.

Threatened species, or communities	Significance assessment question[1]									Likely significant impact?
	a	b	c	d	e	f	g	h	i	
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	No	No	No	No	No	No	No	No	No	No
***Dichanthium setosum* Bluegrass**	No	No	No	No	No	No	No	No	No	No
***Lathamus discolor* Swift Parrot**	No	No	No	No	No	No	No	No	No	No
***Rostratula australis* Australian Painted Snipe**	No	No	No	No	No	No	No	No	No	No
***Dasyurus maculatus maculatus* Spot-tailed Quoll**	No	No	No	No	No	No	No	No	No	No
***Petrogale penicillata* Brush-tailed Rock-wallaby**	No	No	No	No	No	No	No	No	No	No

Threatened species, or communities	Significance assessment question[1]									Likely significant impact?
	a	b	c	d	e	f	g	h	i	
***Phascolarctos cinereus* Koala**	No	No	No	No	No	No	No	No	No	No
***Ardea alba* Great Egret**	No	No	No	No	No	No	No	No	No	No
***Ardea ibis* Cattle Egret**	No	No	No	No	No	No	No	No	No	No
***Gallinago hardwickii* Latham's Snipe**	No	No	No	No	No	No	No	No	No	No
***Merops ornatus* Rainbow Bee-eater**	No	No	No	No	No	No	No	No	No	No
***Tringa nebularia* Common Greenshank**	No	No	No	No	No	No	No	No	No	No

The EPBC Act Referral Guidelines for the Koala (DoE 2014) documents the 'Koala habitat assessment tool' to assist proponents in determining if a proposal may impact on habitat critical to the survival of the Koala. The tool is utilised in Table 7-7 as it applies to the proposal. Impact areas that score five or more using this tool contain habitat critical to the survival of the Koala. The assessment in Table 7-7 resulted in a score of 6 and, as such, habitat within the development site is critical to the survival of the Koala and an assessment of significant impact according to the EPBC Act significant impact criteria is required and has been undertaken.

The assessment of significant impact, based on targeted surveys for this species, concluded significant impact would not be likely as a result of this development and no referral has been recommended.

Table 7-7 Koala habitat assessment tool for inland areas (DoE 2014)

Attribute	Score	Inland	Applicable to the proposal?
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 5 years.	
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 10 years.	
	0 (low)	None of the above.	✓
Vegetation composition	+2 (high)	Has forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	✓
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known koala food tree present.	

Attribute	Score	Inland	Applicable to the proposal?
	0 (low)	None of the above.	
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 1000 ha.	✓
	+1 (medium)	Area is part of a **contiguous landscape** < 1000 ha, but ≥ 500 ha.	
	0 (low)	None of the above.	
Key existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. Areas which score 0 for koala occurrence and have no dog or vehicle threat present	
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, **OR** Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.	
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the subject land at present, **OR** Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.	✓
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	✓ Supports important connectivity
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	

Attribute	Score	Inland	Applicable to the proposal?
Total	**6**	**Decision: Habitat critical to the survival of the Koala—assessment of significance required**	

7.6 LIMITATIONS TO DATA, ASSUMPTIONS AND PREDICTIONS

7.6.1 Assumptions about impact extent

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

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

7.6.2 Survey timing and efficacy

Where survey has been undertaken for candidate species requiring confirmation of presence or absence, this has been done employing appropriate methods and timing. Nevertheless, it is an unavoidable limitation that not all species that utilise an area will be detected. This is generally due to their cryptic nature or mobility and unpredictable movement throughout their habitat and prevailing drought conditions.

The calculation of hollow-bearings trees, in particular the size and number of hollows, was made from ground level. It is possible that some hollows are present that were not visible from ground level, which may result in underestimates of the number of hollows (Gibbons and Lindenmayer, 2000). However, it was noted where it was considered likely that hollows were present but not visible from ground level.

It is possible that some species were not recorded during the survey due to the timing of the survey outside their recommended survey period. Where survey effort or timing is not consistent with the BAM or relevant guidelines, this is stated explicitly in the assessment and measures identified to address the limitation; i.e. assumption of occurrence for species whose survey window could not be met.

8 MITIGATING AND MANAGING IMPACTS

8.1 MITIGATION MEASURES

A general summary of the key measures required to mitigate the impacts of the proposal are provided below. Mitigation measures proposed to manage impacts, including proposed techniques, timing, frequency, responsibility for implementing each measure, risk of failure and an analysis of the consequences of any residual impacts are provided in Table 8-1.

8.1.1 Impacts from the clearing of vegetation and habitats

- Time works to avoid critical life cycle events on threatened species
- Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler
- Relocate habitat features (fallen timber, hollow logs) from within the development site

8.1.2 Indirect impacts

- Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed
- Adaptive dust monitoring programs to control air quality.
- Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas.
- Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.
- Temporary fencing to protect significant environmental features such as riparian zones.
- Preparation of a Biodiversity Management Plan to regulate activity in vegetation and habitat adjacent to the proposed development.
- Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise.
- Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill.
- Preparation of a vegetation management plan to regulate activity in vegetation and habitat adjacent to the proposed development.
- Preparation of a vegetation management plan to monitor ground cover beneath the solar array modules.
- Erosion and sediment controls.

8.1.3 Prescribed impacts

- Appropriate landscape plantings of local indigenous species to replace loss of planted vegetation Adaptive dust monitoring programs to control air quality.
- Sediment barriers and spill management protocols to control the quality of water runoff from the site into the receiving environment Temporary fencing to protect significant environmental features such as riparian zones.
- Enforce site speed limits to reduce impacts of vehicle strikes on threatened fauna.
- Involve a local landcare group or educational institution in ongoing biodiversity monitoring and enhancement.

- Plain wire instead of barbed used on top of the perimeter fence and stock fencing to reduce impacts on birds and Squirrel Glider.
- Perimeter fence would be located to avoid, where possible, segmenting patches of native vegetation to facilitate native fauna movements.
- Install approximately 120 nesting boxes for birds and mammals across the development site.
- Creek lines and retained dams would be planted with native riparian vegetation and transformed into small created wetlands for wildlife.
- Appropriate landscape plantings of local indigenous species (where possible) within the development site.

Table 8-1 Mitigation measures proposed to avoid and minimise impacts on native vegetation and habitat

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Displacement of resident fauna through vegetation clearing and habitat removal						
Time works to avoid critical life cycle events.	• Hollow-bearing trees would not be removed during breeding season (spring to summer) for threatened hollow dependant fauna. • If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure no impacts to fauna would occur.	Construction	Regular	Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted
Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler.	• A tree clearing procedure would be implemented to minimise harm to resident fauna.	Construction	Regular	Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted
Relocate habitat features (fallen timber, hollow logs) from within the development site.	• Procedure for relocation of habitat features to adjacent area for habitat enhancement would be implemented.	Construction	Regular	Contractor	Low	None
Indirect impacts on native vegetation and habitat						
Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in	• Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing. • No stockpiling or storage within dripline of any mature trees. • Access and laydown in areas of White Box Yellow Box Blakely's	Construction	Regular	Contractor	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
situations where partial clearing is proposed.	Red Gum Woodland TEC will be minimised to reduce impacts. • Exclusion fencing and signage or similar would be installed around habitat to be retained.					
Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise.	• Construction Environmental Management Plan will include measures to avoid noise encroachment on adjacent habitats such as avoiding night works as much as possible.	Construction	Regular	Contractor	Low	None
Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill.	• Avoid Night Works where possible. • Direct lights away from vegetation.	Construction/ Operation	Regular	Contractor	Low	None
Adaptive dust monitoring programs to control air quality.	• Daily monitoring of dust generated by construction activities. • Construction would cease if dust observed being blown from site until control measures were implemented. • All activities relating to the proposal would be undertaken with the objective of preventing visible dust emissions from the development site.	Construction	Regular	Contractor	Moderate	Sedimentation in ephemeral waterways and dams
Temporary fencing to protect significant environmental features such as riparian zones.	• Prior to construction commencing, exclusion fencing, and signage would be installed around habitat to be retained.	Construction	Regular	Contractor	Low	None
Hygiene protocols to prevent the spread of weeds or pathogens	• A Weed Management procedure would be developed for the proposal to prevent and minimise	Construction/ Operation	Regular	Contractor	Moderate	Weed encroachment

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
between infected areas and uninfected areas.	the spread of weeds. This would include: ○ Management protocol for declared priority weeds under the Biosecurity Act 2015 during and after construction. ○ Weed hygiene protocol in relation to plant, machinery, and fill. • Any occurrences of pathogens such as Myrtle Rust and Phytophthora would be monitored, treated, and reported. • The weed management procedure would be incorporated into the Biodiversity Management Plan.					
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.	• Site induction and toolbox talks for ecologically sensitive areas would be undertaken.	Construction	Regular	Contractor	Moderate	Impacts to native vegetation or threatened species for Staff training not being followed
Preparation of a vegetation management plan to regulate activity in vegetation and habitat adjacent to the proposed development.	• Preparation of a Biodiversity management plan that would include protocols for: ○ Protection of native vegetation to be retained. ○ Best practice removal and disposal of vegetation. ○ Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist. ○ Weed management. ○ Unexpected threatened species finds.	Construction	One-off	Contractor	Moderate	Impacts to native vegetation or threatened species for Biodiversity Management Plan not being followed

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	○ Exclusion of vehicles through sensitive areas. ○ Rehabilitation of disturbed areas.					
Preparation of a Biodiversity Management Plan to regulate activity in vegetation and habitat adjacent to the proposed development.	• Preparation of a Biodiversity Management Plan that would include protocols for: ○ Protection of native vegetation to be retained. ○ Best practice removal and disposal of vegetation. ○ Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist. ○ Weed management. ○ Pest animal management ○ Unexpected threatened species finds. ○ Exclusion of vehicles through sensitive areas. • Rehabilitation of disturbed areas.	Construction	Regular	Contractor	Moderate	Impacts to native vegetation or threatened species for staff training not being followed
Preparation of a vegetation management plan to monitor ground cover beneath the solar array modules.	• A Ground cover management plan would be developed to: ○ Ensure that ground cover is retained beneath panels, to resist erosion and weeds. ○ Preserve the native composition as much as possible.	Operation	Regular	Contractor	Moderate	Weed cover and erosion may increase Native species composition may decline
Erosion and sediment controls.	• An erosion and sediment control plan would be prepared in conjunction with the final design and implemented.	Construction	Regular	Contractor	Moderate	Impacts may occur if erosion and sedimentation control plan not implemented

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Prescribed biodiversity impacts						
Creek lines and retained dams would be planted with native riparian vegetation and transformed into small created wetlands for wildlife.	• Riparian plantings would comprise local native sedges, rushes, grasses and small shrubs.	Construction	Regular	Client	Moderate	Plants not surviving or being overtaken by weeds
Screening and landscaping plantings to be comprised of local indigenous species representative of the vegetation in the development site.	• Screening and landscaping plantings (up to 50 m where practicable) to be comprised of local indigenous species representative of the vegetation in the development site.	Operation	Regular	Client	Moderate	Plants not surviving
Sediment barriers and spill management procedures to control the quality of water runoff released from the site into the receiving environment.	• An erosion and sediment control plan would be prepared in conjunction with the final design and implemented. • Spill management procedures would be implemented.	Construction	Regular	Contractor	Moderate	Impacts may occur to waterway if erosion and sedimentation control plan not implemented
Appropriate landscape plantings of local indigenous species (where possible) within the development site.	• Landscape plantings will be comprised of local indigenous species.	Operation	Regular	Client	Moderate	Plants not surviving
Staff training and site briefing to communicate impacts of traffic strikes on native fauna.	• Awareness training during site inductions regarding enforcing site speed limits. • Site speed limits to be enforced to minimise fauna strike.	Construction/ Operation	Regular	Contractor	Moderate	Fauna strikes from vehicles
Involve a local landcare group or educational institution in ongoing	• Involve a third party organisation to monitoring and maintain biodiversity enhancement activities.	Operation	Regular	Contractor	Moderate	Lack of interest from third parties

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
biodiversity monitoring and enhancement.	• Communicate outcomes with third parties to contribute knowledge of how biodiversity can be preserved on solar farms.					
Plain wire instead of barbed used on top of the perimeter fence and stock fencing to reduce impacts on birds and Squirrel Glider.	• Security fencing would be comprised of approximately 2 m high cyclone fencing. • Use plain wire perimeter fencing where this intersects woodland to avoid potential entrapment of fauna on fence.	Construction	Regular	Client	Low	None
Perimeter fence would be located to avoid, where possible, segmenting patches of native vegetation to facilitate native fauna movements.	• The final 'for construction' design would include the perimeter fencing avoiding rather than intersecting patches or retained woodland.	Construction	Regular	Client	Low	None
Install approximately 120 nesting boxes for birds and mammals across the development site.	• Nesting boxes would be designed to meet the requirements of target species including Squirrel Gliders, bats, parrots and owls. • Nesting boxes would be monitored periodically for use and/or replacement.	Construction	Regular	Client	Low	Use of nesting boxes by exotic pest animals

8.2 ADAPTIVE MANAGEMENT STRATEGY

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

The largest impact expected from this solar farm is the impact of solar panels and shading on derived native grassland onsite. The assumption that solar panel arrays will result in 100% impact on groundcover is used because there is a lack of scientific data proving otherwise. It is recommended that monitoring of groundcover under the solar panels is undertaken:

1. Primarily to ensure that ground cover is retained to resist erosion and potential weed ingress is managed,
2. But also to provide information to the scientific community regarding the impact of shading on native grasslands in this location.

It may be that the conservative assumptions of this assessment (regarding 100% impact on vegetation) are an unnecessarily high impost on projects that assist the transition to reduced greenhouse gas emissions and that thereby have many broader environmental benefits.

9 SERIOUS AND IRREVERSIBLE IMPACTS (SAII)

The principles used to determine if a development will have serious and irreversible impacts, include impacts that:

- Will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline, or
- Will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size, or
- Impact on the habitat of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very limited geographic distribution, or
- Impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

These are evaluated below for the relevant SAII candidate.

9.1.1 White Box-Yellow Box- Blakely's Red Gum Woodland (Box-gum Woodland TEC)

a) the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII

Up to 408.5 ha of Box-gum Woodland TEC occurs within the development site. This occurs as two condition states:

- areas with canopy over mixed native and exotic grazed understory (85.65 ha),
- areas of mixed native and exotic understory only (322.85 ha)

Areas containing canopy are considered to be of highest ecological and conservation value within the development site, of which 76.36 ha (86%) has been avoided. Additionally, 245.4 ha (76%) of Box-gum Woodland Derived Native Grassland has been avoided of 322.85 ha within the development site. This totals approximately 79% of Box-gum Woodland being avoided by the proposed works. The measures outlined in Section 8 detail how indirect impacts would be mitigated.

b) the area (ha) and condition of the TEC to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone

Up to 86.7 ha of Box-gum Woodland TEC would be impacted by the proposal as follows:

Table 9-1 Box-gum Woodland TEC breakdown

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score
2	510_Woodland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	0.5	69.0
3	510_Derived Native Grassland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	5.4	26.6
4	567_Woodland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	3.9	37.7
5	567_Derived Native Grassland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	76.9	24.6

c) a description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact

No threshold has yet been defined by DPIE for the extent of Box-gum Woodland TEC to be removed that constitutes a serious and irreversible impact.

d) the extent and overall condition of the potential TEC within an area of 1000ha, and then 10,000ha, surrounding the proposed development footprint

Box-gum Woodland TEC, in the context of the broader locality surrounding the development site, is likely to have been heavily modified due to human land use. Particularly on the lower slopes where the land is more accessible and fertile. Areas of Box-gum Woodland TEC that grade into PCTs of higher elevations, may be in better condition due to less historical clearing and ongoing grazing pressure.

Using a combination of State Vegetation Mapping available through the NSW Government's SEED data portal, as well as interpreting aerial imagery via GIS, it is estimated that 461.88 ha of Box-gum Woodland TEC occurs within an area of 1000 ha surrounding the proposed development footprint and 2224.48 ha of Box-gum Woodland TEC occurs within an area of 10000 ha surrounding the proposed development footprint. Important to note, State Vegetation Mapping only takes into account woody vegetation and derived native grasslands would not be calculated for in this total.

e) an estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration

Detailed State Vegetation Mapping is not available for the Armidale Plateau IBRA Subregion and New England Tablelands IBRA Bioregion. However, mapping of the Border Rivers Gwydir / Namoi Region, covers the western portion of the IBRA Region from Nundle in the south to the Queensland border in the north, approximately 55% of the IBRA Region. Reference to this mapping (DPIE 2015) indicates that over 115868 ha of Box-Gum Woodland TEC could occur within the mapped area, with a further 162000 ha mapped as derived grasslands, some of which are likely to represent Box-gum Woodland TEC in an understory form as

allowed by the NSW Scientific Communities final determination (NSW SC 2011). The 86.7 ha that would be removed for the proposal, largely as derived native grassland, equates to less than 0.01% of the total estimated Box-gum woodland derived native grassland.

DPIE (2015) marginally enters the Armidale Plateau Subregion in the west, as such, it is not able to estimate the cover of Box-gum Woodland TEC on the Armidale Plateau. However, the Subregion comprises approximately 10% of the Bioregion. A conservative estimate would be that 2% of the Box-gum Woodland TEC within the Bioregion occurs within the Subregion. Meaning that about 5% of that within the Subregion would be impacted by the proposal. This estimate is considered to be considerably higher than the reality given the assumptions made.

f) an estimate of the area of the potential TEC that is in the reserve system within the IBRA region and the IBRA subregion

Detailed state vegetation type mapping is not available for the entire New England Tablelands IBRA Bioregion and 90% of the Armidale Plateau Subregion. It is likely that less than 10% of Box-Gum Woodland TEC that occurs in the Subregion is in the reserve system such as in Oxley Wild Rivers National Park. However, a credible estimate of area cannot be given due to data limitations.

g) the development, clearing or biodiversity certification proposal's impact on:

- **abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns**

Groundwater supplies and levels are unlikely to be affected by the proposal plant and no groundwater is anticipated to be intercepted or extracted. During construction, the proposal would have a short-term gross impact upon soils and possibly surface water flow, within discreet areas. These impacts are manageable with the implementation of erosion and sediment controls and would be unlikely to impact on abiotic factors critical to the long-term survival of Box-gum Woodland TEC.

- **characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants**

No characteristic or functionally important species would be lost through the removal of the Box-gum Woodland TEC. The vast majority of Box-gum Woodland TEC within the development site has been modified or degraded due to historical land use and edge effects. No impacts to the remaining Box-gum Woodland TEC are anticipated. No introduced fire or flooding regimes would occur and no increase of natural occurrences of these events is anticipated from the development.

- **the quality and integrity of an occurrence of the potential 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 potential TEC**

With the implementation of environmental weed and invasive animal management plans, it is likely the remaining 321.8 ha of Box-gum Woodland TEC within the development site avoided by the development footprint would remain unchanged from the current existing condition. Herbicides, fertilisers or other chemicals or pollutants will not be used within the development site.

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

As noted, connectivity of treed areas within the development site is poor and the occurrence of Box-gum Woodland TEC within the development site and immediate surrounding landscape has been subject to clearing for historical land use. Higher condition areas such as woodlands have been avoided where possible by the development footprint and connectivity of more intact areas has been maintained. The proposal is not considered to fragment or isolate an important area of the TEC.

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

The 86.7 ha of Box-gum Woodland TEC to be removed by the proposal would be offset by the retiring of 1,213 ecosystem credits, to provide perpetuity management and improvement of Box-gum Woodland TEC, ensuring no net loss.

10 REQUIREMENT TO OFFSET

10.1 IMPACTS REQUIRING AN OFFSET

10.1.1 Ecosystem credits

An offset is required for all impacts of development on PCTs that are associated with:

a) a vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an endangered or critically endangered ecological community, or

b) a vegetation zone that has a vegetation integrity score of ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or

c) a vegetation zone that has a vegetation integrity score ≥20 where the PCT is not representative of a TEC or associated with threatened species habitat.

The PCTs and vegetation zones requiring offset, and the ecosystem credits required, are documented below.

Table 10-1 PCTs and vegetation zones that require offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score	Ecosystem credits required
1	84_Riparian	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	0.03	49.8	1
2	510_Woodland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	5.4	69.0	186
3	510_Derived Native Grassland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	0.5	26.6	7
4	567_Woodland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	3.9	37.7	73
5	567_Derived Native Grassland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	76.9	24.6	947
6	84_Sedgeland	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	0.2	76.4	6

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix C.

10.1.2 Species credits

An offset is required for the threatened species impacted by the development that require species credits. These species and the species credits required are documented in Table 10-2.

Table 10-2 Species credit species that require offsets

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost	Species credits required
Tusked Frog ***Adelotus brevis*** **(Endangered population in the Nandewar and New England Tableland Bioregions)**	3.0	0.03 ha of PCT 84_Riparian (Zone 1) 0.2 ha of PCT 84_Sedgeland (Zone 6)	12
Glandular Frog ***Litoria subglandulosa***	3.0	0.03 ha of PCT 84_Riparian (Zone 1) 0.2 ha of PCT 84_Sedgeland (Zone 6)	12
Southern Myotis ***Myotis macropus***	2.0	4.9 ha of PCT 510_Woodland (Zone 2) 2.7 ha of PCT 567_Woodland (Zone 4)	220
Hawkweed ***Picris evae***	2.0	5.4 ha of PCT 510_Woodland (Zone 2)	186
Austral toadflax ***Thesium australe***	1.5	5.4 ha of PCT 510_Woodland (Zone 2) 0.5 ha of PCT 510_DNG (Zone 3) 3.9 ha of PCT 567_Woodland (Zone 4) 76.9 ha of PCT 567_DNG (Zone 5)	910

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix C.

10.1.3 Offsets required under the EPBC Act

Assessments of significance have concluded that significant impacts to EPBC listed entities are not likely. Hence referral and offsets are not required.

10.2 IMPACTS NOT REQUIRING AN OFFSET / ASSESSMENT

Areas of land that meet the Category 1-exempt land requirement do not require assessment or generate offsets under the BAM. This is set out in Section 3.2 of this report. All other native vegetation at the site generates offsets as set out Section 10.1.

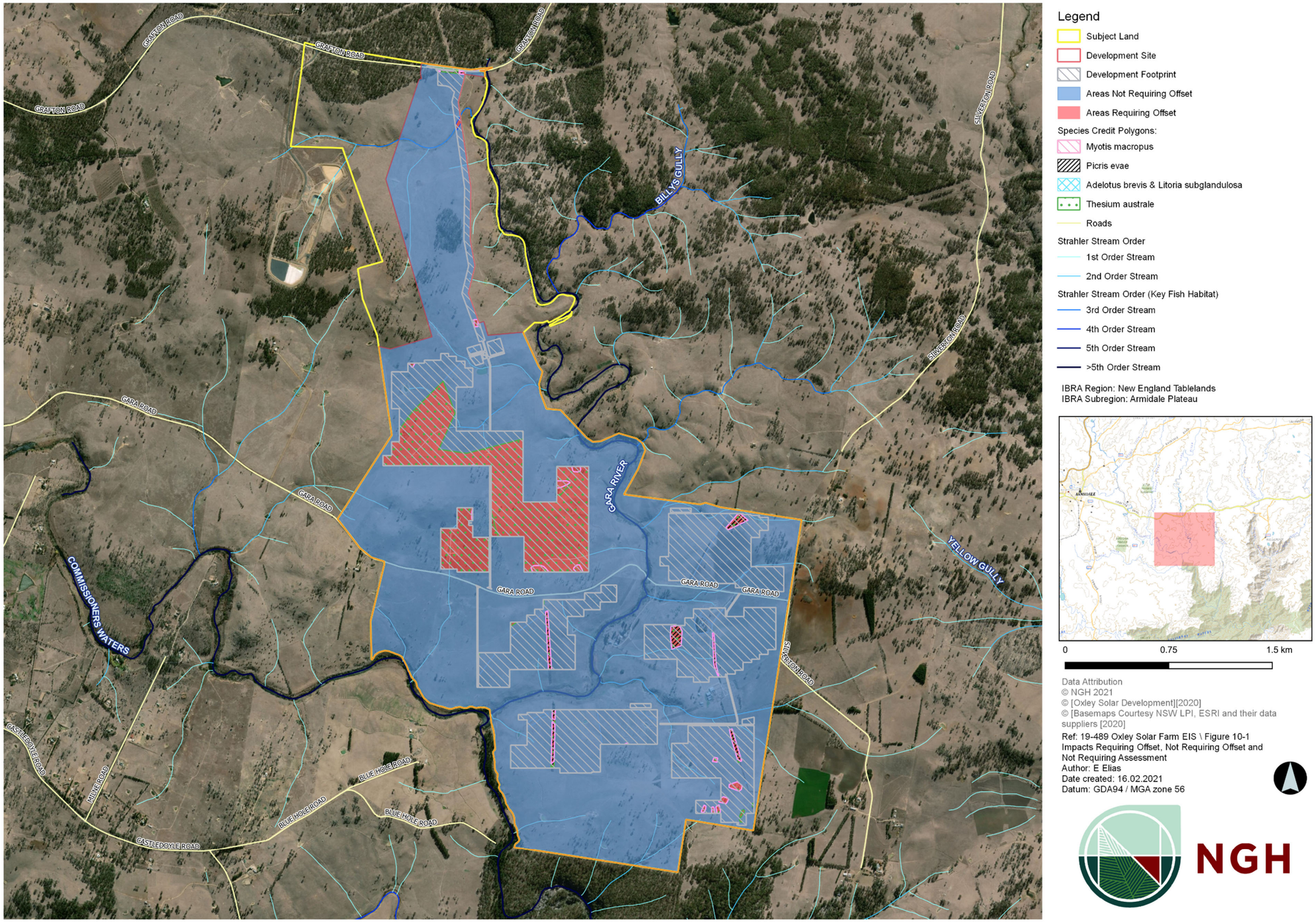


Figure 10-1 Impacts requiring offset, not requiring offset and not requiring assessment

11 CONCLUSION

11.1 NSW BAM ASSESSMENT

NGH Environmental has prepared this BDAR for the Oxley Solar Farm. The purpose of this BDAR was to address the requirements of the BAM.

In this BDAR, biodiversity impacts have been assessed through comprehensive mapping and assessment completed in accordance with the BAM. Targeted surveys were undertaken over four survey periods:

- 20th August -22nd August 2019
- 25th November – 29th November 2019
- 4th May – 8th May 2020
- 28th September – 30th September 2020

Key results included:

- Impacts to 87 ha of native vegetation will generate ecosystem credits for the project. This includes:
    - 86.7 ha of Box Gum Woodland TEC (around 70% of this would be impacted by panel shading rather than direct removal).
    - 20 hollow bearing trees would be removed by the proposal.
- Three ecosystem credit species were detected within the development site during field surveys. Offsets for these species are included in the ecosystem credit requirement for the project:
    - Glossy Black- Cockatoo *Calyptorhynchus lathami*
    - Little Eagle *Hieraaetus morphnoides*
    - Square-tailed Kite *Lophoictinia isura*
- 5 species credit species were assumed to occur as survey effort could not confidently rule them out. They will generate an offset requirement:
    - Tusked Frog *Adelotus brevis* (assumed present)
    - Glandular Frog *Litoria subglandulosa* (assumed present)
    - Southern Myotis *Myotis Macropus* (assumed present)
    - Hawkweed *Picris evae* (assumed present)
    - Austral toadflax *Thesium australe* (assumed present)

The credit requirement has therefore been defined as:

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score	Ecosystem credits required
1	84_Riparian	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	0.03	49.8	1

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score	Ecosystem credits required
2	510_Woodland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	5.4	69.0	186
3	510_Derived Native Grassland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	0.5	26.6	7
4	567_Woodland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	3.9	37.7	73
5	567_Derived Native Grassland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	76.9	24.6	947
6	84_Sedgeland	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	0.2	76.4	6

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost	Species credits required
Tusked Frog *Adelotus brevis* (Endangered population in the Nandewar and New England Tableland Bioregions)	3.0	0.03 ha of PCT 84_Riparian (Zone 1) 0.2 ha of PCT 84_Sedgeland (Zone 6)	12
Glandular Frog *Litoria subglandulosa*	3.0	0.03 ha of PCT 84_Riparian (Zone 1) 0.2 ha of PCT 84_Sedgeland (Zone 6)	12
Southern Myotis *Myotis macropus*	2.0	4.9 ha of PCT 510_Woodland (Zone 2) 2.7 ha of PCT 567_Woodland (Zone 4)	220
Hawkweed *Picris evae*	2.0	5.4 ha of PCT 510_Woodland (Zone 2)	186
Austral toadflax *Thesium australe*	1.5	5.4 ha of PCT 510_Woodland (Zone 2) 0.55 ha of PCT 510_DNG (Zone 3) 3.87 ha of PCT 567_Woodland (Zone 4) 76.88 ha of PCT 567_DNG (Zone 5)	910

Avoidance measures were considered first and secondarily, mitigation measures have been outlined to reduce the impacts to biodiversity. The residual impacts will be offset.

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

(d) Retiring credits under the Biodiversity Offsets Scheme, or

(e) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or

(f) Funding a biodiversity action that benefits the threatened entity impacted by the development.

11.2 COMMONWEALTH ASSESSMENT

The BDAR includes assessment of EPBC Act listed entities. An evaluation was undertaken for species predicted to occur within the broader study locality (10 km radius). An EPBC Act Assessments of Significance (AoS) (Appendix G) was completed for each entity with a moderate to high likelihood of presence within the development site. Additionally, the EPBC Act Referral Guidelines for the Koala (DoE 2014) were addressed.

The evaluation concluded significant impacts are not anticipated and therefore referral and offsets for EPBC Act listed entities is not considered warranted.

12 REFERENCE LIST

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APPENDIX A SURVEY DATA

A.1 PLOT DATA

Provided digitally with spatial files.

APPENDIX B PERSONNEL

Field survey:

- Mitch Palmer - Principal Ecologist and Botanist (BAM Assessor BAAS 17051)
- Aleksei Atkin – Senior Fauna Ecologist (BAM Assessor BAAS 17093)
- Michelle Patrick – Ecologist (BAM Assessor BAAS 19078)
- Elijah Elias – Ecologist
- Daniel Perkovic – Ecologist
- Martin Kim – Environmental Consultant
- Sarah Downey – Ecologist

BAM calculations, assessment and review:

- Aleksei Atkin – Senior Fauna Ecologist (BAM Assessor BAAS 17093)
- Elijah Elias – Ecologist
- Brooke Marshall (BAM Assessor BAAS 18149)

APPENDIX C BAM CALCULATOR CREDIT REPORT

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00022438/BAAS17093/20/00022439

Proposal Name
Oxley Solar Farm EIS

BAM data last updated *
21/12/2020

Assessor Name
Aleksei Atkin

Assessor Number
BAAS17093

BAM Data version *
36

Proponent Names

Report Created
15/02/2021

BAM Case Status
Open

Assessment Revision
4

Assessment Type
Major Projects

Date Finalised
To be finalised

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box Yellow Box Blakely's Red Gum Woodland	Endangered Ecological Community	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
White Box Yellow Box Blakely's Red Gum Woodland	Endangered Ecological Community	567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion

Species
Litoria subglandulosa / Glandular Frog

BAM Biodiversity Credit Report (Like for like)

Adelotus brevis - endangered population / Tusked Frog population in the Nandewar and New England Tableland Bioregions

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Not a TEC	0.2	0	7	7
510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	5.9	186	7	193
567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	80.8	73	947	1020

BAM Biodiversity Credit Report (Like for like)

84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Eastern Riverine Forests This includes PCT's: 42, 84, 85, 485, 486, 1105, 1106, 1108, 1127, 1270, 1271, 1292, 1293, 1318, 1713, 1714, 1761	Eastern Riverine Forests <50%	84_Riparian	No	1	Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Eastern Riverine Forests This includes PCT's: 42, 84, 85, 485, 486, 1105, 1106, 1108, 1127, 1270, 1271, 1292, 1293, 1318, 1713, 1714, 1761	Eastern Riverine Forests <50%	84_Sedgeland	No	6	Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	
510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	**Like-for-like credit retirement options**

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region

	White Box Yellow Box Blakely's Red Gum Woodland This includes PCT's: 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698	-	510_Woodland	Yes	186	Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	White Box Yellow Box Blakely's Red Gum Woodland This includes PCT's: 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698	-	510_DNG	No	7	Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	**Like-for-like credit retirement options**

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region

	White Box Yellow Box Blakely's Red Gum Woodland This includes PCT's: 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698	-	567_Woodland	Yes	73	Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	White Box Yellow Box Blakely's Red Gum Woodland This includes PCT's: 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698	-	567_DNG	No	947	Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Adelotus brevis - endangered population / Tusked Frog population in the Nandewar and New England Tableland Bioregions	**84_Riparian, 84_Sedgeland**	0.2	12.00
Litoria subglandulosa / Glandular Frog	**84_Riparian, 84_Sedgeland**	0.2	12.00
Myotis macropus / Southern Myotis	**510_Woodland, 567_Woodland**	7.6	220.00
Picris evae / Hawkweed	**510_Woodland**	5.4	186.00
Thesium australe / Austral Toadflax	**510_Woodland, 510_DNG, 567_Woodland, 567_DNG**	86.7	910.00

Credit Retirement Options

Like-for-like credit retirement options

Adelotus brevis - endangered population / Tusked Frog population in the Nandewar and New England Tableland Bioregions	Spp	IBRA subregion
	Adelotus brevis - endangered population / Tusked Frog population in the Nandewar and New England Tableland Bioregions	Any in NSW
Litoria subglandulosa / Glandular Frog	Spp	IBRA subregion
	Litoria subglandulosa / Glandular Frog	Any in NSW

Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW
Picris evae / Hawkweed	Spp	IBRA subregion
	Picris evae / Hawkweed	Any in NSW
Thesium australe / Austral Toadflax	Spp	IBRA subregion
	Thesium australe / Austral Toadflax	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00022438/BAAS17093/20/00022439

Proposal Name
Oxley Solar Farm EIS

BAM data last updated *
21/12/2020

Assessor Name
Aleksei Atkin

Assessor Number
BAAS17093

BAM Data version *
36

Proponent Name(s)

Report Created
15/02/2021

BAM Case Status
Open

Assessment Revision
4

Assessment Type
Major Projects

Date Finalised
To be finalised

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box Yellow Box Blakely's Red Gum Woodland	Endangered Ecological Community	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
White Box Yellow Box Blakely's Red Gum Woodland	Endangered Ecological Community	567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion

Species
Litoria subglandulosa / Glandular Frog
Adelotus brevis - endangered population / Tusked Frog population in the Nandewar and New England Tableland Bioregions

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Not a TEC	0.2	0	7	7.00
510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	5.9	186	7	193.00
567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	80.8	73	947	1020.00

84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

Eastern Riverine Forests This includes PCT's: 42, 84, 85, 485, 486, 1105, 1106, 1108, 1127, 1270, 1271, 1292, 1293, 1318, 1713, 1714, 1761	Eastern Riverine Forests <50%	84_Riparian	No	1	Armidale Plateau,Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Eastern Riverine Forests This includes PCT's: 42, 84, 85, 485, 486, 1105, 1106, 1108, 1127, 1270, 1271, 1292, 1293, 1318, 1713, 1714, 1761	Eastern Riverine Forests <50%	84_Sedgeland	No	6	Armidale Plateau,Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region
Forested Wetlands	Tier 4 or higher threat status	84_Riparian	No	1	IBRA Region: New England Tablelands, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Forested Wetlands	Tier 4 or higher threat status	84_Sedgeland	No	6	IBRA Region: New England Tablelands, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

White Box Yellow Box Blakely's Red Gum Woodland This includes PCT's: 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698	-	510_Woodland	Yes	186	Armidale Plateau,Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

White Box Yellow Box Blakely's Red Gum Woodland This includes PCT's: 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698	-	510_DNG	No	7	Armidale Plateau,Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region

	Grassy Woodlands	Tier 3 or higher threat status	510_Woodland	Yes (including artificial)	186	IBRA Region: New England Tablelands, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Grassy Woodlands	Tier 3 or higher threat status	510_DNG	No	7	IBRA Region: New England Tablelands, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

White Box Yellow Box Blakely's Red Gum Woodland This includes PCT's: 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698	-	567_Woodland	Yes	73	Armidale Plateau,Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

White Box Yellow Box Blakely's Red Gum Woodland This includes PCT's: 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698	-	567_DNG	No	947	Armidale Plateau,Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region

	Grassy Woodlands	Tier 3 or higher threat status	567_Woodland	Yes (including artificial)	73	IBRA Region: New England Tablelands, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Grassy Woodlands	Tier 3 or higher threat status	567_DNG	No	947	IBRA Region: New England Tablelands, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Adelotus brevis - endangered population / Tusked Frog population in the Nandewar and New England Tableland Bioregions	**84_Riparian, 84_Sedgeland**	0.2	12.00
Litoria subglandulosa / Glandular Frog	**84_Riparian, 84_Sedgeland**	0.2	12.00
Myotis macropus / Southern Myotis	**510_Woodland, 567_Woodland**	7.6	220.00
Picris evae / Hawkweed	**510_Woodland**	5.4	186.00
Thesium australe / Austral Toadflax	**510_Woodland, 510_DNG, 567_Woodland, 567_DNG**	86.7	910.00

Credit Retirement Options

Like-for-like options

	Spp	IBRA region
Adelotus brevis - endangered population/ Tusked Frog population in the Nandewar and New England Tableland Bioregions	**Adelotus brevis - endangered population**/Tusked Frog population in the Nandewar and New England Tableland Bioregions	Any in NSW
	Variation options	

	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Endangered Population	Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Litoria subglandulosa/ Glandular Frog	Spp	IBRA region	
	Litoria subglandulosa/Glandular Frog	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Vulnerable	Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Myotis macropus/ Southern Myotis	Spp	IBRA region
	Myotis macropus/Southern Myotis	Any in NSW
	Variation options	

Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Vulnerable	Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Picris evae/ Hawkweed	Spp	IBRA region
	Picris evae/Hawkweed	Any in NSW
	Variation options	

Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Flora	Vulnerable	Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Thesium australe/ Austral Toadflax	Spp	IBRA region	
	Thesium australe/Austral Toadflax	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Flora	Vulnerable	Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Candidate Species Report

Proposal Details

Assessment Id 00022438/BAAS17093/20/00022439	Proposal Name Oxley Solar Farm EIS	BAM data last updated * 21/12/2020
Assessor Name Aleksei Atkin	Report Created 15/02/2021	BAM Data version * 36
Assessor Number BAAS17093	Assessment Type Major Projects	BAM Case Status Open
Assessment Revision 4	Date Finalised To be finalised	

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

List of Species Requiring Survey

Name	Presence	Survey Months
Adelotus brevis - endangered population Tusked Frog population in the Nandewar and New England Tableland Bioregions	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Anthochaera phrygia Regent Honeyeater	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☑ Survey month outside the specified months?
Bertya ingramii Narrow-leaved Bertya	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Boronia granitica Granite Boronia	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Callitris oblonga Pygmy Cypress Pine	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Calyptorhynchus lathami Glossy Black-Cockatoo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Dichanthium setosum Bluegrass	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Diuris pedunculata Small Snake Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Eucalyptus magnificata Northern Blue Box	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Eucalyptus nicholii Narrow-leaved Black Peppermint	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Grevillea beadleana Beadle's Grevillea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Haliaeetus leucogaster White-bellied Sea-Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Haloragis exalata subsp. velutina Tall Velvet Sea-berry	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Hieraaetus morphnoides Little Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Hoplocephalus bitorquatus Pale-headed Snake	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Litoria subglandulosa Glandular Frog	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lophoictinia isura Square-tailed Kite	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Myotis macropus Southern Myotis	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox connivens Barking Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox strenua Powerful Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Petaurus norfolcensis Squirrel Glider	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Petrogale penicillata Brush-tailed Rock-wallaby	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Picris evae Hawkweed	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pteropus poliocephalus Grey-headed Flying-fox	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Swainsona sericea Silky Swainson-pea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Thesium australe Austral Toadflax	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tyto novaehollandiae Masked Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Barrington Tops Ant Orchid	Chiloglottis platyptera	Habitat degraded
Eastern Pygmy-possum	Cercartetus nanus	Habitat degraded
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Large-eared Pied Bat	Chalinolobus dwyeri	Habitat constraints
Swift Parrot	Lathamus discolor	Habitat constraints

BAM Credit Summary Report

Proposal Details

Assessment Id
00022438/BAAS17093/20/00022439

Proposal Name
Oxley Solar Farm EIS

BAM data last updated *
21/12/2020

Assessor Name
Aleksei Atkin

Report Created
15/02/2021

BAM Data version *
36

Assessor Number
BAAS17093

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
4

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
Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion											
2	510_Woodland	White Box Yellow Box Blakely's Red Gum Woodland	69	69.0	5.4	Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.00	TRUE	186
3	510_DNG	White Box Yellow Box Blakely's Red Gum Woodland	26.6	26.6	0.5	Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.00	TRUE	7

										Subtotal	**193**
Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion											
4	567_Woodland	White Box Yellow Box Blakely's Red Gum Woodland	37.7	37.7	3.9	Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.00	TRUE	73
5	567_DNG	White Box Yellow Box Blakely's Red Gum Woodland	24.6	24.6	76.9	Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.00	TRUE	947
										Subtotal	**1020**
River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion											
1	84_Riparian	Not a TEC	49.8	49.8	0.03			High Sensitivity to Potential Gain	1.50		1
6	84_Sedgeland	Not a TEC	76.4	76.4	0.2			High Sensitivity to Potential Gain	1.50		6
										Subtotal	**7**
										Total	**1220**

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
Adelotus brevis - endangered population / Tusked Frog population in the Nandewar and New England Tableland Bioregions (Fauna)								
84_Riparian	49.8	49.8	0.03	Endangered Population	Not Listed	3	True	1
84_Sedgeland	76.4	76.4	0.2	Endangered Population	Not Listed	3	True	11
							Subtotal	**12**

Litoria subglandulosa / Glandular Frog (Fauna)								
84_Riparian	49.8	49.8	0.03	Vulnerable	Not Listed	3	True	1
84_Sedgeland	76.4	76.4	0.2	Vulnerable	Not Listed	3	True	11
							Subtotal	**12**
Myotis macropus / Southern Myotis (Fauna)								
510_Woodland	69.0	69.0	4.9	Vulnerable	Not Listed	2	False	169
567_Woodland	37.7	37.7	2.7	Vulnerable	Not Listed	2	False	51
							Subtotal	**220**
Picris evae / Hawkweed (Flora)								
510_Woodland	69.0	69.0	5.4	Vulnerable	Vulnerable	2	False	186
							Subtotal	**186**
Thesium australe / Austral Toadflax (Flora)								
510_Woodland	69.0	69.0	5.4	Vulnerable	Vulnerable	1.5	False	140
510_DNG	26.6	26.6	0.5	Vulnerable	Vulnerable	1.5	False	5
567_Woodland	37.7	37.7	3.9	Vulnerable	Vulnerable	1.5	False	55
567_DNG	24.6	24.6	76.9	Vulnerable	Vulnerable	1.5	False	710
							Subtotal	**910**

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00022438/BAAS17093/20/00022439		4	15/02/2021

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

Assessment Type	Date Finalised
Major Projects	To be finalised

PCT list

Price calculated	PCT common name	Credits
Yes	**84 -** River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	7
Yes	**510 -** Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	193
Yes	**567 -** Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	1020

Species list

Price calculated	Species	Credits
Yes	***Adelotus brevis - endangered population*** (Tusked Frog population in the Nandewar and New England Tableland Bioregions)	12
Yes	***Litoria subglandulosa*** (Glandular Frog)	12
Yes	***Myotis macropus*** (Southern Myotis)	220

Yes	***Picris evae*** (Hawkweed)	186
Yes	***Thesium australe*** (Austral Toadflax)	910

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

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Armidale Plateau	**84 -** River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	No	Eastern Riverine Forests <50%	20.69%	$264.93	2.0460	$8,258.60	7	$57,810.20
Armidale Plateau	**510 -** Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Yes	White Box Yellow Box Blakely's Red Gum Woodland	18.83%	$244.89	2.1064	$7,519.83	193	$1,451,326.28
Armidale Plateau	**567 -** Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Yes	White Box Yellow Box Blakely's Red Gum Woodland	18.83%	$244.89	2.1064	$7,519.83	1020	$7,670,221.77

Subtotal (excl. GST) **$9,179,358.25**

GST **$917,935.82**

Biodiversity payment summary report

Total ecosystem credits (incl. GST)	**$10,097,294.08**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10032	***Adelotus brevis - endangered population*** (Tusked Frog population in the Nandewar and New England Tableland Bioregions)	Endangered Population	$309.97	20.6900%	$80.00	12	$5,449.23
10493	***Litoria subglandulosa*** (Glandular Frog)	Vulnerable	$495.24	20.6900%	$80.00	12	$8,132.46
10549	***Myotis macropus*** (Southern Myotis)	Vulnerable	$741.31	20.6900%	$80.00	220	$214,431.15
10627	***Picris evae*** (Hawkweed)	Vulnerable	$158.64	20.6900%	$80.00	186	$50,492.05
10802	***Thesium australe*** (Austral Toadflax)	Vulnerable	$17.30	20.6900%	$80.00	910	$91,800.23

Subtotal (excl. GST)	**$370,305.12**
GST	**$37,030.51**
Total species credits (incl. GST)	**$407,335.63**

Grand total	**$10,504,629.71**

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00022438/BAAS17093/20/00022439	Oxley Solar Farm EIS	21/12/2020
Assessor Name	Report Created	BAM Data version *
Aleksei Atkin	15/02/2021	36
Assessor Number	Assessment Type	BAM Case Status
BAAS17093	Major Projects	Open
Assessment Revision		Date Finalised
4		To be finalised

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

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

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Black-necked Stork	Ephippiorhynchus asiaticus	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion

Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Diamond Firetail	Stagonopleura guttata	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Eastern False Pipistrelle	Falsistrellus tasmaniensis	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Flame Robin	Petroica phoenicea	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Glossy Black-Cockatoo	Calyptorhynchus lathami	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Greater Broad-nosed Bat	Scoteanax rueppellii	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

Grey-headed Flying-fox	Pteropus poliocephalus	567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Hoary Wattled Bat	Chalinolobus nigrogriseus	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Koala	Phascolarctos cinereus	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Large Bent-winged Bat	Miniopterus orianae oceanensis	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Little Eagle	Hieraaetus morphnoides	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Little Lorikeet	Glossopsitta pusilla	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

Little Lorikeet	Glossopsitta pusilla	567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Masked Owl	Tyto novaehollandiae	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Painted Honeyeater	Grantiella picta	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Powerful Owl	Ninox strenua	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Regent Honeyeater	Anthochaera phrygia	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Scarlet Robin	Petroica boodang	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Speckled Warbler	Chthonicola sagittata	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion

Speckled Warbler	Chthonicola sagittata	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Spotted Harrier	Circus assimilis	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Square-tailed Kite	Lophoictinia isura	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Swift Parrot	Lathamus discolor	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Turquoise Parrot	Neophema pulchella	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Varied Sittella	Daphoenositta chrysoptera	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

Varied Sittella	Daphoenositta chrysoptera	567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
White-bellied Sea-Eagle	Haliaeetus leucogaster	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Yellow-bellied Glider	Petaurus australis	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
		567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

BAM Vegetation Zones Report

Proposal Details

Assessment Id
00022438/BAAS17093/20/00022439

Assessment name
Oxley Solar Farm EIS

BAM data last updated *
21/12/2020

Assessor Name
Aleksei Atkin

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15/02/2021

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

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	84_Riparian	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Riparian	0.03	1	

2	510_Woodland	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Woodland	5.4	3	
3	510_DNG	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	DNG	0.5	1	
4	567_Woodland	567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Woodland	3.9	2	
5	567_DNG	567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	DNG	76.9	5	
6	84_Sedgeland	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Sedgeland	0.2	1	

APPENDIX D HOLLOW-BEARING TREE IINVENTORY

Provided digitally with spatial files.

APPENDIX E EPBC ACT PROTECTED MATTERS SEARCH

APPENDIX F EPBC ACT HABITAT ASSESSMENT

The tables in this appendix present the habitat evaluation for threatened species, ecological communities and endangered populations listed from the EPBC Act Protected Matters Report.

The likelihood of occurrence is based on presence of habitat, proximity of nearest records and mobility of the species (where relevant). The assessment of potential impact is based on the nature of the proposal, the ecology of the species and its likelihood of occurrence. The following classifications are used:

Presence of habitat:

Present: Potential or known habitat is present within the subject land

Absent: No potential or known habitat is present within the subject land

Likelihood of occurrence

Unlikely: Species known or predicted within the locality but unlikely to occur in the subject land

Possible: Species could occur in the subject land

Present: Species was recorded during the field investigations

Possible to be impacted

No: The proposal would not impact this species or its habitats. No further assessment would be necessary at this stage of the project.

Yes: The proposal could impact this species or its habitats. Further investigation into the likelihood and consequence of the impact of the proposal on these species would be considered under the EPBC Act (Refer to Assessments of significance, Appendix G).

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
Threatened Ecological Communities				
Low Rainforest of Subtropical Australia **EPBC – CE**	Lowland subtropical rainforest is home to a wide diversity of animal and plant species. The soils are nutrient rich, and the moist environment supports the growth of many plants with fruits and leaves with a high nutritional content. Some of the native species found here, including threatened wildlife such as the Giant Barred Frog.	**Absent** Characteristic species absent from the development site	**Unlikely** Development site cleared. Presence eliminated during site survey	**No** TEC not present
New England Peppermint (*Eucalyptus nova anglica*) Grassy Woodlands **EPBC – CE** **BC – CE**	This woodland community is dominated by trees of New England Peppermint *Eucalyptus nova-anglica* and occasionally Mountain Gum *E. dalrympleana* subsp. *heptantha* and is usually 8-20 metres tall. The woodland has a predominantly grassy understorey with few shrubs. The species present at a site will vary according to recent rainfall or drought condition and the degree of disturbance (including fire).	**Absent** Characteristic species absent from the development site	**Unlikely** Development site cleared. Presence eliminated during site survey	**No** TEC not present
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland **EPBC – CE** **BC – CE**	It is an open woodland community (sometimes occurring as a forest formation), in which the most obvious species are one or more of the following: White Box Eucalyptus albens, Yellow Box E. melliodora and Blakely's Red Gum E. blakelyi. Intact sites contain a high diversity of plant species, including the main tree species, additional tree species, some shrub species, several climbing plant species, many grasses and a very high diversity of herbs. The community also includes a range of mammal, bird, reptile, frog and invertebrate fauna species. Intact stands that contain diverse upper and mid-storeys and groundlayers are rare. The Australian Government listing of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland is slightly different to the NSW listing. Areas that are part of the Australian Government listed ecological community must have either: • An intact tree layer and predominately native ground layer. • An intact native ground layer with a high diversity of native plant species but no remaining tree layer.	**Present** Characteristic trees species present within the development site	**Confirmed** Site survey confirmed the presence of this PCT	**Yes** AoS completed

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
Flora				
Hairy-joint Grass ***Arthraxon hispidus*** **EPBC – V** **BC – V**	Occurs over a wide area in south-east Queensland, and on the northern tablelands and north coast of NSW but is never common. Also found from Japan to central Eurasia. Moisture and shade-loving grass, found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps.	**Absent** Species absent from the development site	**Unlikely** Development site cleared. Presence eliminated during site survey	**No** Suitable habitat would not be impacted
Bertya ingramii **EPBC – E** **BC – E**	Occurs only on the New England Tablelands of NSW. Was previously known only from two small populations in the Oxley Wild Rivers National Park but was historically more widespread on the Tablelands. A third population was discovered in Oxley Wild Rivers National Park in 2006. Grows among rocks or in thin soils close to cliff-edges in dry woodland with she-oaks, wattles and tea-trees. Male and female flowers occur on the same plant. Female flowers have about 8 weeks of intermittent synchrony with male flowers. Flowers from August to November.	**Absent** No thin soils near cliffs	**Unlikely** Development site cleared. Presence eliminated during site survey	**No** Suitable habitat would not be impacted
Callistemon pungens **EPBC – V**	*Callistemon pungens* is a distinct shrub or small tree ranging from 2-5 m tall. The leaves are 2-3 cm long with a pungent tip 1-2 mm long. The flower spike is 5-6 cm long and 2.5-4.5 cm in diameter. The species is characterised by its purple stamens and small, pungent leaves. Habitats range from riparian areas dominated by *Casuarina cunninghamiana* subsp. *cunninghamiana* to woodland and rocky shrubland. Often in rocky watercourses, usually with sandy granite (occasionally basalt) creek beds.	**Absent** Species absent from the development site	**Unlikely** Development site cleared. Presence eliminated during site survey	**No** Suitable habitat would not be impacted
White-flowered Wax Plant ***Cynanchum elegans*** **EPBC – E** **BC – E**	The White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree *Leptospermum laevigatum* – Coastal Banksia *Banksia integrifolia* subsp. integrifolia coastal scrub; Forest Red Gum *Eucalyptus tereticornis* aligned open forest and woodland; Spotted Gum *Corymbia maculata* aligned open forest and woodland; and Bracelet Honeymyrtle *Melaleuca armillaris* scrub to open scrub.	**Absent** Species absent from the development site	**Unlikely** Development site cleared. Presence eliminated during site survey	**No** Suitable habitat would not be impacted

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
	Flowering occurs between August and May, with a peak in November. Flower abundance on individual plants varies from sparse to prolific.			
Bluegrass ***Dichanthium setosum*** **EPBC – V** **BC – V**	Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. (Often collected from disturbed open grassy woodlands on the northern tablelands, where the habitat has been variously grazed, nutrient-enriched and water-enriched). It is open to question whether the species tolerates or is promoted by a certain amount of disturbance, or whether this is indicative of the threatening processes behind its depleted habitat.	**Present** Cleared woodland and highly disturbed pasture present within the development site	**Possible** Within known distribution area – presence assumed	**Yes** AoS completed
Diuris eborensis **EPBC – E** **BC – E**	Found mainly in damp grassland and woodland sites or in areas of sedge and swampy sites. Main locations are higher altitude sites in the eastern New England Plateau, with known locations in the Ebor, Yarrowitch and Backwater areas. Typically, in brown clay loam soil over an igneous substrate (basalt most commonly in the sites visited, but not always), but the soil may have large amounts of organic matter.	**Absent** Species absent from the development site	**Unlikely** Development site cleared. Presence eliminated during site survey	**No** Suitable habitat would not be impacted
Small Snake Orchid ***Diuris pedunculata*** **EPBC – E** **BC – E**	The Small Snake Orchid grows on grassy slopes or flats, often on peaty soils in moist areas. Also on shale and trap soils, on fine granite, and among boulders. It flowers during August-October. Pollination is mostly by sexual deception, with the Small Snake-orchid attracting mostly males of a native bee *Halictus lanuginosus*. However, the flowers produce nectar and emit a strong scent that attracts a range of other pollinators.	**Absent** Peaty soils absent from the development site. Granite outcrops absent from the development site	**Unlikely** Development site cleared. Presence eliminated during site survey	**No** Suitable habitat would not be impacted
McKie's Stringybark ***Eucalyptus mckieana*** **EPBC – V** **BC – V**	*Eucalyptus mckieana* is found in grassy open forest or woodland on poor sandy loams, most commonly on gently sloping or flat sites. Associated species at Northern Tablelands sites include *Angophora floribunda*, *Eucalyptus amplifolia*, *Eucalyptus andrewsii*, *Eucalyptus bridgesiana*, *Eucalyptus youmanii*, Eucalyptus *nicholii*, *Eucalyptus blakelyi* and *Eucalyptus conica*, and at North Western Slopes sites *Eucalyptus andrewsii*, *Eucalyptus stannicola*, *Eucalyptus prava* and *Angophora floribunda*.	**Absent** Species absent from the development site	**Unlikely** Development site cleared. Presence eliminated during site survey	**No** Suitable habitat would not be impacted
Narrow-leaved Peppermint	Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock.	**Absent**	**Unlikely**	**No**

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
Eucalyptus nicholii **EPBC – V** **BC – V**	Seedling recruitment is common, even in disturbed soils, if protected from grazing and fire. Tends to grow on lower slopes in the landscape.	Species absent from the development site	Development site cleared. Presence eliminated during site survey	Suitable habitat would not be impacted
Euphrasia arguta **EPBC – CE** **BC – CE**	Euphrasia arguta was rediscovered in the Nundle area of the NSW north western slopes and tablelands in 2008. Prior to this, it had not been collected for 100 years. Historically, Euphrasia arguta has only been recorded from relatively few places within an area extending from Sydney to Bathurst and north to Walcha. Euphrasia arguta has an 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.	**Absent** Species absent from the development site. Outside known distribution	**Unlikely** Development site cleared. Presence eliminated during site survey	**No** Suitable habitat would not be impacted
Beadle's Grevillea ***Grevillea beadleana*** **EPBC – E**	Known from four separate areas, all in north-east NSW: the Torrington area west of Tenterfield, Oxley Wild Rivers National Park, Guy Fawkes River National Park and at Shannon Creek south-west of Grafton. Historical records suggest it was also once found near Walcha. Open eucalypt forest with a shrubby understorey. It is usually found on steep granite slopes at high altitudes, although the population at Shannon Creek is at a lower elevation on sandstone.	**Absent** Species absent from the development site	**Unlikely** Development site cleared. Presence eliminated during site survey	**No** Suitable habitat would not be impacted
Gnarled Corkbark ***Hakea fraseri*** **EPBC -V**	Found only in the upper Macleay River gorges, and the escarpment country in Oxley Wild Rivers National Park. Mainly occurs on the dry and steep rocky slopes of river gorges. Sometimes grows in open woodland on gorge rims.	**Absent** Species absent from the development site	**Unlikely** Development site cleared. Presence eliminated during site survey	**No** Suitable habitat would not be impacted
Tall Velvet Sea-berry ***Haloragis exalata*** **subsp. *velutina*** **EPBC – V** **BC – V**	Tall Velvet Sea-berry is a shrub to 1.5 m high. The stems are ribbed and square in section. The velvety leaves are opposite, 50 - 60 mm long, 6 - 8 mm wide and have finely toothed margins. The three to seven small yellowish green flowers form where the leaf joins the stem and are followed by tiny pear-shaped fruit 2 mm long. Grows in damp places near watercourses. This subspecies also occurs in woodland on the steep rocky slopes of gorges.	**Absent** Species absent from the development site	**Unlikely** Development site cleared. Presence eliminated during site survey	**No** Suitable habitat would not be impacted

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
Macadamia Nut ***Macadamia integrifolia*** **EPBC – V**	Found in drier types of subtropical rainforest north from Currumbin in Qld. It is not known to occur naturally in the wild in N.S.W., however, it has been recorded from Camden Haven but it is not known if the tree was cultivated or growing naturally.	**Absent** Species absent from the development site	**Unlikely** Development site cleared. Presence eliminated during site survey	**No** Suitable habitat would not be impacted
Hawkweed ***Picris evae*** **EPBC – V** **BC – V**	Its main habitat is open Eucalypt forest including a canopy of *Eucalyptus melliodora*, *E. crebra*, *E. populnea*, *E. albens*, *Angophora subvelutina, Allocasuarina torulosa*, and/or *Casuarina cunninghamiana* with a *Dichanthium* grassy understory. Soils are black, dark grey or red-brown (specified as shallow, stony soil over basalt for one collection) and reddish clay-loam or medium clay soils. The flowering and fruiting period is mainly October to January, with a few plants collected in flower or fruit until May.	**Present** White Box and Yellow Box present within the development site	**Unlikely** Development site highly degraded	**No** Suitable habitat would not be impacted
Austral Toadflax ***Thesium australe*** **EPBC – V** **BC – V**	Austral Toadflax is a small, straggling herb to 40 cm tall. Leaves are pale green to yellow-green, somewhat succulent, 1 - 4 cm long and 0.5 - 1.5 mm wide. Flowers are minute and white, emerging where the leaves meet the stems and appearing in spring. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.	**Absent** Development site highly degraded	**Unlikely** Outside known distribution range	**No** Suitable habitat would not be impacted
Tylophora woollsii **EPBC – E** **BC – E**	This species grows in moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins. Flowering occurs in summer and autumn, usually between January and March but sometimes as late as November. Thought to be wind-dispersed. Plants appear to persist as a network of stems under leaf litter when aerial stems are absent.	**Absent** Development site highly degraded	**Unlikely** Outside known distribution range	**No** Suitable habitat would not be impacted

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
Aves				
Botaurus poiciloptilus Australasian Bittern EPBC – E BC - E	In NSW, this species occurs along the coast and is frequently recorded in the Murray-Darling Basin, notably in floodplain wetlands of the Murrumbidgee, Lachlan, Macquarie and Gwydir Rivers. Occurs in permanent freshwater wetlands with tall, dense vegetation. Favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and/or reeds (e.g. *Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus*) or cutting grass (*Gahnia*) growing over muddy or peaty substrate. Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails.	**Absent** No suitable water bodies within the development site. The Gara River would be avoided by the proposal	**Unlikely** No suitable habitat present	**No** Suitable habitat would not be impacted
Regent Honeyeater *Anthochaera phrygia* EPBC – CE	A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests (NPWS, 1999 177 /id) (Pizzey, 1997). A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests (NPWS, 1999 177 /id) (Pizzey, 1997).	**Present** Temperate eucalyptus woodland present within the development site	**Unlikely** Within known distribution but not within important habitat mapping	**No** Not likely to occur in the locality
Curlew Sandpiper *Calidris ferruginea* EPBC – CE	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Curlew Sandpipers generally roost on bare dry shingle, shell or sand beaches,	**Absent** No suitable water bodies within or in proximity to development site. The Gara River	**Unlikely** No suitable habitat present	**No** Suitable habitat would not be impacted

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
	sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh. This species does not breed in Australia. This species forages mainly on invertebrates, including worms, molluscs, crustaceans, and insects, as well as seeds.	would be avoided by the proposal		
Red Goshawk *Erythrotriorchis radiatus* EPBC – V BC – CE	Red Goshawks inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers.	**Present** Open woodland and riparian area present within the development site	**Unlikely** Outside known distribution range	**No** Not likely to occur in this locality
Grey Falcon *Falco hypoleucos* EPBC – V BC – E	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	**Present** Open woodland and riparian area present within the development sit. The Gara River would be avoided by the proposal	**Unlikely** Outside known distribution range	**No** Not likely to occur in this locality
White-tailed Needletail *Hirundapus caudacutus* EPBC – V	White-throated Needletails occur in Australia only between late spring and early autumn, but mostly in summer, when they sometimes form large flocks, appearing as a swirling cloud of birds. They have been seen catching flying insects at heights of more than a kilometre. Sometimes they form mixed-species feeding flocks with other swifts, such as Fork-tailed Swifts or swallows. These	**Present** Aerial species	**Possible** Development site within known distribution of species	**No** Exclusively aerial species and not dependent on habitat in development site

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
	feeding flocks may be associated with thunderstorms, the uplift of which may assist with their flight and carry insects high into the air.			
Swift Parrot *Lathamus discolor* EPBC – CE	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis* and Yellow Box *E. melliodiora.* Return to home foraging sites on a cyclic basis depending on food availability.	**Present** Eucalyptus woodland exists within the development site	**Possible** Within known distribution range – presence assumed	**Yes** AoS completed
Painted Honeyeater *Grantiella picta* BC – V EPBC – V	The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema*. Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches.	**Present** Open eucalypt woodland present within the development site	**Unlikely** Within species known range, though no BioNet records within 10 km	**No** Unlikely to occur within the locality
Rostratula australis	They feed in shallow water or at the waters' edge and on mudflats, taking seeds and invertebrates such as insects, worms, molluscs and crustaceans. Females, which are larger and more brightly coloured than males, are thought to	**Present** artificial habitats, such as farm dams	**Possible** No suitable habitat present	**Yes** AoS completed

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
Australian Painted Snipe BC – E EPBC – E IBRA Sub-region: Inland Slopes, Lower Slopes	sometimes be polyandrous, mating with several males and leaving each one to incubate and raise chicks. Inhabits inland and coastal shallow freshwater wetlands. The species occurs in both ephemeral and permanent wetlands, particularly where there is a cover of vegetation, including grasses, Lignum and Samphire. Individuals have also been known to use artificial habitats, such as sewage ponds, dams and waterlogged grassland. Nests on the ground amongst tall vegetation, such as grass tussocks or reeds. Forages nocturnally on mud flats and in shallow water. Breeding is often in response to local conditions; generally, occurs from September to December.	and occasional waterlogged grassland present.		
Black-breasted Button-quail *Turnix melanogaster* *EPBC – V* *BC – CE*	Preferred habitat includes drier low closed forests, including dry rainforests, vine forest and vine thickets, often in association with Hoop Pine, and Bottletree scrubs. The understorey may be dense or sparse, but a deep, moist leaf-litter layer, in which the birds forage, is an important component of habitat. Black-breasted Button-quails forage in leaf-litter by pivot-feeding, scratching at the leaf-litter with one leg while pivoting the body on the other, displacing leaves and soil, and exposing invertebrate prey.	**Absent** Development site highly degraded. Lack of leaf litter, disturbed by grazing	**Unlikely** Outside known distribution range	**No** Suitable habitat would not be impacted
Mammals				
Large-eared Pied Bat *Chalinolobus dwyeri* EPBC – V BC – V	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years.	**Absent** No suitable habitat for roosting available on site	**Unlikely** Within known distribution range. However, no roosting habitat is available on site	**No** No suitable roosting habitat will be impacted by the proposal

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
Spot-tailed Quoll *Dasyurus maculatus maculatus* EPBC – E BC – V	Tiger Quolls are found in a range of forest habitats, from rainforest to open forest, coastal heath and inland riparian forest. They require forest with suitable den sites such as rock crevices, small caves, rocky-cliff faces. hollow logs, burrows and tree hollows. The Tiger Quoll has a large home range and can cover considerable distances (more than 6 km) overnight. It is largely nocturnal and solitary.	**Present** Open eucalypt woodland present within the development site	**Possible** Within species known range, BioNet records within 10 km	**Yes** AoS completed
Greater Glider *Petauroides volans* EPBC – V	Requires forest with abundant hollows. Greater Gliders subsist almost entirely on the young leaves and flower buds of select eucalypt species, especially *Eucalyptus radiata*, *Eucalyptus viminalis*, and *Eucalyptus acmenoides*.	**Absent** Characteristic food species absent within the development site	**Unlikely** Within known distribution range. However, no suitable microhabitat available	**No** No characteristic food trees will be impacted by the proposal
Brush-tailed Rock-wallaby *Petrogale penicillata* EPBC – V BC – E	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night when foraging. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.	**Present** Rocky outcrops occur within the development site	**Possible** Within species known range, BioNet records within 10 km	**Yes** AoS completed
Phascolarctos cinereus *Koala* BC - V EPBC - V	Occurs in eastern Australia, from north-eastern Queensland to south-eastern South Australia and to the west of the Great Dividing Range. In NSW it mainly occurs on the central and north coasts with some populations in the western region. It was historically abundant on the south coast of NSW, but now occurs in sparse and possibly disjunct populations. The koala inhabits a range of eucalypt forest and woodland communities, including coastal forests, the	**Present** Feed trees present	**Possible** Within species known range, BioNet records within 10 km	**Yes** AoS completed

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
IBRA Sub-region: Inland Slopes, Lower Slopes	woodlands of the tablelands and western slopes, and the riparian communities of the western plains.			
Long-nosed Potoroo *Potorous tridactylus tridactylus* *EPBC – E*	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. The fruit-bodies of hypogeous (underground-fruiting) fungi are a large component of the diet of the Long-nosed Potoroo. They also eat roots, tubers, insects and their larvae and other soft-bodied animals in the soil. Often digs small holes in the ground in a similar way to bandicoots. Mainly nocturnal, hiding by day in dense vegetation - however, during the winter months animals may forage during daylight hours. Individuals are mainly solitary, non-territorial and have home range sizes ranging between 2-5 ha. Breeding peaks typically occur in late winter to early summer and a single young is born per litter. Adults are capable of two reproductive bouts per annum.	**Absent** Development site highly degraded. Food sources likely depleted by grazing and soil compaction	**Unlikely** Outside known distribution range	**No** Suitable habitat would not be impacted
New Holland Mouse *Pseudomys novaehollandiae* EPBC – V	Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. It is a social animal, living predominantly in burrows shared with other individuals. Distribution is patchy in time and space, with peaks in abundance during early to mid-stages of vegetation succession typically induced by fire.	**Absent** Development site highly degraded. Middle-storey almost entirely absent. Soil	**Possible** Within known distribution	**No** Suitable habitat would not be impacted

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
		compacted by grazing		
Grey-headed Flying-fox *Pteropus poliocephalus* EPBC -V	Grey-headed Flying-foxes are found within 200 km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria. Occur in 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, often in stands of riparian rainforest, Paperbark or Casuarina forest, and are commonly found in gullies, close to water, or in vegetation with a dense canopy. Forage on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. Travel up to 50 km to forage. Annual mating commences in January with single young born each October or November. Site fidelity to camps is high with some camps being used for over a century.	**Present** Open eucalypt woodland and riparian vegetation present within the development site	**Unlikely** Within species known range, though no BioNet records within 10 km	**No** Unlikely to occur within the locality
Reptiles				
Border Thick-tailed Gecko *Uvidicolus sphyrurus* EPBC – V BC – V	As implied by another of its common names (Granite Thick-tailed Gecko), this species often occurs on steep rocky or scree slopes, especially granite. Recent records from basalt and metasediment slopes and flats indicate its habitat selection is broader than formerly thought and may have extended into areas that were cleared for agriculture. Favours forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter. Occupied sites often have a dense tree canopy that helps create a sparse understorey.	**Present** Granite outcrops present within the development site	**Unlikely** Outside know species range, no BioNet records within 10 km	**No** Unlikely to occur within the locality

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
Bell's Turtle *Wollumbinia belli* EPBC – V BC – E	Shallow to deep pools in upper reaches or small tributaries of major rivers in granite country. Occupied pools are most commonly less than 3 m deep with rocky or sandy bottoms and patches of vegetation. Most typically uses narrow stretches of rivers 30 - 40 m wide. Most surrounding habitat has been converted to grazing land.	**Present** The Gara River would be avoided by the proposal	**Unlikely** Outside known distribution range	**No** Not likely to occur in this locality
Amphibians				
Yellow-spotted Tree Frog, *Litoria castanea* EPBC – CE BC – CE	Require large permanent ponds or slow flowing 'chain-of-ponds' streams with abundant emergent vegetation such as bulrushes and aquatic vegetation. Adults are active during spring and summer and bask on sunny days. Move and forage at night on grassy banks or float on the water's surface. Males call at night from the open water and breeding generally occurs during or following rain. Eggs are laid amongst aquatic vegetation. Shelter during autumn and winter under fallen timber, rocks, other debris or thick vegetation.	**Present** Farm dams fed by local watercourses would be impacted	**Unlikely** Within distribution range, no BioNet records within 10 km	**No** Not likely to occur in this locality
Peppered Tree Frog *Litoria piperata* EPBC – V	The species has not been recorded in the wild since the 1970s. It was previously found on the New England Tablelands from south of Armidale to the Gibraltar Range, at an altitude of 800 to 1000 m. Found in streamside vegetation and under rocks and fallen timber along rocky streams flowing eastward from the Tablelands.	**Present** Farm dams fed by local watercourses would be impacted	**Possible** Within species known range, BioNet records within 10 km but maybe extinct in the wild	**No** Not likely to occur in this locality

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
Migratory Species				
Common Sandpiper *Actitis hypoleucos* EPBC – CE, M	This migratory wetland species is found along all Australian coastlines and many inland areas. They are active birds that will pursue invertebrates over rocks. Breeding habitat is mainly in Europe.	**Absent** No wetlands, mangroves or coastal landforms in subject land.	**Unlikely** No suitable habitat in subject land.	**No** No suitable habitat would be impacted by the proposal.
Osprey *Pandion haliaetus* EPBC – M	Ospreys are found on the coast and in terrestrial wetlands of tropical and temperate Australia and off-shore islands, occasionally ranging inland along rivers, though mainly in the north of the country.	**Present** Gara River occurs within the development site bout would be avoided by the proposal.	**Possible** Suitable habitat occurs within the subject land.	**No** No suitable habitat would be impacted by the proposal.
Black-faced Monarch *Monarcha melanopsis* EPBC – M	The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	**Absent** No rainforests, or coastal studies or mangroves within subject land	**Unlikely** No suitable habitat in subject land.	**No** No suitable habitat would be impacted by the proposal.
Spectacled Monarch *Monarcha trivirgatus* EPBC – M	The Spectacled Monarch is found in coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, NSW. It is much less common in the south. It is also found in Papua New Guinea, the Moluccas and Timor.	**Absent** No rainforests, or coastal studies or	**Unlikely** No suitable habitat in subject land.	**No** No suitable habitat would be

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
	The Spectacled Monarch prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	mangroves within subject land		impacted by the proposal.
Rufus Fantail *Rhipidura rufifrons* EPBC – M	The Rufous Fantail is found in northern and eastern coastal Australia, being more common in the north. The Rufous Fantail is found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. During migration, it may be found in more open habitats or urban areas. Strongly migratory in the south of its range, it moves northwards in winter, and virtually disappears from Victoria and NSW at this time.	**Absent** No wetlands, mangroves or coastal landforms in subject land.	**Unlikely** No suitable habitat in subject land.	**No** No suitable habitat would be impacted by the proposal.
Common Sandpiper *Actitis hypoleucos* EPBC – M	The common sandpiper forages by sight on the ground or in shallow water, picking up small food items such as insects, crustaceans and other invertebrates; it may even catch insects in flight. It nests on the ground near freshwater.	**Absent** No coastal waters, wetlands or mangroves in the subject land	**Unlikely** No suitable habitat in subject land.	**No** No suitable habitat would be impacted by the proposal.
White-throated Needletail *Hirundapus caudacutus* EPBC – V, M	This migratory terrestrial species occurs in Australia from late spring to early autumn. Found across a range of habitats more often over woodland areas, where it is almost exclusively aerial. Large tracts of native vegetation may be a key habitat requirement for this species. Found to roost in tree hollows in tall trees on ridge-tops, on bark or rock faces	**Absent** Large patches of connected native vegetation would not be impacted by the proposal.	**Unlikely** No suitable habitat in subject land.	**No** No suitable habitat would be impacted by the proposal.
Apus pacificus Fork-tailed Swift EPBC – M	This migratory marine species is a non-breeding visitor to Australia and has been recorded in all regions of NSW. Found across a range of habitats from	**Present** Aerial species	**Possible** Development site within known	**No** Exclusively aerial species and not

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
	inland open plains to wooded areas. They are mainly exclusively aerial flying from < 1m to 300 m above ground.		distribution of species	dependent on habitat in development site
Swift Parrot *Lathamus discolor* EPBC – CE	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis* and Yellow Box *E. melliodiora.* Return to home foraging sites on a cyclic basis depending on food availability.	**Present** Eucalyptus woodland exists within the development site	**Possible** Within known distribution range – presence assumed	**Yes** AoS completed
Ardea alba Great Egret EPBC – M	Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands. Great Egrets can be seen alone or in small flocks, often with other egret species, and roost at night in groups.	**Present** Suitable damp grassland and farm dams within the development site	**Possible** Suitable habitat present	**Yes** AoS completed
Ardea ibis Cattle Egret EPBC – M	The Cattle Egret is found in grasslands, woodlands and wetlands, and is not common in arid areas. It also uses pastures and croplands, especially where drainage is poor. Will also forage at garbage dumps and is often seen with cattle and other stock.	**Present** Grazing pasture and cropland present within the development site	**Possible** Suitable habitat present	**Yes** AoS completed

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
Calidris acuminata Sharp-tailed Sandpiper EPBC - M	This migratory wetland species wades mud in estuarine habitats feeding on invertebrates. They are widespread throughout much of NSW but are sparse in the south-central and lower western regions. Breeding habitat is in Northern Siberia.	**Absent** No wetland or estuarine habitat within the development site.	**Unlikely** No suitable habitat present	**No** No suitable habitat would be impacted by the proposal
Calidris ferruginea Curlew Sandpiper EPBC - M	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Curlew Sandpipers generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh. This species does not breed in Australia. This species forages mainly on invertebrates, including worms, molluscs, crustaceans, and insects, as well as seeds.	**Absent** No wetland or estuarine habitat within the development site.	**Unlikely** No suitable habitat present	**No** No suitable habitat would be impacted by the proposal
Pectoral Sandpiper *Calidris melanotos* EPBC - M	This species breeds in high-arctic tundra from the Yamal Peninsula eastwards to the Bearing Strait in Siberia and in arctic Alaska and Canada. It is known to migrate mostly through the USA and Mexico and spends most of its non-breeding months in South America. A small number of these birds are known to reach Australia and are believed to be concentrated in south-eastern Australia. This species prefers freshwater mudflats.	**Absent** No suitable water bodies within or adjacent to development site	**Unlikely** No suitable habitat present	**No** No suitable habitat would be impacted by the proposal

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
Black-eared Cuckoo *Chrysococcyx osculans* EPBC – M	The Black-eared Cuckoo is found in drier country where species such as mulga and mallee form open woodlands and shrublands. It is often found in vegetation along creek beds.	**Present** Riparian vegetation occurs within the development site but would be avoided by the proposal.	**Possible** Within known distribution.	**No** No suitable habitat would be impacted by the proposal
Latham's Snipe, Japanese Snipe *Gallinago hardwickii* EPBC - M	In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity. Latham's Snipe does not breed within Australia.	**Present** Suitable damp grassland and farm dams within the development site	**Possible** Suitable habitat present	**Yes** AoS completed
Merops ornatus Rainbow Bee-eater EPBC - M	Rainbow Bee-eaters are most often found in open forests, woodlands and shrublands, and cleared areas, usually near water. They will be found on farmland with remnant vegetation and in orchards and vineyards. They will use disturbed sites such as quarries, cuttings and mines to build nesting tunnels.	**Present** Open woodland and cleared areas within the development site	**Possible** Suitable habitat within development site	**Yes** AoS completed
Satin Flycatcher *Myiagra cyanoleuca* EPBC – M	The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	**Absent** No tall forests or forested gullies within the development site	**Unlikely** No suitable habitat present	**No** No suitable habitat would be impacted by the proposal

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
Yellow Wagtail *Motacilla flava* EPBC - M	This migratory terrestrial species migrates from Africa to Australia in summer and breeds in Europe. Foraging habitat in Australia comprises mostly well-watered open grasslands and the fringes of wetlands. Roosts in Mangroves and other dense vegetation.	**Absent** No mangroves or dense vegetation within the development site	**Unlikely** Suitable habitat not found within development site	**No** No suitable habitat would be impacted by the proposal
Common Greenshank *Tringa nebularia* EMPC – M	Common Greenshanks are found both on the coast and inland, in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms and flooded crops.	**Present** Suitable damp grassland and farm dams within the development site	**Possible** Suitable habitat present	**Yes** AoS completed

CE BC = listed as Critically Endangered under Schedule 1 of the NSW *Biodiversity Conservation Act 2016*

CE EPBC = listed as Critically Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

E BC = listed as Endangered under Schedule 1 of the NSW *Biodiversity Conservation Act 2016*

E EPBC = listed as Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

V BC = listed as Vulnerable under Schedule 1 of the NSW *Biodiversity Conservation Act 2016*

V EPBC = listed as Vulnerable under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

M EPBC = listed as Migratory under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

CE FM = listed as Critically Endangered under Schedule 4A of the NSW *Fisheries Management Act 1994.*

E FM = listed as Endangered under Schedule 4 of the NSW *Fisheries Management Act 1994.*

V FM = listed as Vulnerable under Schedule 5 of the NSW *Fisheries Management Act 1994.*

CAMBA = Chinese-Australia Migratory Bird Agreement

JAMBA = Japan-Australia Migratory Bird Agreement

APPENDIX G EPBC ACT ASSESSMENT OF SIGNIFICANT IMPACT

TEC's

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered

Flora

- *Dichanthium setosum* Bluegrass – Vulnerable

Aves

- *Lathamus discolor* Swift Parrot – Critically Endangered
- *Rostratula australis* Australian Painted Snipe – Endangered

Mammals

- *Dasyurus maculatus maculatus* Spot-tailed Quoll – Endangered
- *Petrogale penicillata* Brush-tailed Rock-wallaby – Vulnerable
- *Phascolarctos cinereus* Koala - Vulnerable

Migratory

- *Ardea alba* Great Egret – Migratory
- *Ardea ibis* Cattle Egret – Migratory
- *Gallinago hardwickii* Latham's Snipe – Migratory
- *Merops ornatus* Rainbow Bee-eater – Migratory
- *Tringa nebularia* Common Greenshank – Migratory

Vulnerable Species

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

a. **Lead to a long-term decrease in the size of an important population of a species?**

Flora

Dichanthium setosum Bluegrass

Habitat for *Dichanthium setosum* Bluegrass occurs within the subject land and there are several records of this species within the locality. Bluegrass was detected in an isolated patch in the development site during surveys in May 2020. However, this species was not detected during targeted searches in Spring 2020. The proposal would result in the removal of no areas of known habitat; habitat has been excluded from the development footprint. Despite Bluegrass being found in the development area during targeted searches, it will not be impacted from the development footprint. As such, it is unlikely that the proposal will lead to long term decreases in the size of an important population of this species.

Mammals

Petrogale penicillata Brush-tailed Rock-wallaby and *Phascolarctos cinereus* Koala

The Brush-tailed Rock-wallaby and the Koala were not detected during targeted surveys. Despite the impact to potential habitat, it is considered unlikely that this would have an adverse effect on the species such that it would lead to a long-term decrease in the size of an important population of the species as they were not found to be utilising the development site during surveys. Furthermore, more suitable habitat occurs just south of the development site in Gara Gorge Nature Preserve and Oxley Wild Rivers National Park.

b. Reduce the area of occupancy of an important species?

Flora

Dichanthium setosum Bluegrass

The proposal would result in the removal of no areas of known habitat. Targeted searches for the species found it to occur in one isolated patch of land within the development site which will not be impacted by the development footprint. Furthermore, this species is known to occur in an extensive area and is tolerant to wide range of environmental factors. The proposal would therefore not result in a reduction in the area of occupancy for this species.

Mammals

Petrogale penicillata Brush-tailed Rock-wallaby and *Phascolarctos cinereus* Koala

The development site is not located in a known important population of this species and is not likely to support a significant portion of a viable local population of these species. The proposal would therefore not result in a reduction in the area of occupancy of these species.

c. Fragment an existing important population into two or more populations?

Flora

Dichanthium setosum Bluegrass

It is unlikely that the proposal would result in the fragmentation of an existing important population into two or more populations as the Bluegrass within the development site occurs as an isolated patch that will not be impacted from the development footprint. Furthermore, it is unlikely that this patch qualifies as an important population that is necessary for the long-term survival of this species.

Mammals

Petrogale penicillata Brush-tailed Rock-wallaby and *Phascolarctos cinereus* Koala

Fragmentation of existing important populations of these species into two or more populations is unlikely to occur as neither of these species were found within the development site during surveys. Furthermore, should any individuals have been found to occur within the development site, it is unlikely that they would form an important population that is necessary for the species' long-term survival and recovery.

d. Adversely affect habitat critical to the survival of a species?

Flora

Dichanthium setosum Bluegrass

Bluegrass occurs on heavy basaltic black soils and red-brown loams with clay subsoil and it is often found in moderately disturbed areas. Targeted surveys have shown that it occurs in the development site in an isolated patch which will not be directly impacted by the footprint design. Furthermore, given the species extensive distribution and wide environmental tolerances, it is unlikely that the proposal will adversely affect habitat critical to the survival of the species.

Mammals

Petrogale penicillata Brush-tailed Rock-wallaby

Suitable habitat for the Brush-tailed Rock-wallaby occurs in the form of rocky escarpments, outcrops and cliffs and with a preference for complex structures with fissures, caves and ledges, often facing north. The proposal footprint will not be impacting these areas in the development site. Furthermore, it is unlikely that this habitat is critical to the survival of this species.

Phascolarctos cinereus Koala

Koalas inhabit eucalypt woodlands and forests and feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species. There is limited availability of trees favoured by koalas within the development site and the area surrounding the trees is highly disturbed due to land clearing. As such, it is unlikely that the proposal will adversely impact habitat critical to the survival of these species.

e. Disrupt the breeding cycle of an important population?

Flora

Dichanthium setosum Bluegrass

Flowering of *Dichanthium setosum* Bluegrass occurs mostly during the summer months. Given that targeted searches only found the species to occur in a small isolated patch that is not going to be impacted by the development footprint, it is unlikely that the area of habitat to be impacted by the proposal would be relied upon by a significant proportion of a population of the species. Therefore, it is considered unlikely that the proposal will disrupt the breeding cycle of an important population of this species.

Mammals

Petrogale penicillata Brush-tailed Rock-wallaby

Brush-tailed Rock-wallabies breed throughout the year with a peak in births between February and May. The lack of sightings during surveys and the fact that the development site doesn't occur near an area declared as an important population suggest it is unlikely that the proposal will disrupt the breeding cycle of an important population of these species.

Phascolarctos cinereus Koala

Koalas breed from 2 years of age and produce one offspring per year. The limited availability of trees favoured by Koalas within the development site and the lack of sightings of this species during surveys suggest that it is unlikely that the proposal will disrupt the breeding cycle of an important population of this species.

f. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Flora

Dichanthium setosum Bluegrass

The proposal would result in the removal of no known habitat. This may comprise habitat that is suitable for this flora species. Given that this species occurs in an isolated patch within the development site that will not be impacted by the development footprint, it is unlikely that the proposal will impact the availability or quality of habitat to the extent that this species is likely to decline.

Mammals

Petrogale penicillata Brush-tailed Rock-wallaby and *Phascolarctos cinereus* Koala

Given these species were not detected during targeted surveys, the disturbed nature of the habitat within the development site and the availability of greater quality habitat close to the development site, it is unlikely that the proposal will impact the availability or quality of habitat to the extent that these species are likely to decline.

g. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

Flora

Dichanthium setosum Bluegrass

Several invasive flora species have been recorded within the development site. The proposal has the potential to contribute to the spread of invasive species in the development site through the transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread of weeds on site. The proposal would therefore be unlikely to result in invasive species that are harmful to these species becoming established in its potential habitat.

Mammals

Petrogale penicillata Brush-tailed Rock-wallaby and *Phascolarctos cinereus* Koala

The proposal has the potential to result in invasive species that are harmful to the vulnerable species' becoming established in the development site. Mitigation measures have been recommended to prevent invasive species becoming established in the development site. The proposal would therefore be unlikely to result in invasive species that are harmful to these species becoming established in its potential habitat.

h. Introduce disease that may cause the species to decline?

Flora

Dichanthium setosum Bluegrass

The proposal has the potential to contribute to the introduction of disease that may cause the species to decline. Mitigation measures have been recommended to prevent the introduction of disease on the development site. The proposal would therefore be unlikely to result in the introduction of disease that may cause this species to decline.

Mammals

Petrogale penicillata Brush-tailed Rock-wallaby and *Phascolarctos cinereus* Koala

The proposal has the potential to contribute to the introduction of disease that may cause these species to decline. Mitigation measures have been recommended to prevent the introduction of disease within the development site. The proposal would therefore be unlikely to result in the introduction of disease that may cause these species to decline.

i. Interfere substantially with the recovery of the species?

Flora

Dichanthium setosum Bluegrass

No Recovery Plan currently exists for Bluegrass. Management activities to protect Bluegrass determined by NSW Government Saving our Species include objectives such as minimising impacts from slashing and grazing, reducing and maintaining weed densities at low levels, augmenting extant wild populations and tracking species abundance and condition over time. As the proposal does not interfere with the objectives of the recovery plan, it is unlikely that it will interfere with the recovery of this species.

Mammals

Petrogale penicillata Brush-tailed Rock-wallaby

The National Recovery Plan for the Brush-tailed Rock-wallaby includes the following objectives:

- Determine and manage threats to the Brush-tailed Rock-wallaby and its habitat.
- Determine distribution, abundance, population trends and viability for the Brush-tailed Rock-wallaby.
- Establish and maintain separate, viable captive populations derived from the Southern and Central ESUs.
- Undertake translocations to improve the genetic and demographic robustness of populations and to establish new colonies of Brush-tailed Rock-wallabies.
- Investigate key aspects of Brush-tailed Rock-wallaby biology and ecology for conservation management.
- Increase community awareness and support for Brush-tailed Rock-wallaby conservation

As the proposal does not interfere with the objectives of the recovery plan, it is unlikely that it will interfere with the recovery of this species.

Phascolarctos cinereus Koala

The NSW Recovery Plan for the Koala includes the following objectives:

- To conserve koalas in their existing habitat.
- To rehabilitate and restore koala habitat and populations.
- To develop a better understanding of the conservation biology of koalas.

- To ensure that the community has access to factual information about the distribution, conservation and management of koalas at a national, state and local scale.
- To manage captive, sick or injured koalas and orphaned wild koalas to ensure consistent and high standards of care.
- To manage overbrowsing to prevent both koala starvation and ecosystem
- damage in discrete patches of habitat.
- To coordinate, promote the implementation, and monitor the effectiveness of
- the NSW Koala Recovery Plan across NSW.

As the proposal does not interfere with the objectives of the recovery plan, it is unlikely that it will interfere with the recovery of this species.

Critically Endangered and Endangered Species

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:

a. Lead to a long-term decrease in the size of a population

Aves

Lathamus discolor Swift Parrot and *Rostratula australis* Australian Painted Snipe

The Swift Parrot and the Australian Painted Snipe were not detected during surveys. The impacts to these species occur through a loss of potential habitat. Despite the impact to potential habitat, it is considered unlikely that this would have an adverse effect on the species such that it would lead to a long-term decrease in the size of a population of the species as they were not found to be utilising the development site during surveys. Furthermore, more suitable habitat occurs south of the development site in Gara Gorge Nature Preserve and Oxley Wild Rivers National Park.

Mammals

Dasyurus maculatus maculatus Spot-tailed Quoll

The Spot-tailed Quoll was not detected during surveys. Despite the impact to potential habitat, it is considered unlikely that this would have an adverse effect on the species such that it would lead to a long-term decrease in the size of a population of the species as there has been no evidence of it occurring in the development site during surveys and the habitat within the development site occurs within a disturbed landscape. Furthermore, habitat of greater quality occurs to the south of the development site in Gara Gorge Nature Preserve and Oxley Wild Rivers National Park.

b. Reduce the area of occupancy of the species

Aves

Lathamus discolor Swift Parrot and *Rostratula australis* Australian Painted Snipe

It is unlikely that the development site supports a significant portion of a viable local population of these species. Therefore, it is unlikely that the proposal would result in a reduction in the area of occupancy of these species.

Mammals

Dasyurus maculatus maculatus Spot-tailed Quoll

The development site is not likely to support a significant portion of a viable local population of the Spot-tailed Quoll. The proposal would therefore not result in a reduction in the area of occupancy of this species.

c. Fragment an existing population into two or more populations

Aves

Lathamus discolor Swift Parrot and *Rostratula australis* Australian Painted Snipe

Fragmentation of existing populations of these species into two or more populations is unlikely to occur as neither of these species were found within the development site during surveys. Furthermore, should any individuals have been found to occur within the development site, it is unlikely that they would form an important population that is necessary for the species' long-term survival and recovery.

Mammals

Dasyurus maculatus maculatus Spot-tailed Quoll

Fragmentation of existing populations of this species into two or more populations is unlikely to occur as it is unlikely that the development site supports populations of Spot-tailed Quolls. Furthermore, should any individuals have been found to occur within the development site, it is unlikely that they would form an important population that is necessary for the species' long-term survival and recovery.

d. Adversely affect habitat critical to the survival of a species

Aves

Lathamus discolor Swift Parrot

The Swift Parrot occurs in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Habitat for the Swift Parrot occurs on the development site in the form of some of their favoured feed and lerp trees. It is unlikely that the removal of these trees would adversely affect habitat critical to the survival of this species given there is greater quality habitat to the south of the development site.

Rostratula australis Australian Painted Snipe

The Australian Painted Snipe occurs on the fringes of swamps, dams and marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Habitat for this species within the development site occurs in the form of creeks and farm dams. These areas will not be directly impacted from the proposal. It is also unlikely that this habitat is utilised in a way that it is critical to the survival of the species.

Mammals

Dasyurus maculatus maculatus Spot-tailed Quoll

The Spot-tailed Quoll occupies a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest. They utilise hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites. Some of these habitats occur within the development site though existing within a highly disturbed landscape due to land clearing and grazing. As such, it is unlikely that the proposal will adversely affect habitat critical to the survival of this species.

e. Disrupt the breeding cycle of a population

Aves

Lathamus discolor Swift Parrot

The Swift Parrot breeds in Tasmania during the spring and summer months before migrating to the mainland in the autumn and winter months. As such, it is unlikely that the proposal will disrupt the breeding cycle of a population.

Rostratula australis Australian Painted Snipe

The Australian Painted Snipe breeds from September to December. There is limited availability of habitat for breeding within the development site and the habitat occurs within a disturbed landscape. As such, it is unlikely that the proposal will disrupt the breeding cycle of a population of this species.

Mammals

Dasyurus maculatus maculatus Spot-tailed Quoll

The Spot-tailed Quoll uses hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites. Some of these habitats occur within the development site and may provide breeding habitat for Spot-tailed Quoll. Given this species was not detected within the development site during surveys, it is unlikely that this proposal will disrupt the breeding cycle of a population of this species

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

Aves

Lathamus discolor Swift Parrot

The habitat within the development site is in the form of low quality foraging habitat. Given the high mobility of this species and the availability of greater quality habitat close to the development site, it is unlikely that the proposal will impact the availability or quality of habitat to the extent that these species are likely to decline.

Rostratula australis Australian Painted Snipe

Potential habitat will not be impacted directly though may face indirect impacts such as habitat degradation. Given the high mobility of this species and the availability of greater quality habitat close to the development site, it is unlikely that the proposal will impact the availability or quality of habitat to the extent that these species are likely to decline.

Mammals

Dasyurus maculatus maculatus Spot-tailed Quoll

The Spot-tailed Quoll occupies a home range of between 200 – 4000ha and there is greater quality habitat close to the development site. As such, it is unlikely that the proposal will impact the availability or quality of habitat to the extent that these species are likely to decline.

g. Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Aves

Lathamus discolor Swift Parrot and *Rostratula australis* Australian Painted Snipe

The proposal has the potential to contribute to invasive species that are harmful to these vulnerable species becoming established in the development site. Mitigation measures have been recommended to prevent invasive species becoming established in the development site. The proposal would therefore be unlikely to result in invasive species that are harmful to these species becoming established in its potential habitat.

Mammals

Dasyurus maculatus maculatus Spot-tailed Quoll

The proposal has the potential to contribute to invasive species that are harmful to the vulnerable species' becoming established in the development site. Mitigation measures have been recommended to prevent invasive species becoming established within the development site. The proposal would therefore be unlikely to result in invasive species that are harmful to these species becoming established in its potential habitat.

h. Introduce disease that may cause the species to decline, or

Aves

Lathamus discolor Swift Parrot and *Rostratula australis* Australian Painted Snipe

The proposal has the potential to contribute to the introduction of disease that may cause these species to decline. Mitigation measures have been recommended to prevent the introduction of disease within the development site. The proposal would therefore be unlikely to result in the introduction of disease that may cause these species to decline.

Mammals

The proposal has the potential to contribute to the introduction of disease that may cause these species to decline. Mitigation measures have been recommended to prevent the introduction of disease within the development site. The proposal would therefore be unlikely to result in the introduction of disease that may cause these species to decline.

i. Interfere with the recovery of the species.

Aves

Lathamus discolor Swift Parrot

The National Recovery Plan for the Swift Parrot includes the following objectives:

- To prevent further decline of the Swift Parrot population.
- To achieve a demonstrable sustained improvement in the quality and quantity of Swift Parrot habitat to increase carrying capacity. To achieve these objectives the following actions are identified:
- Identify the extent and quality of habitat.
- Manage and protect Swift Parrot habitat at the landscape scale.
- Monitor and manage the impact of collisions, competition and disease.
- Monitor population and habitat.

As the proposal does not interfere with the objectives of the recovery plan, it is unlikely that it will interfere with the recovery of this species.

Rostratula australis Australian Painted Snipe

The National Recovery Plan for the Australian Painted Snipe is currently in its draft phase. It states its objective is to sustain a positive population trend in the number of mature individuals of the Australian Painted Snipe by 2030 compared to 2020. The strategies to achieve this include:

- Manage and protect known Australian Painted Snipe breeding habitats at the landscape scale
- Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions
- Reduce, or eliminate threats at breeding and non-breeding habitats
- Improve knowledge of the habitat requirements, biology and behaviour of Australian Painted Snipe
- Engage community stakeholders to improve awareness of the conservation of Australian Painted Snipe
- Coordinate, review and report on recovery process

As the proposal does not interfere with the objectives of the recovery plan, it is unlikely that it will interfere with the recovery of this species.

Mammals

Dasyurus maculatus maculatus Spot-tailed Quoll

The Overall Objective of the National Recovery Plan for the Spot-tailed Quoll is to reduce the rate of decline and ensure that viable populations remain throughout its current range in eastern Australia. It also includes the following specific objectives:

- Determine the distribution and status of Spotted-tailed Quoll populations throughout the range, and identify key threats and implement threat abatement management practices.
- Investigate key aspects of the biology and ecology of the Spotted-tailed Quoll to acquire targeted information to aid recovery.
- Reduce the rate of habitat loss and fragmentation on private land.
- Evaluate and manage the risk posed by silvicultural practices.
- Determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on Spotted-tailed Quoll populations.
- Determine and manage the impact of fire regimes on Spotted-tailed Quoll populations.
- Reduce deliberate killings of Spotted-tailed Quolls.
- Reduce the frequency of Spotted-tailed Quoll road mortality.
- Assess the threat Cane Toads pose to Spotted-tailed Quolls and develop threat abatement actions if necessary.
- Determine the likely impact of climate change on Spotted-tailed Quoll populations.
- Increase community awareness of the Spotted-tailed Quoll and involvement in the Recovery Program.

As the proposal does not interfere with the objectives of the recovery plan, it is unlikely that it will interfere with the recovery of this species.

Critically endangered and endangered ecological communities

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

a. Reduce the extant of an ecological community?

White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Approximately 4.87 ha of CEEC White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland meeting the threshold for consideration as the EPBC Act listed form of the community occurs within the development site. Of that, approximately 0.5 ha would be impacted by the development footprint, within the north of the development footprint in association with the Grafton Road intersection.

It is likely that this community will continue to exist within areas adjacent to the development site, and with larger patches of higher ecological integrity protected in the broader locality. The proposal is therefore considered unlikely to substantially reduce the extent of this CEEC that its local occurrence is placed at risk of extinction.

b. Fragment or increase fragmentation of an ecological community?

Fragmentation or isolation is unlikely to occur from the proposal as this CEEC exists within the development site in a highly modified and disturbed environment. The proposal would largely involve removing vegetation from patch edges rather than breaking apart large patches of vegetation into many smaller patches. Importantly, the proposal would not result in the breaking apart of large patches of high-quality examples of this CEEC.

c. Adversely affect habitat critical to the survival of an ecological community?

The development site does not occur in an area of habitat critical to the survival of this CEEC.

d. 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?

The proposal does not involve works that would result in the reduction of groundwater levels or a substantial alteration of surface water drainage patterns which would lead to modifying or destroying abiotic factors necessary for this CEEC's survival.

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

The proposal does not involve regular burning or flora or fauna harvesting and unlikely to cause a substantial change in the species composition of an occurrence of the CEEC.

f. Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

1. Assisting invasive species, that are harmful to the listed ecological community, to become established, or

2. 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

A number of invasive flora species have been recorded within the development site. The proposal has the potential to contribute to the spread of invasive species in the development area through the transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread of weeds on site. The proposal would therefore be unlikely to result in invasive species reducing the quality or integrity of this CEEC.

The proposal would not require the use of regular fertilisers, herbicides or chemicals that would lead to a reduction in the quality or integrity of this CEEC.

g. Interfere with the recovery of an ecological community.

The overall objective of the recovery plan for this CEEC is to promote the recovery and prevent extinction. Specific objectives to minimise the risk of extinction of this CEEC include:

- achieving no net loss in extent and condition of the ecological community throughout its geographic distribution;
- increasing protection of sites with high recovery potential;
- increasing landscape functionality of the ecological community through management and restoration of degraded sites;
- increasing transitional areas around remnants and linkages between remnants; and
- bringing about enduring changes in participating land manager attitudes and behaviours towards environmental protection and sustainable land management practices to increase extent, integrity and function of Box-Gum Grassy Woodland.

As the proposal does not interfere with the objectives of the recovery plan, it is unlikely that it will interfere with the recovery of this CEEC.

Migratory Species

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

- *Ardea alba* Great Egret
- *Ardea ibis* Cattle Egret
- *Gallinago hardwickii* Latham's Snipe
- *Merops ornatus* Rainbow Bee-eater
- *Tringa nebularia* Common Greenshank

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

The Great Egret, Cattle Egret, Common Greenshank and Latham's Snipe are most often found in wetlands and other watered areas such as swamps, marshes and croplands with poor drainage. Habitat for these species occur within the development site in the form of farm dams and creeks.

The Rainbow Bee-eater is most often found in open forests, woodlands and shrublands, and cleared areas, usually near water. It also occurs on farmland with remnant vegetation, orchards, vineyards, and in disturbed sites such as mine sites and quarries.

These habitats occur within a disturbed environment due to land clearing and grazing. It is unlikely that the proposal will substantially modify, destroy or isolate an area of important habitat for these migratory species.

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

The proposal has the potential to contribute to invasive species that are harmful to these migratory species becoming established in the development site. Mitigation measures have been recommended to prevent invasive species becoming established in the development site. The proposal would therefore be unlikely to result in invasive species that are harmful to these species becoming established in its potential habitat.

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

Conclusion

Of the EPBC listed species, ecological communities and migratory species assessment of significance were conducted for, all were deemed unlikely for the proposed development to cause a significant impact. The development was unlikely to cause fragmentation of species' or the CEEC within the development site. It was also unlikely to adversely affect habitat critical to survival of the CEEC within the subject land. The proposed development was deemed unlikely to place the species' or the CEEC at risk of extinction in the locality or beyond.