Appendix D Updated Biodiversity Development Assessment Report (BDAR v3)

Biodiversity Development Assessment Report

Oxley Solar Farm

October 2022

Project Number: 21-393

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BAM Certification

This Biodiversity Development Assessment Report has been prepared by an assessor accredited under the NSW Biodiversity Offset Scheme on the basis of the requirements and information provided under the BAM as at the date listed below. The table below details the submission date of this document, associated BAM-C cases within BOAMS and associated GIS data.

Date	Document Title	BAM-C Case	Date Finalised	Signature
15/06/22	21-393 Oxley Solar Farm BDAR V3 Final V3.1 20221005 IV	Parent Case - 00022438 Case 00022439/Revision 0 – Development Site Case 00022439/ Revision 6 – Development Footprint Case 00033373/Revision 0 - Scattered Trees	30/09/2022	Julie Gooding (BAAS18074) 

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Acronyms and Abbreviations

AOO	Area of Occupancy
BAM	Biodiversity Assessment Method 2020
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
CEEC	Critically Endangered Ecological Community
Cwth	Commonwealth
DAWE	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 Act* (c.f.)
NSW	New South Wales
OSD	Oxley Solar Development Pty Ltd
TEC	Threatened Ecological Community

Executive Summary

NGH has prepared this Biodiversity Development Assessment Report (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

BDAR Version 2.2 was publicly exhibited to support the Environmental Impact Statement (EIS) lodged for this project in March 2021. In response to the public and agency submissions, the Oxley Solar Farm has made significant additional changes to the proposal. In comparison to the BDAR v2.2, further 'avoid and minimise' actions now include:

- Increased setbacks to Gara River and Oxley Wild Rivers National Park
- Reduced SAII impacts on threatened ecological communities (TECs): No solar panels would be installed in areas of Box Gum Woodland with a vegetation integrity score of 30 or more.
- More certainty in relation to impact areas: In terms of how the impacts areas have been calculated, instead of buffering an indicative layout, a more refined development footprint based on further civil design has been developed, to provide greater certainty regarding the extent of the final infrastructure layout. This includes 'constructability' buffers, to ensure the areas presented are inclusive of all environmental controls and activities required to construct and operation the project.
- Strengthened mitigation strategies in relation to biodiversity offsets: The project's first preference is now to maximise the generation of credits on the residual areas of the project site, to be established as a new in perpetuity stewardship site under the Biodiversity Offsets Scheme (BOS).
- Separate to this BDAR, in response to consultation with the Armidale Tree Group, the project has included an additional commitment; preparation and implementation of a Wildlife Corridor Connectivity Enhancement Plan, to improve connectivity in specific areas of the site and to maintain this improvement for the life of the project. To capture this commitment, it is now included in the mitigation measures in Section 8.

Two other changes have been required to ensure the project has sufficient certainty in relation to access. These impacts are also assessed by this BDAR V3.1:

a. A new access route is now assessed. This access is via the existing Council landfill access road to the west of the Project site.

b. Causeway upgrades across the Gara River to improve access during flooding events for the project, neighbours of the project and local traffic. Increased road and crossing impact areas are included to allow for these upgrades.

These amendments are described and justified in more detail in Section 1.1, 6.1 and 7.1.4 and the Oxley Solar Farm Amendment Report (NGH 2022).

In this updated assessment to support the Oxley Solar Farm Amendment Report, the key results are now:

- Impacts to approximately 92.78ha of native vegetation for the project. This includes:
    - 1.68ha of Box Gum Woodland TEC
    - 90.71 ha of Box Gum Woodland TEC Derived Grassland
    - 5 hollow bearing trees
    - 2 Scattered trees
    - 0.29ha PCT 84 Riparian
    - 0.11ha of PCT 84 Sedgeland
- 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. These species 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	5
2	510_Woodland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	24
3	510_Derived Native Grassland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	35
4	567_Woodland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	27
5	567_Derived Native Grassland	Broad-leaved Stringybark – Yellow Box shrub/grass open forest of the New England Tableland Bioregion	1363
6	84_Sedgeland	River Oak – Rough-barked Apple – red gum – box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	3
Scattered Trees	510	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	2
Tusked Frog *Adelotus brevis* (Endangered population in the Nandewar and New England Tableland Bioregions)			657
Glandular Frog *Litoria subglandulosa*			134
Southern Myotis *Myotis Macropus*			299
Hawkweed *Picris evae*			19
Austral toadflax *Thesium austral*			869

Retirement of these credits will be carried out in accordance with the NSW Biodiversity Offsets scheme. The project's first preference is to maximise the generation of credits on the residual areas of the project site, to be established as a new in perpetuity stewardship site under the Biodiversity Offsets Scheme (BOS). Where credits cannot be generated efficiently onsite, the remainder will be achieved by purchasing credits under the BOS or making payments into the Biodiversity Conservation Fund using the offset payments calculator.

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:

1. **Subject land** – land subject to a development (synonymous for this project with Development site)
    - **Development footprint** – All areas of land which may be directly impacted by the proposal, either during construction, operation or decommissioning. This includes areas required for environmental controls and machinery manoeuvring and stockpiling / laydown. Generous delineation of this footprint (indicative infrastructure layout generally with a 50m buffer) allows flexibility during the final design stages of the project. The final disturbance is likely to be smaller than the development footprint presented, subject to detailed design with appointed contractors. The development footprint for Oxley Solar Farm is 268ha
2. **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. The development site is 1047.8ha.
3. **Buffer area** – Land extending 1500m out from the development site, used to assess native vegetation extent and other landscape features.
4. **Proposal site** – Mentioned in the Submissions report- refers to the broader area of land considered for siting of the solar farm.

1.1 The Proposal

The proposed Oxley Solar Farm involves the construction, operation and decommissioning of a ground-mounted PV solar array. Approximately 215MW (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. The development footprint now presented in this BDAR V3.1 shows significant additional 'avoid and minimise' actions (detailed in Section 6.1.2) as well as now including a new access option and causeway upgrades across Gara River.

Of the 1047.8 ha development site, the development footprint would represent approximately 268 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.

The development footprint assessed assumes the maximum development impact[1] and includes the following key infrastructure:

- Approximately 385,280 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 43 Power Conversion Units (PCU) composed of two inverters, a transformer and associated control equipment to convert DC energy generated by the solar panels to 33kV AC energy.
- An onsite 132kV substation containing up to two transformers and associated switchgear to facilitate connection to the national electricity grid via the existing 132kV transmission lines onsite.
- Steel mounting frames with driven or screwed pile foundations.
- 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.
- Internal access tracks for construction and maintenance activities.
- An energy storage facility with a capacity of up to 50MWh (i.e., 50 MW power output for one hour) and comprising of lithium-ion batteries with inverters.
- Perimeter security fencing about 2.3m high.
- Native vegetation planting to provide visual screening onsite and for specific receivers.
- Access and upgrades:
    - The site access for all phases of development would be off Waterfall Way (Grafton Road), north of the site, via the existing Council landfill access road, and running east to join the project site via a new access track. This would involve slight widening of the existing landfill access road and relocation of

[1] Proposing a 'maximum development footprint' and assessing this allows flexibility required in the final design stages, post project approval. This minimises the need for further assessment at that time but should be noted as generally overestimating the impacts of the proposal at this time.

the landfill entrance gates however, no upgrades to the Waterfall Way (Grafton Road) intersection would be required.

- A causeway upgrade of the Gara River crossing will now include– install approx. 3 x 1200Ø culverts (subject to hydraulic and detail design), raising the causeway level by approximately 1.3m, and widening Gara Road suitable for two-way heavy vehicle traffic. Castellated kerbing is shown in lieu of safety barriers since the causeway would be regularly submerged in major flow events, though this would be subject to Council design requirements. Maximum approach gradient would be ~10%.

The construction phase of the proposal would take about 12 – 18 months. The peak construction period would be a shorter period of about 6 to 9 months. Approximately 300 workers would be required during construction.

Around five fulltime equivalent operations and maintenance staff and service contractors would operate the facility.

The solar farm is anticipated to be operational for about 30 years. Refurbishment may occur if it is extended beyond this initial duration. At the very end of the project's life, when the solar farm if no longer considered viable, the site will be returned to existing or better land capability. 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 this 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 (Grafton Road), 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.

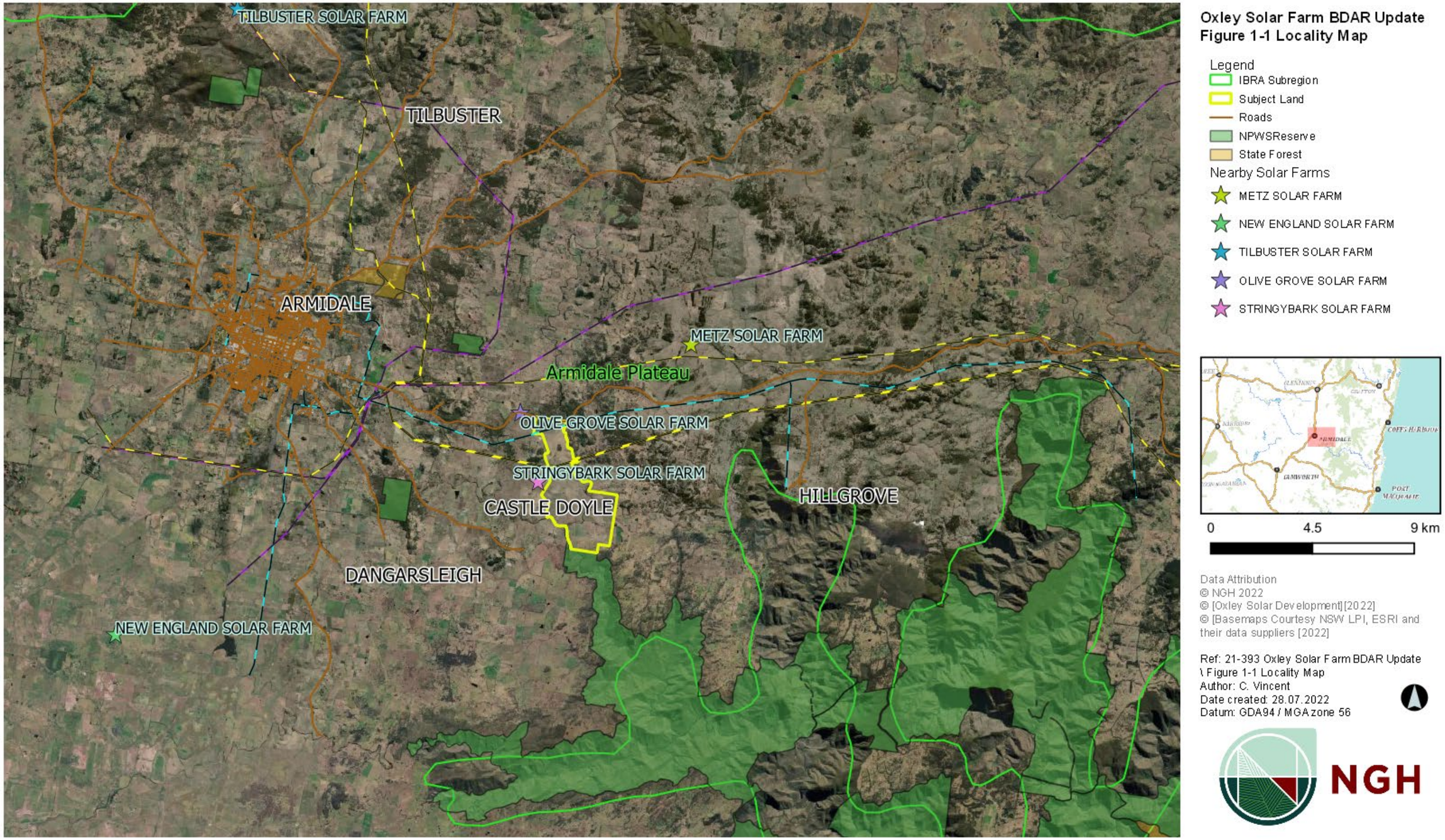

Figure 1-1 Locality map

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 1047.8 ha. It is the area surveyed for this assessment. The subject land is shown in Figure 1-2.

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 1 DP1206469	Council	Landfill	OSD has negotiated with Council relating to using the council landfill road
		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 (Grafton Road) 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 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 for the project. The development footprint is 268 ha. The development footprint is shown Figure 1-3.

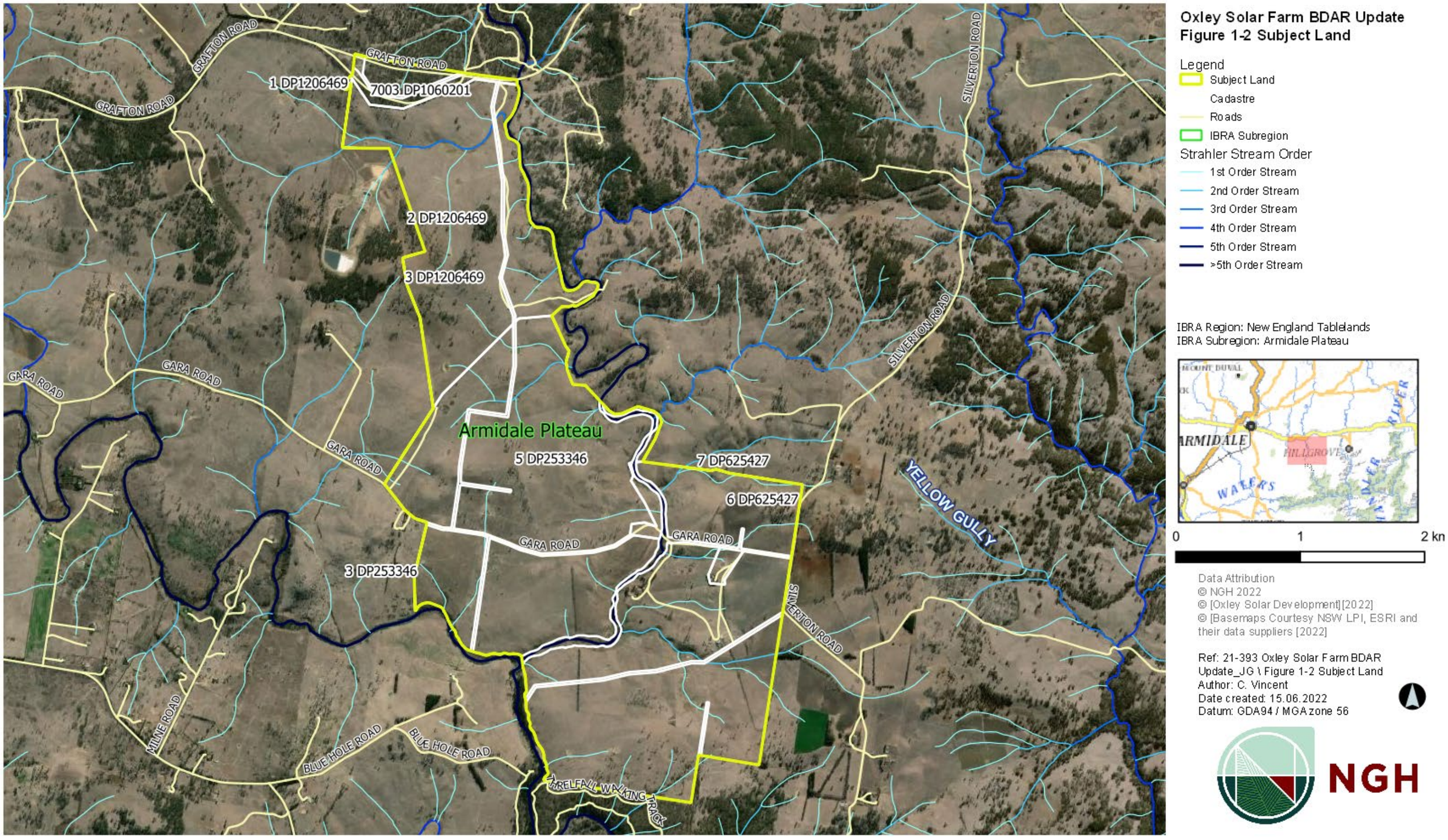

Figure 1-2 Subject land

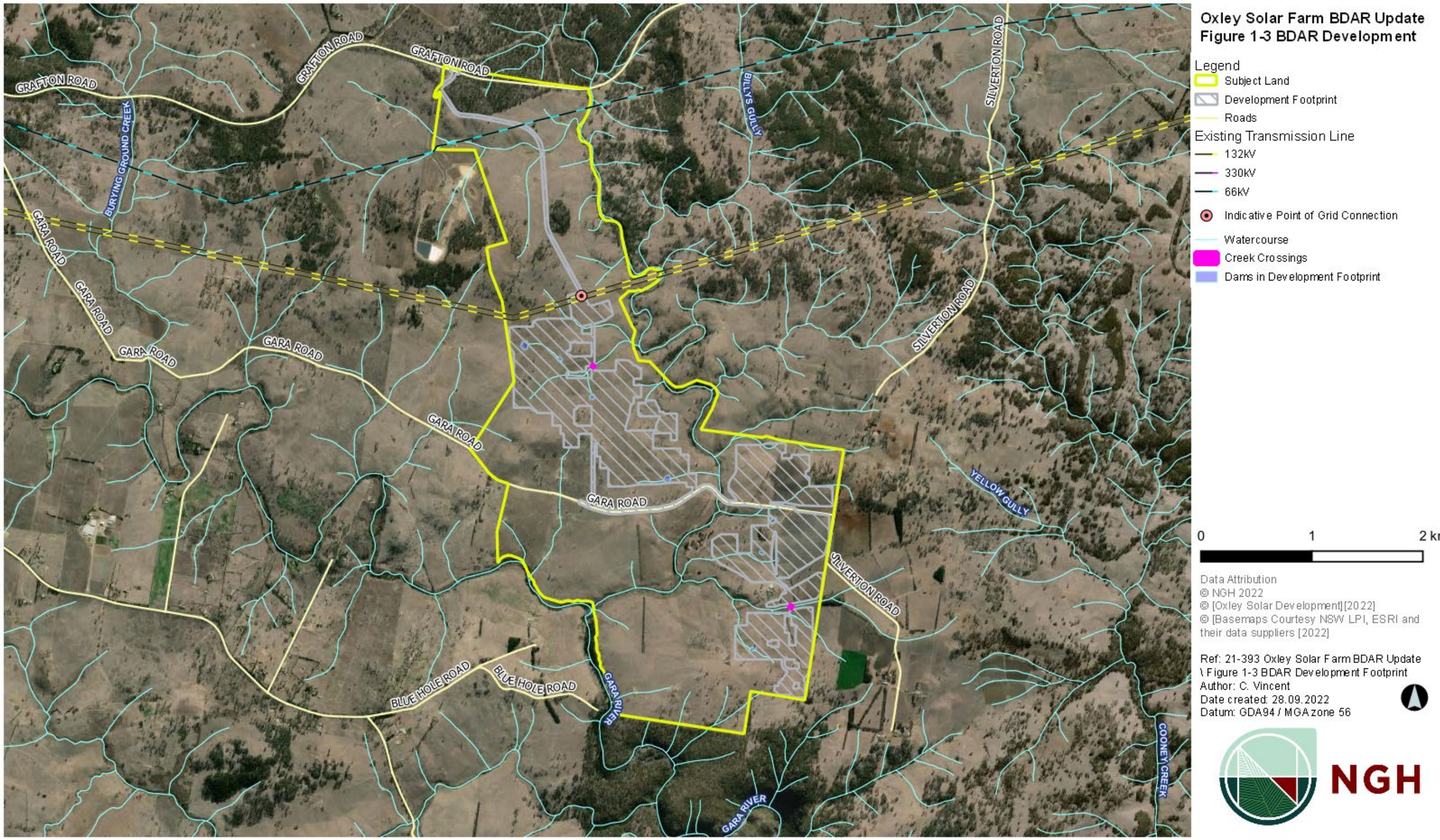

Figure 1-3 Development Footprint

1.2.4 Site description

Of the 1047.8 ha development site, the development footprint would represent up to 268 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-seven dams
- One ephemeral watercourse and approximately 40 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.** • **Any proposal to fund a biodiversity conservation action.**	**Section 10**

Secretary's Environmental Assessment Requirement	Where addressed
• **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 B**

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 and Environment (DPIE).

BCD comments to BDAR v2.2 have been addressed within this document, as set out below.

Table 1-3 Biodiversity Conservation Division comments received during public exhibition phase

Issue raised	Detail	Response
Native Vegetation Cover: BDAR	The native vegetation cover assessment must include the subject land in accordance with the Biodiversity Assessment Method operational manual	Native vegetation cover extent has been updated in Section 2.3, Section 2.10 and Figure 2-2.
Category 1 exempt land assessment: BDAR	The BDAR must be updated to assess the area between Gara Road and the Gara River as Category 2 regulated land.	Category 1 land maps have been updated in this BDAR v3.1, Figure 3-1 Category 1 land excluded from the BAM assessment. No impacts are now proposed in this area.
Threatened species habitat: BDAR	The BDAR must be updated to include reference to the important habitat maps for the swift parrot and the regent honeyeater	Important habitat Map for the Regent Honeyeater and Swift Parrot shows these species are not included within the Subject Land, see Appendix G and Table 4-2.
Indirect impacts: BDAR	Further consideration must be given in the BDAR to identifying indirect impacts immediately adjacent to the development footprint and determining whether biodiversity credits are required to offset these impacts.	Consideration has occurred in three ways: In terms of how the impacts areas have been calculated, instead of buffering an indicative layout, a more refined development footprint based on further civil design has been developed, to provide greater certainty regarding the extent of the final infrastructure layout. This includes 'construction' buffers, to ensure the areas presented are inclusive of all environmental controls and activities required to construct and operation the project. No soil or vegetation disturbance would occur outside of this area. In consideration of indirect impacts, for a solar

Issue raised	Detail	Response
		farm these are primarily during the construction period and include noise and vibration for 12 – 18 months. The peak construction period would be a shorter period of about 6 to 9 months. They would be more intense than existing farm operations but are not considered to require offsetting. During operation, routine maintenance traffic and noise from inverters is anticipated to be not greatly higher than existing noise impacts generated by agricultural use. Fences, and the barrier they may cause to wildlife movement is the more significant impact. This has been considered further in Section 7.2. Thirdly, while considered a low risk for solar farm construction, in consideration of concerns regarding soil and water contamination impacts, the project has undertaken to commit to greater setbacks from Gara River and the National Park. To supplement the information provided in the EIS, a Soil Impact Assessment (NGH, 2022) and Soil and Water Management Plan (NGH 2022) have also been prepared addressing the refined Development footprint.
Serious and Irreversible impacts: BDAR	Further avoidance of the Critically endangered Ecological Community White Box Yellow Box Blakely's Red Gum Woodland vegetation zones 2 and 4 needs to be included into the proposal and the BDAR updated accordingly	Further avoidance of zones 2 and 4 has been undertaken. BDAR v2.2 Zone 2 = 5.4 ha; now reduced to 0.55 ha BDAR v2.2 Zone 4 = 3.9 ha; now reduced to 1.13 ha. The project now commits that no solar panels would be installed in areas of Box Gum Woodland with a vegetation integrity score of 30 or more. Only impacts that cannot be avoided (limited fencing, and access alignments) are now proposed within this vegetation.
Management Plans: BDAR	Further detail should be provided on the scope of the proposed management plans and actions identified in the BDAR to clarify the areas to which they apply and the rehabilitation targets for these areas.	The management plans now committed to include: • Biodiversity Management Plan to regulate activity in vegetation and habitat adjacent to the proposed development and guide rehabilitation • Wildlife corridor connectivity enhancement plan to improve connectivity in specific areas of the site and to maintain this improvement for the life of the project. • Groundcover management plan to monitor and retain ground cover

Issue raised	Detail	Response
		beneath the solar array modules. Further detail on their scope and relevant targets is included in Section 8.2. Other plans to be developed that will assist biodiversity outcomes include the Construction environmental management plan – the framework document to hold all construction subplans – and an erosion and sediment control plan and a Rehabilitation plan to ensure the array site is returned to at least or better than pre-solar farm land and soil capability, with reference to base line soil testing and with input from an agronomist.
Impacts to National Parks Estate: EIS	Further information is required in the EIS to address the NPWS Estate issues relating to acknowledgment of existing NPWS Estate values, and potential direct and indirect impacts on NPWS Estate and its values including but not limited to, sedimentation, erosion, stormwater runoff, fire management, visual amenity at Blue Hole Road, Blue Hole Picnic Area and the Threlfall Walking Track, and cumulative impacts from state significant developments in the locality	The EIS (NGH 2021) addressed these matters which have been further reduced by the commitment to additional setbacks from both Gara River and Oxley Wild River National Park. The updated assessment against key matters is as follows: Erosion and sedimentation: Removal of vegetation and disturbance of groundcover from construction activities will expose the soil and increase the risk of erosion. A Soil and Water Management Plan (SWMP) with erosion and sediment control plans would be prepared, implemented and monitored. Standard safeguards and best practice works in an near waterways ensure this risk is manageable. Stormwater runoff: The discharge of stormwater to this land poses a threat to the values of land and downstream environments. Management as per Erosion and sedimentation. Bushfire: fire is a natural and recurring factor which shapes the environment. However, altered fire regimes may pose a significant threat to life, property and other values including biodiversity, cultural heritage and tourism, and the onset of climate change may exacerbate these risks. Bushfire management commitments apply to both construction and operation to manage potential fire ignition and fighting of fires. The project has considered bush fire guidelines and setbacks and committed to the preparation of an Emergency Response Plan. Visual amenity A wide band of native plantings of trees up to 5-10m in height for the southern boundary of the proposal site to address potential visual impacts from

Issue raised	Detail	Response
		the Oxley Wild Rivers National Park. These can be positioned in three (3) rows (or approximately 6 - 9m wide) between the property boundary and security fence. The tree canopy should not intrude into the zone that exists between the edge of the security fence and the solar panels Cumulative impacts from SSD The SSD projects in the Armidale area that could have potential cumulative impacts during the construction stage are more than 10km from the proposed project site. This would mean that the cumulative impacts during construction are negligible. Cumulative visual impacts have been addressed and the footprint of the project has been minimised to mitigate the impact. Noise and vibration issues initially for receivers 4,5 and 6 has been removed due to revised footprint.

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 DPE's Biodiversity Assessment Method (BAM) calculator (http://www.environment.nsw.gov.au/bbccapp/ui/mynews.aspx)
- NSW DPE's BioNet threatened biodiversity database
  Accessed online via login at http://www.bionet.nsw.gov.au/

- DPE BioNet Vegetation Classification Database (DPE 2017)
  Accessed online via login at
  http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx
- DPE VIS Mapping
  Accessed online at http://www.environment.nsw.gov.au/research/VISmap.htm
- Department of Planning and Environment (DPE) (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 (Department of Planning and Environment (DPE), 2017)
- NSW Woody vegetation extent and Foliage Projective Cover (FPC) 2011 (DPE, 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 2004 ha of native

vegetation occurs in the 1500 m buffer area. This constitutes approximately 46.6% 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 2307.65 ha occurs as cleared areas within the 1500 m buffer around the development site. This constitutes approximately 53.7% 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. Approximately 40 1st and 2nd order tributaries of Commissioners waters and the Gara River also 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).

37[2] man-made dams exist within the development site, 28 within Lot 5 DP 253346, 5 within Lot 2 DP 1206469 and 4 within Lot 6 DP 625427. 27 of the 37 dams would be retained.

2.6 Wetlands

An EPBC protected matters search completed on the 29th of September 2019 and again on 09 June 2022 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 avoided where possible by the development. Refer to Figure 1-3.

[2] It appears 24 may have been an underestimate a stated in the EIS.

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 Percent native vegetation cover

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 comprises an area of 4292 ha. As determined by GIS mapping from aerial imagery, approximately 1984.73 ha of native vegetation occurs in the 1500 m buffer area. This constitutes approximately 47% of the buffer area. This value was entered into the BAM-C.

Refer to Figure 2-2.

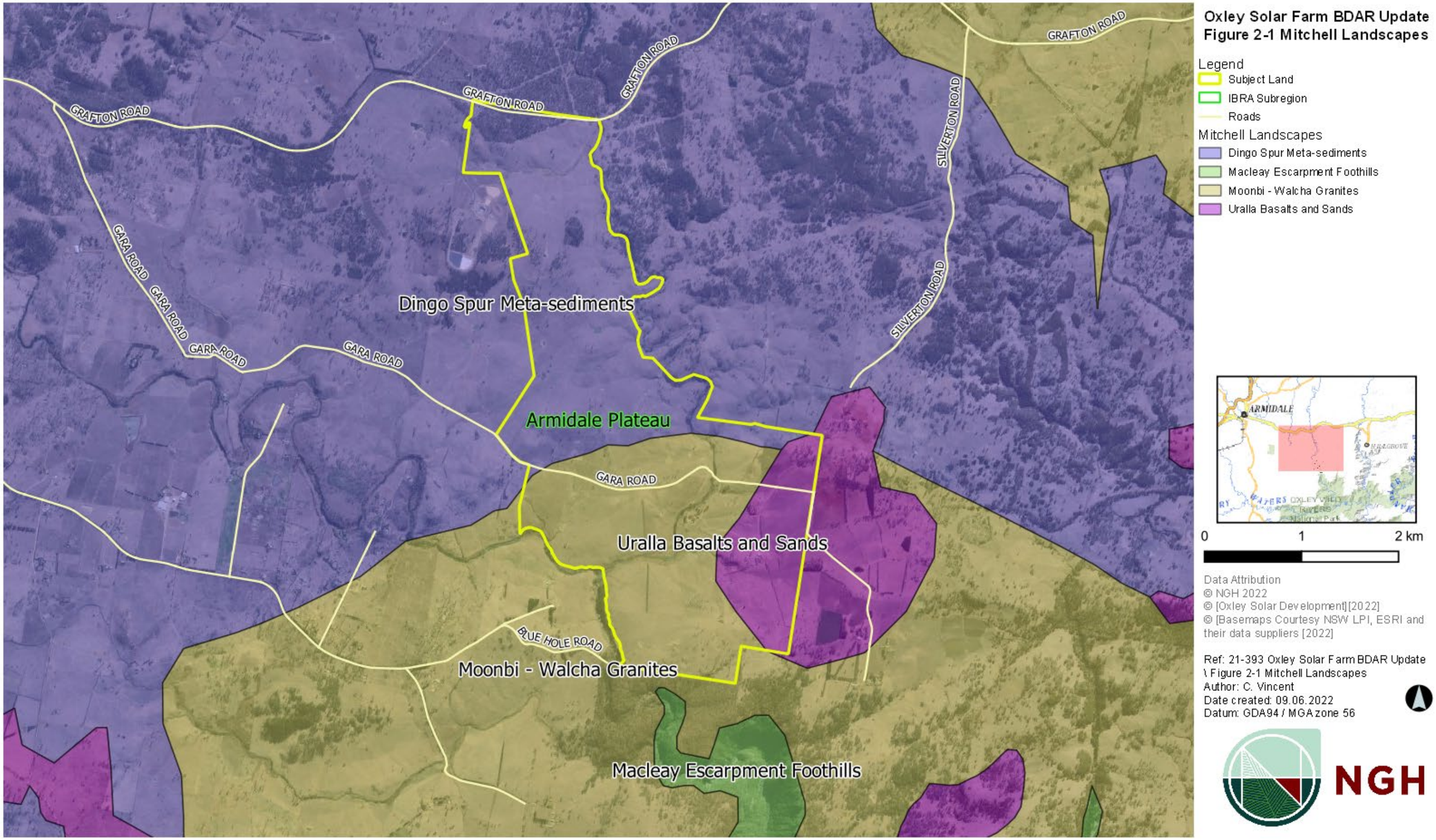

Figure 2-1 Mitchell landscapes

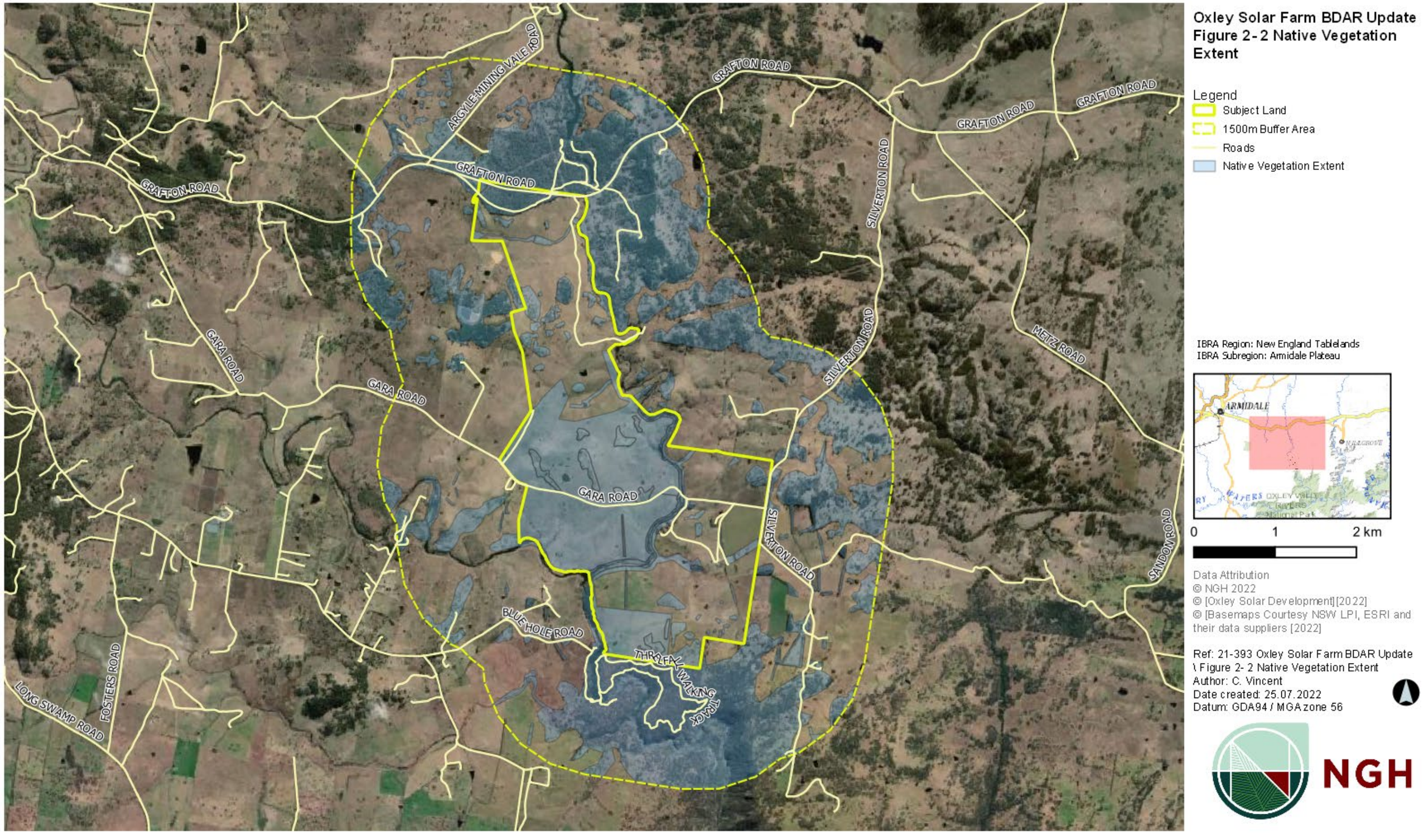

Figure 2-2 Native vegetation extent within 1500m buffer area

3. Native Vegetation

3.1 Native Vegetation Extent

About 544.21 ha of native vegetation is present within the development site, constituting approximately 52% of the development site. This is comprised of:

- Approximately 386 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 39.4 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 52.7 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 (Grafton Road), with patches re-occurring towards the South toward Oxley Wild Rivers National Park.
- Approximately 65.3 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 *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 Land use 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 504.41 ha of land within the subject land has been determined to meet the definition of Category 1- exempt land.

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

In addition, BCD requested in their submission to BDAR v2.2 that the area between Gara Road and Gara River be classified and assessed. This has been updated in this BDAR v3.1. The extension of the Development Site to include the proposed access has included an area of planted non-native vegetation we consider this to be Category 1 Land, and an area mapped as sensitive regulated land.

These areas have been excluded from the BAM assessment, except where prescribed impacts are relevant and discussed in Section 7.2. 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.

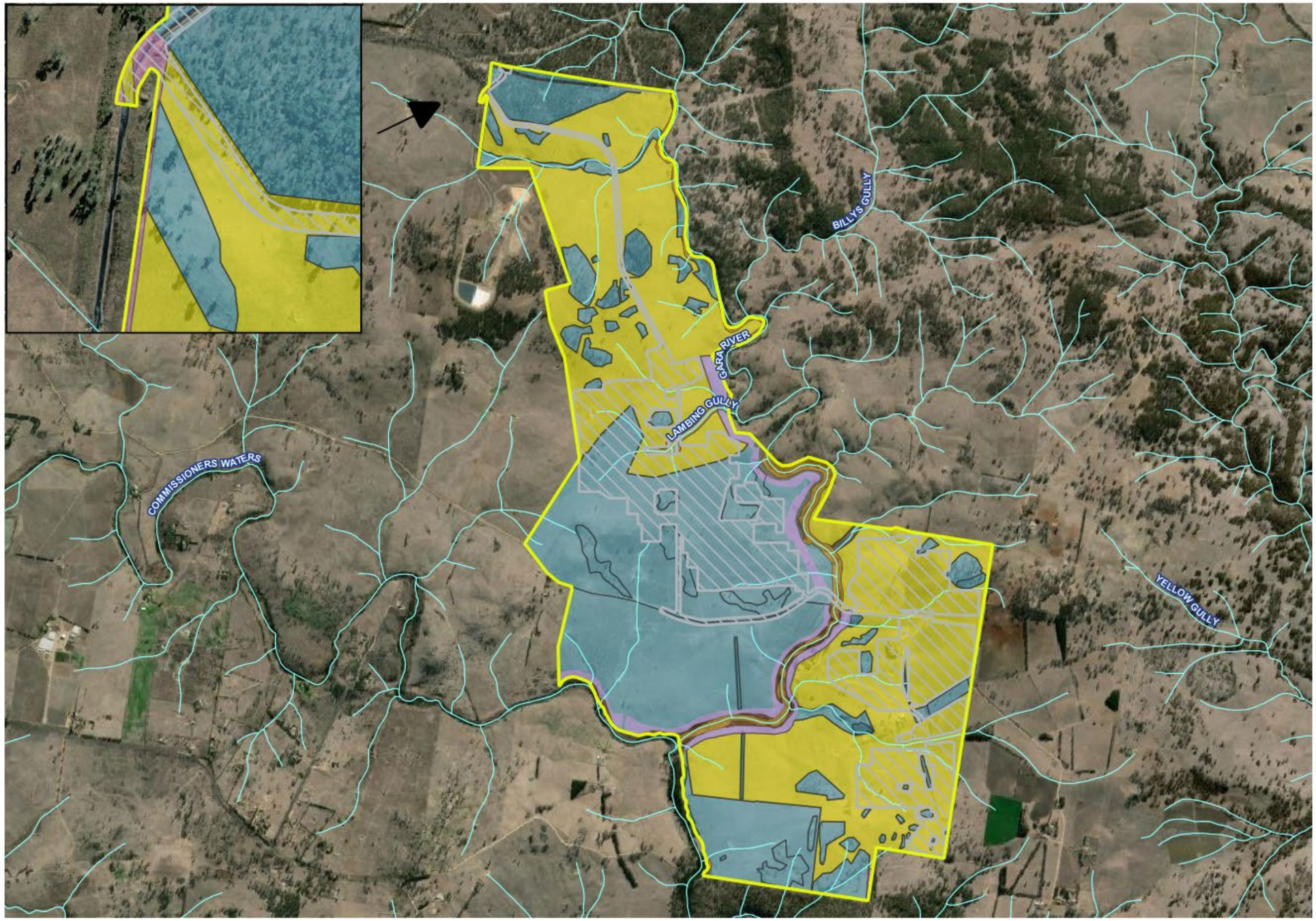

Figure 3-1 Category 1 land excluded from the BAM assessment

3.3 Plant Community Types (PCTS)

3.3.1 Methods to assess PCTs

Review of existing information

A search was undertaken of the DPE 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. Three further plots were undertaken in January 2022 with an extension of the Subject Land in the north-west. 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	38.66 ha of this PCT occurs within the development site. This is comprised of 32.44 ha as Riparian vegetation 6.22 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 *Microlaena 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 *Eucalyptus 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 PCT 84 was considered the best match for the PCT based on the following criteria present in the community:	

River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	
	• 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	242.32 ha of this PCT occurs within the development site. This is comprised of 189.65 ha of Derived Native Grassland 52.7 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%
	Purple 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 • 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)	

Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	
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	262.8 ha of this PCT occurs within the development site. This is comprised of 196.34 ha of Derived Native Grassland 66.45 ha of Woodland	
Species relied upon for PCT identification	Species name	Relative abundance
	Broad-leaved 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%
	Purple 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 Stringybark *Eucalyptus caliginosa* which ruled out PCT 510 and 704 • Yellow Box *Eucalyptus melliodora* was sub dominant in canopy • 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- CEEC)	
Estimate of percent cleared within NSW	Estimated 62% cleared within NSW	

Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	
Examples	

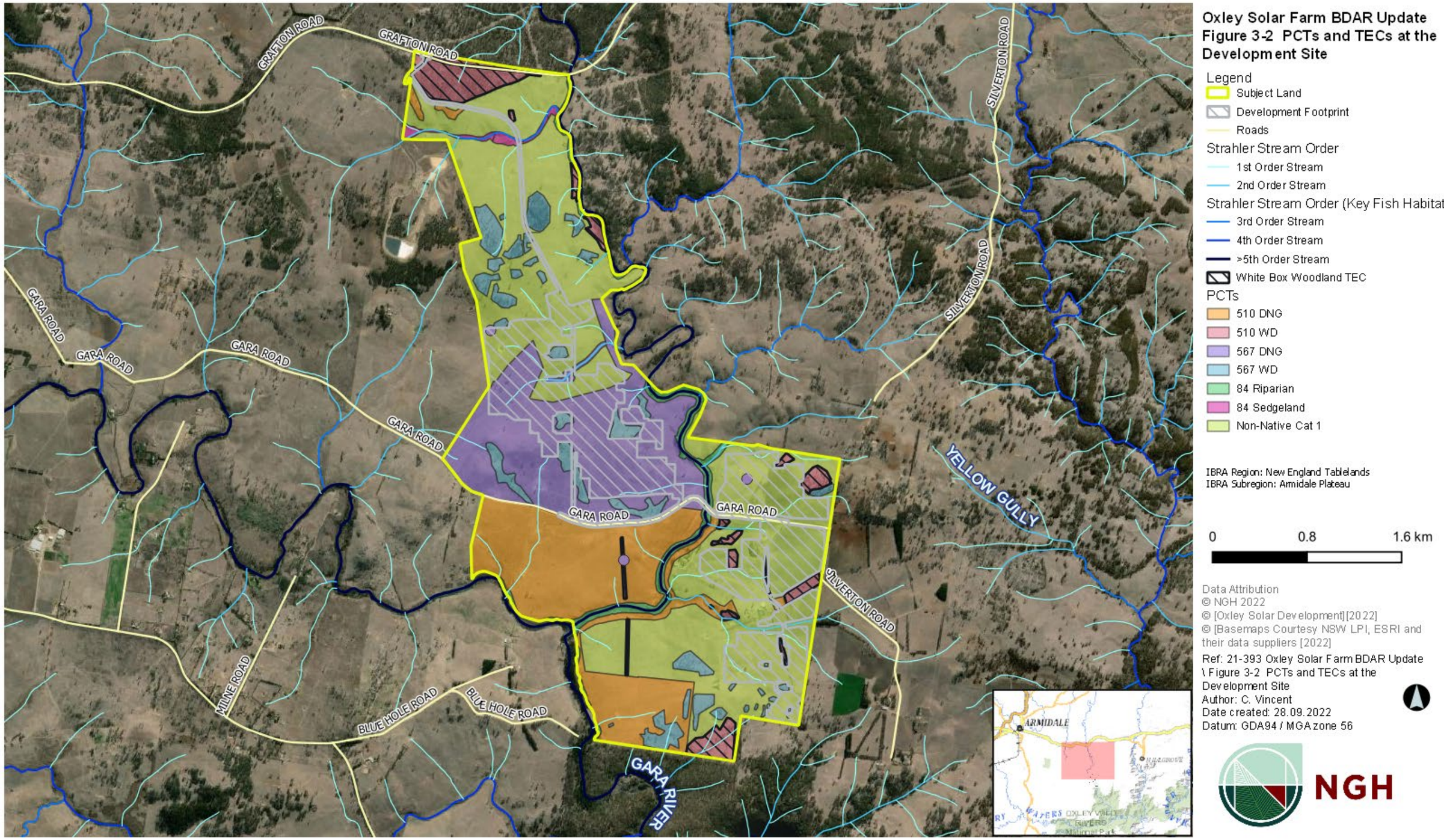

Figure 3-2 PCTs and TECs at the development site

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 2nd last design update, given the area of the zones within the development site, with a total of 48 VIPs completed 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 design update in v2.2. 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 for V2.2 to generate the relevant ecosystem and species credit species requiring assessment (Case 00022439/Revision 0). A new BAM case revision (Case 00022439/ Revision 6 reflects those zones and species impacted, with the relevant credit and offset obligation generated (Appendix C).

3.4.2 Scattered trees

Numerous scattered 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 scattered 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 scattered 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, scattered trees were included in the relevant woodland vegetation zone of the associated PCT, except where they occurred within Category 1 Land.

Table 3-4 Vegetation zones at the development site

Zone ID	PCT ID	Condition	Development Site (ha)	Development Footprint	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 shrubs such as Tantoon *Leptospermum polygalifolium* and Black Tee Tree *Melaleuca bracteata* prevalent throughout the creek line. The ground stratum is dominated by a mix of native and exotic species. Snow Grass *Poa sieberiana*, Barbed Wire Grass *Cymbopogon 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.	32.44	0.29	4	100+	

Zone ID	PCT ID	Condition	Development Site (ha)	Development Footprint	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 (Grafton Road). 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.	52.7	0.55	4	100+	

Zone ID	PCT ID	Condition	Development Site (ha)	Development Footprint	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.	189.65	2.12	6	100+	

Zone ID	PCT ID	Condition	Development Site (ha)	Development Footprint	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 strigosa*. With some supporting a dense midstorey.	66.45	1.13	5	100+	

Zone ID	PCT ID	Condition	Development Site (ha)	Development Footprint	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.	196.34	88.58	6	100+	

Zone ID	PCT ID	Condition	Development Site (ha)	Development Footprint	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.	6.22	0.11	2	100+	

Zone ID	PCT ID	Condition	Development Site (ha)	Development Footprint	Survey effort (# plots)	Patch size (ha)	Photos of BAM Plots
7	510	**Scattered Trees** This zone is comprised of two remnant Blakely's Red Gum that occur within the Category 1 Land.	n/a	2 trees	n/a	n/a	

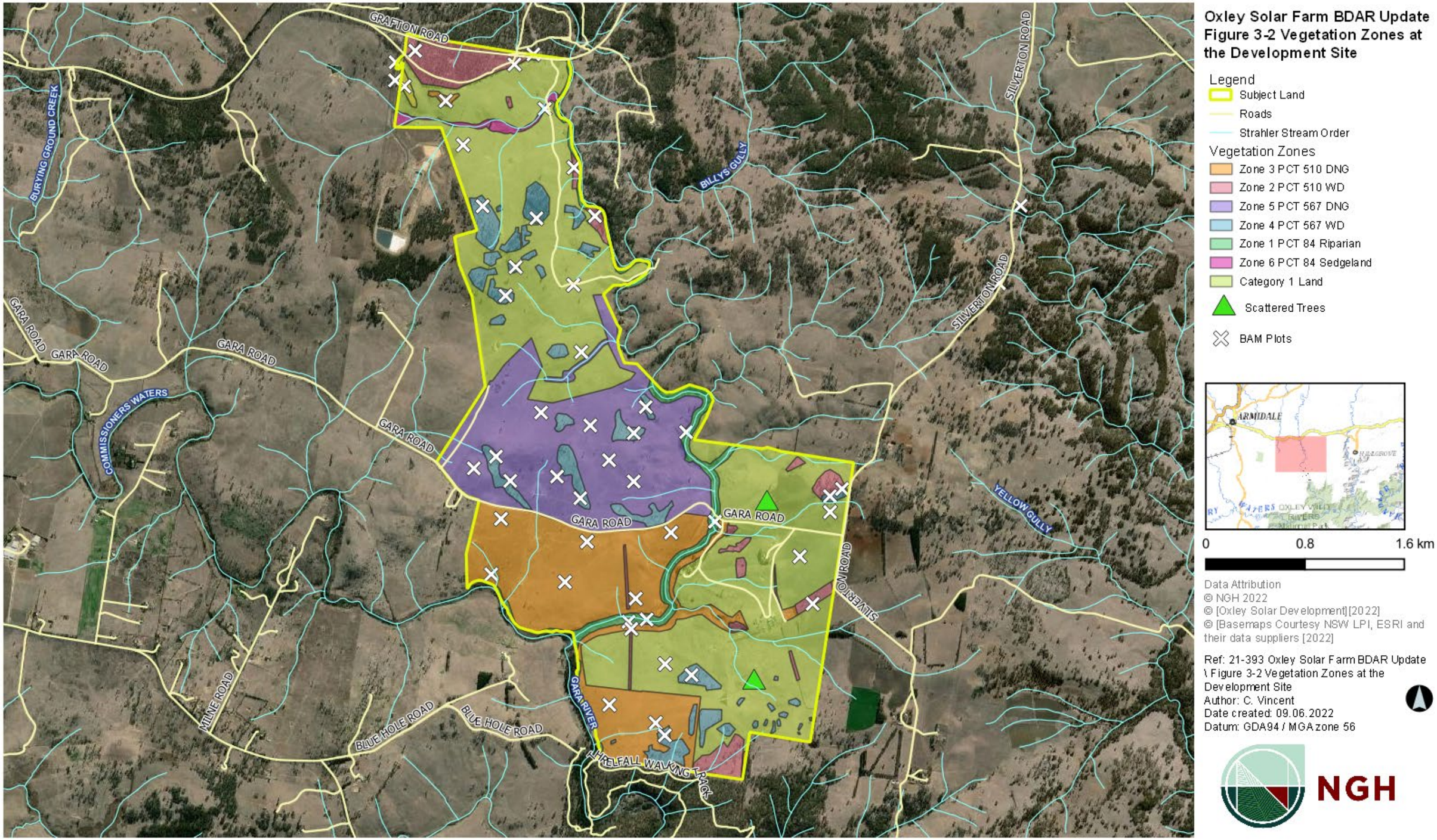

Figure 3-3 Vegetation zones at the development site

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 Falcon ***Falco subniger***	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Vulnerable	Not listed

Common Name	Associated PCT	NSW Listing Status	National Listing Status
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
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

Common Name	Associated PCT	NSW Listing Status	National Listing Status
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	Vulnerable	Not listed

Common Name	Associated PCT	NSW Listing Status	National Listing Status
	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	Endangered	Endangered
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

Common Name	Associated PCT	NSW Listing Status	National Listing Status
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
New Holland Mouse ***Pseudomys novaehollandiae***	567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Not Listed	Vulnerable
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	Critically Endangered	Critically Endangered

Common Name	Associated PCT	NSW Listing Status	National Listing Status
	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	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	Vulnerable	Not listed

Common Name	Associated PCT	NSW Listing Status	National Listing Status
	(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	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
White-throated Needletail ***Hirundapus caudacutus***	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	Not listed	Vulnerable
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 35 species credit species to occur within 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.

Seven species were excluded as species credit species due to four lacking suitable habitat, two falling outside their mapped important areas (Appendix G) and one outside geographic 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
6. Regent Honeyeater
7. Pygmy Cypress Pine

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
Callistemon pungens Callistemon pungens	Often associated with rocky watercourses.	High 2.0	Not listed	Vulnerable	Rocky watercourse (Gara River) on 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. East of Chandler River	High 2.0	Vulnerable	Vulnerable	Watercourses and open woodland in granite within development site. Development site is west of Chandler River	Excluded	Development site not within geographic range
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	Living or dead tree with hollows greater than 15 cm	High 2.0	Vulnerable	Not listed	Suitable hollow bearing trees within	Included	Habitat components on

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
Glossy Black-Cockatoo (Breeding)	diameter and greater than 5 m above ground.				the development site.		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 kilometers of rocky areas containing caves, overhangs, escarpments, outcrops or crevices. Or within two kilometers 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
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	High 2.0	Vulnerable	Vulnerable	Dry grassy woodland, on shallow soils of slopes and ridges	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
	derived from granite or metasedimentary rock.				within development 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. Oxley Wild Rivers National Park or within a 10 km buffer around the park	High 2.0	Endangered	Endangered	Rocky areas within development site. Located within 10km of the Oxley Wild Rivers National Park	Included	Habitat components on site. Within 10km of Oxley Wild Rivers National Park
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
Lathamus discolor Swift Parrot	Important Area Mapping	Very high 3.0	Endangered	Critically Endangered	Favoured flowering eucalypts and lerp tree species within	Excluded	Development site outside of breeding range

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
(breeding)					development site		and not within Important Area Map (Appendix G)
Lophoictinia isura Square-tailed Kite	Timbered habitats including dry woodlands and open forests, particularly timbered watercourses. Nest trees	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. This includes rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200m of the site.	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

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
	Within 5 km buffer of Macleay Gorges subregion				Within 5km Macleay Gorges subregion buffer of		Within 5 k Macleay Gorges subregion 5km buffer of
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
Petauroides Volans Greater Glider	Hollow dependent species that will have large trees with hollows within its home range. Home range is < 5 ha and typically 1 to 3 ha.	High 2.0	Not listed	Vulnerable	Suitable hollow bearing trees within development site	Included	Habitat components on site
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	Endangered	Endangered	Eucalypt woodlands and forests 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
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 Southwest Slopes. Sometimes in association with cypress pines.	High 2.0	Vulnerable	Not listed	Box-gum woodland within	Included	Surveys required
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	Living or dead trees with	High	Vulnerable	Not listed	Suitable hollow	Included	Habitat

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
Masked Owl	hollows greater than 20 cm diameter.	2.0			bearing trees within development site		components on site
Anthochaera phrygia Regent Honeyeater	Important Area Mapping.	Very high 3.0	Critically Endangered	Critically Endangered	Dry open forest, woodland and Box-Ironbark woodland within development site	Excluded	Habitat components on site, however, the Development site is not within Important Area Map (Appendix G)
Hieraaetus morphnoides Little Eagle	Nest trees – live (occasionally dead) large old trees within vegetation. Scattered 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

Inclusions

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:

- Peppered Tree Frog *Litoria piperata*

This species has been added to the predicted ecosystem credit species list within the BAM-C for the proposal. An additional BioNet search was undertaken on 30 May 2022. No other species had been updated in the BioNet records that were not already in the BAM-C.

Exclusions

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	The Development site is not within Important Area Map for Swift Parrot (Appendix G)
Anthochaera phrygia Regent Honeyeater	Zones 1 to 6	The Development site is not within Important Area Map for Regent Honeyeater (Appendix G)
Callistemon pungens Callistemon pungens	Zone 1 and zone 6	Zone 6 does not have any shrubs present. As evidenced from aerial imagery, PCT 84 in the riparian zone within the development footprint is highly degraded. The area within the development footprint was surveyed and this species was not identified, therefore considered highly unlikely to have this species present.
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.

Species credit species	Habitats present	Reason for exclusion
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. The method for creating a polygon for species assumed to be present has changed since the last BDAR update. BOS helpdesk was contacted via email on 3 June 2022. A BOS assessor was consulted via phone on 7 June 2022.

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 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.	0.29 PCT 84 Riparian (Zone 1) 0.11 PCT 84 Sedgeland (Zone 6) 0.94 PCT 510 DNG 32.732 PCT 567 DNG 0.18 PCT 510 Woodland 0.27 PCT 567 Woodland
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. No breeding habitat.	Nil
Haliaeetus leucogaster White-bellied Sea-	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 within development footprint
Eagle (Breeding)				
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. No breeding habitat.	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.	0.29 PCT 84 Riparian (Zone 1) 0.11 PCT 84 Sedgeland (Zone 6) 6.36 PCT 567 DNG (zone 5)
Lophoictinia isura Square-tailed Kite *(Breeding)*	1.50	Surveyed August and November 2019, and May and September 2020.	Yes. Identified within the development site. No breeding habitat	Nil
Myotis macropus Southern Myotis	2.00	Assumed present	Assumed present.	0.12 ha of PCT 510_DNG (Zone 3) (within 200m of waterbody) 24.13 ha in Zone 4: PCT 567 DNG (within 200m of waterbody)
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	2.00	Spotlight and Call Playback surveys conducted in August and	No	Nil

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area within development footprint
(Breeding)		November 2019. Additional terrestrial surveys conducted in May and September 2020.		
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 2019, and May and September 2020.	No	Nil
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
Dichanthium setosum Bluegrass	2.00	Threatened species transects conducted in May 2020.	Yes. Identified within the development site but not within 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
Picris evae Hawkweed	2.00	Assumed present Survey period Nov-Feb as per the BAM.	Assumed present	0.55 ha of PCT 510 Woodland (Zone 2)

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area within development footprint
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	0.55 ha of PCT 510_Woodland (Zone 2) 2.12 ha of PCT 510_DNG (Zone 3) 1.13 ha of PCT 567_Woodland (Zone 4) 88.58 ha of PCT 567_DNG (Zone 5)

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 (DPE 2018)
- Species credit threatened bats and their habitats (DPE 2018)
- Draft Threatened biodiversity survey and assessment (DPE 2004)
- Flora Species with Specific Survey Requirements (DPE 2018)
- 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
20th January 2022	14.4	19.3	86	5.2, 39.2	SE 54km/h	Flora 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. Scattered 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 of August 2019 one Little Eagle was identified, with two (2) Little Eagles observed in a similar area of the development site on the 21st of 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 scattered 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 and Greater 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 scattered 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. We have updated this BDAR with the most up to date method. The species polygon for the Southern Myotis is based on the NSW DPE 'Species credit' threatened bats and their habitats (2018). This describes the potential habitat as ‘The range of PCTs associated with the species (as per the TBDC) within 200 meters of any medium to large permanent creeks, rivers,

lakes or other waterways (i.e., with pools/ stretches 3m or wider)'. A 200m buffer was created from the watercourses presumed to be 3m or wider (which included Gara Creek, and a few waterways connected to it), associated PCTs (PCT 510 & 567) were then clipped to this buffer, then the clipped PCTs were clipped to the development footprint to get the final species polygon.

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 the species polygons. We have updated this BDAR with the most up to date method in consultation with BCD on 24 June 2022. This involves an increase in area, which included a 500m buffer for the Tusked Frog (incorporating associated PCTs 84, 510 and 567) and 200m buffer for the Glandular Frog (incorporating associated PCT 567 and including PCT 84 as there is a BioNet record immediately south of the subject land near the Gara River. These methods are in line with the DPE NSW Survey Guide for Threatened Frogs A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (2020).

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 scattered 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 of the development site in addition to the number of survey days on site without koala evidence suggests they unlikely to occur.

Rock Wallaby

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 scattered trees. Spotlight searches were conducted on foot by 2 Ecologists in dense woodland areas.

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 Rock Wallaby signs, or individuals seen over the 16 survey days on site. It is considered that an adequate coverage of the development site in addition to the number of survey days on site without Rock Wallaby evidence suggests they unlikely to occur

Threatened Forbs and Grasses (Blue Grass (Dichanthium 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 *Dichanthium 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 australe* were unable to be undertaken during the specified period (November to February) as per the BAM.

Survey results

Hawkweed and Austral Toadflax are assumed present. Hawkweed is determined to only potentially occur in the associated PCT 510 WD. A species polygon was created by clipping this PCT 510 WD to the development footprint.

Austral Toadflax is known to occur in grassland and grassy woodland away from the coast. It is associated with two PCTs identified on site (PCT 510 & 567). A species polygon was created by clipping these associated PCTs to the development footprint.

Blue Grass was identified within the development site during targeted threatened species transects during May 2020. The species was not found in the development footprint, no species polygon is required.

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

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

Threatened shrubs and trees (Narrow-leaved Bertya (Bertya ingramii), Granite boronia (Boronia granitica), 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.

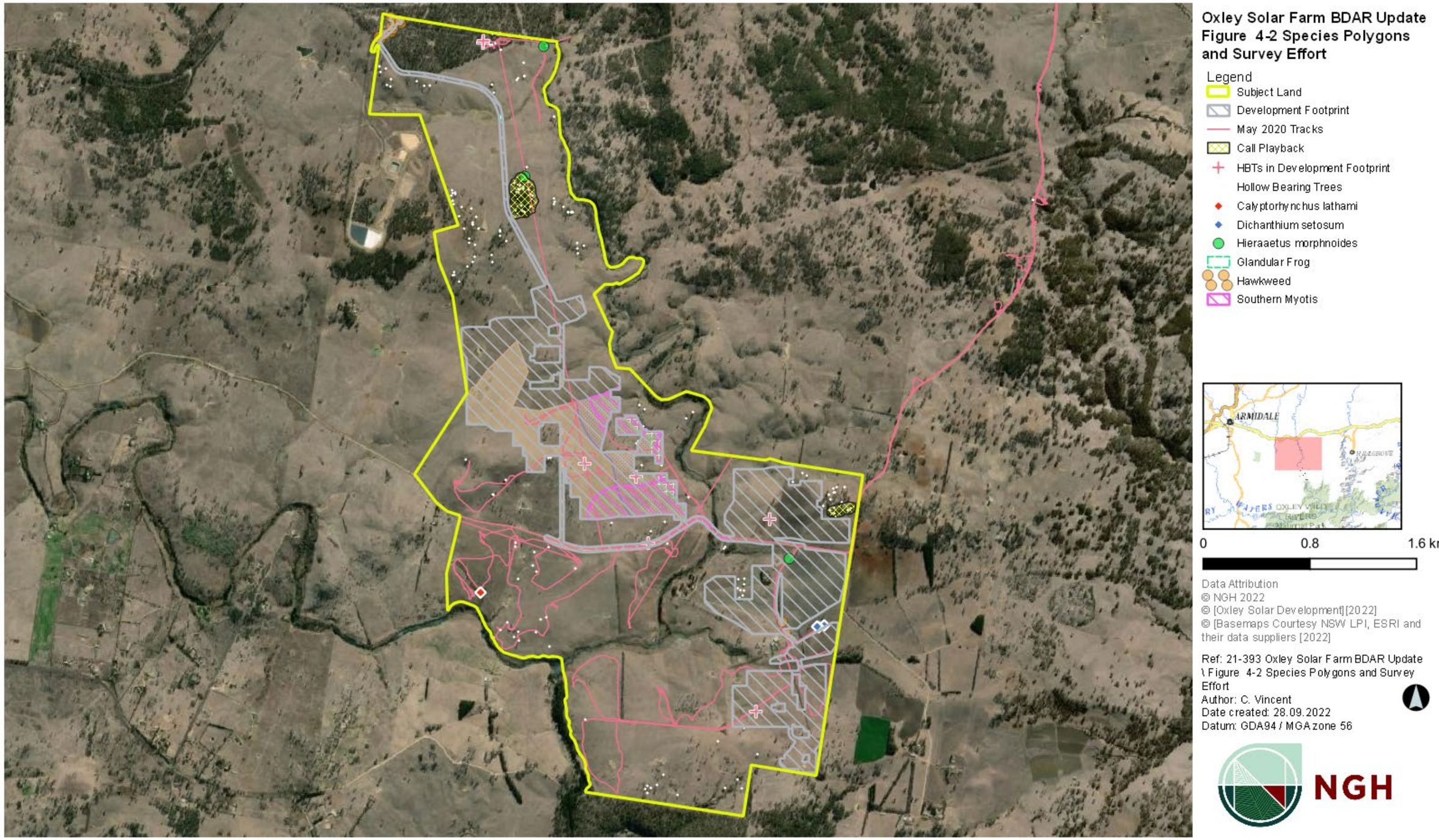

Figure 4-2 Species polygons and survey effort

4.3 Additional Habitat Features Relevant to PRESCRIBED BIODIVERSITY Impacts

Prescribed additional biodiversity impacts (prescribed impacts) must be assessed as part of the BOS, as per clause 6.1 of the BC Regulation. A summary is provided in Table 4-6 below.

Table 4-6 Prescribed additional biodiversity impacts

Feature	Present	Description of feature characteristics	Threatened Species or community using or dependent on feature
Karst, Caves, Crevices, Cliffs or other geological features of significance	Yes	Large rocky outcrops and boulders occur throughout the development site, particularly in areas surrounding the Gara River. There are no occurrences of karsts, caves, crevices or cliffs in the development site.	Brush-tailed Rock Wallaby however not detected from site surveys.
Human-made structures	Yes	Several residences and small structures, including storage sheds, associated with current land use. Dirt roads, dams and a small wooden bridge.	No threatened species are considered to rely on the human-made structure present.
Non-native vegetation	Yes	Exotic vegetation present as cleared paddocks and cropping areas. Small areas of landscape planting contain Radiata Pine *Pinus radiata*	No threatened species are considered to rely on the non-native vegetation present regularly for foraging or breeding.
Habitat Connectivity	Yes	Vegetation along Gara River that traverse the Subject Land in the south. Patchy woodland connecting with Wild Rivers National Park in the south. A patchy woodland connecting with some patchy woodland in the mid-north wet. Woodland connected at the northernmost end of the Subject Land is part of a larger woodland patch adjacent.	Ecosystem species defined in 4.1. Southern Myotis
Waterbodies and hydrological processes	Yes	Gara River, ephemeral unnamed tributaries of Commissioners Waters, Table and dams are present. Gara River would receive run off from surrounding cultivated land	Ecosystem species defined in 4.1 Tusked Frog Glandular Frog
Wind farm development	No	No Wind farm development	N/A
Vehicle strikes	Yes	Gara Road may have increased traffic, particularly during construction and decommissioning.	Ecosystem species defined in 4.1

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 threatened ecological communities were identified from the protected matters report. One 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 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 eleven birds, eight mammals, nineteen plants, two amphibians, and two 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* Spot-tailed Quoll – Endangered
5. *Petrogale penicillata* Brush-tailed Rock-wallaby – Vulnerable
6. *Phascolarctos cinereus* Koala – Endangered

5.4 Migratory Species

Excluding marine species, fourteen (14) migratory species were identified from the protected matters report. Of these, five 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 to the site's constraints.

BDAR V2.2, submitted to support the EIS in March 2021, demonstrated that the following higher values areas had been avoided by the project:

- 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

It resulted in impacts to approximately 87 ha of native vegetation including, most occurring in Box Gum Woodland TEC), and impacts to habitat for three ecosystem credit species (detected within the development site) and potential habitat for five species credit species (assumed to occur).

In response to the public and agency submissions, the Oxley Solar Farm has made significant additional changes to the proposal. In comparison to the BDAR v2.2, further 'avoid and minimise' actions now include:

- Increased setbacks:
    - Gara River: No infrastructure is now proposed in the moderate constraint native vegetation between Gara Road and Gara River or the area immediately south of Gara River, on the site's south west. Increased setbacks from Gara River on the site's north-eastern boundary. This reduces the impacts on native vegetation and the potential to impact Gara River, an issue raised in several community submissions:

  - Oxley Wild Rivers National Park: No infrastructure now proposed in land immediately adjoining the Oxley Wild Rivers National Park. This was undertaken to address community concerns in relation to protecting the values of the park. The closest infrastructure would now be approximately 300m distant, in the site's south-eastern corner.

- Reduced Box Gum Woodland SAII impacts: No solar panels would be installed in areas of Box Gum Woodland with a vegetation integrity score of 30 or more. This vegetation is a Serious and Irreversible Impact candidate and only impacts that cannot be avoided (limited fencing and access alignments) are now proposed within this woodland vegetation. However, as a results of reducing impacts to woodland vegetation, there is a small increase in impacts to the lower condition derived native grasslands.
- More certainty in relation to impact areas: In terms of how the impacts areas have been calculated, instead of buffering an indicative layout, a more refined development footprint based on further civil design has been developed, to provide greater certainty regarding the extent of the final infrastructure layout. This includes 'constructability' buffers, to ensure the areas presented are inclusive of all environmental controls and activities required to construct and operation the project.
  - Strengthened mitigation strategies: In relation to biodiversity offsets, the project's first preference is now to maximise the generation of credits on the residual areas of the project site, to be established as a new in perpetuity stewardship site under the Biodiversity Offsets Scheme (BOS). Where credits cannot be generated efficiently onsite, the remainder will be achieved by purchasing credits under the BOS or making payments into the Biodiversity Conservation Fund using the offset payments calculator. An offset strategy is now provided that demonstrates that offsets for clearing are feasible under a newly established biodiversity stewardship agreement, the preferred offset option under the Biodiversity Conservation Act 2016.
  - Separate to this BDAR, in response to consultation with the Armidale Tree Group, and to address broader community concerns raised about water quality and impacts on Oxley Wild Rivers National Park, the project has included an additional commitment; preparation and implementation of a Wildlife Corridor Connectivity Enhancement Plan. The aim of the plan would be to improve connectivity in specific areas of the site and to maintain this improvement for the life of the project. To capture this commitment, it is now included in the mitigation measures in Section 8.

The updated project description and environmental commitments demonstrate the desire to develop a project that responds to local values and concerns. The change in impacts is summarised in Table 6-2 below..

Table 6-2 Comparison of BDAR V2.2 and V3.1

Entity	BDAR v2.2	BDAR 3.1	Net
Zone 1 (84 Riparian)	0.03	0.298 ha	+ 0.265 ha
Zone 2 (510 Woodland) (SAII)	5.4	0.55 ha	- 4.85 ha
Zone 3 (510 DNG)	0.6	2.12 ha	+ 1.52 ha
Zone 4 (567 Woodland) (SAII)	3.9	1.13 ha	- 2.8 ha
Zone 5 (567 DNG)	76.9	88.58 ha	+ 11.68 ha
Zone 6 (84 Sedgeland)	0.2	0.11 ha	- 0.09 ha
Hollow bearing trees to be removed by the proposal.	20	5	-15
Dams to be removed	14	10	- 4
Tusked Frog *Adelotus brevis* (assumed present) potential habitat	26 ha	34.52ha	+ 8.52 ha
Glandular Frog *Litoria subglandulosa* (assumed present) potential habitat	26 ha	6.76 ha	-19.24 ha
Southern Myotis *Macropus* (assumed present) potential habitat	7.6 ha	24.25 ha	+ 16.65 ha
Hawkweed *Picris evae* (assumed present) potential habitat	4.9 ha	0.55 ha	-4.35 ha
Austral Toadflax *Thesium australe* (assumed present)	86.7 ha	92.38 ha	+ 5.68 ha

Note: The method for calculating threatened species assumed presence polygons has been updated since BDAR v2.2. This has resulted in an increase in assumed area for some species, namely, the Tusked Frog and Southern Myotis.

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.

7. Impacts Unable to be Avoided

Precautionary assessment note:

The largest area of impact for this project is generated by the solar array modules; about 70% of the development footprint. 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. 33.4% percent (90.7ha) of the development footprint is derived native grassland. It is not known whether shading would lead to a change in groundcover species composition, so it is assumed to be removed rather than modified, in this assessment. Management of ground cover beneath the arrays is a commitment of the project (Section 8) to ensure that ground cover is retained beneath panels, to resist erosion and weeds and to preserve the native composition as much as possible. Hence this is a precautionary approach likely to overestimate impacts,

The impact area calculations is conservative in one other way:

1. As above, in terms of how the impacts areas have been calculated, a development footprint rather than a final infrastructure layout is used, inclusive of all environmental controls and activities required to construct and operate the project. Generous delineation of this footprint at this stage allows flexibility during the final design stages of the project. The final disturbance would be smaller than the development footprint presented subject to detailed design with appointed contractors (refer to Indicative layout Figure 7-1)

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)	92.78 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

Nature of impact	Extent	Frequency	Duration and timing	Consequence
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	5 HBTs 10 waterbodies	Regular	Construction	Direct loss of native fauna habitat 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.

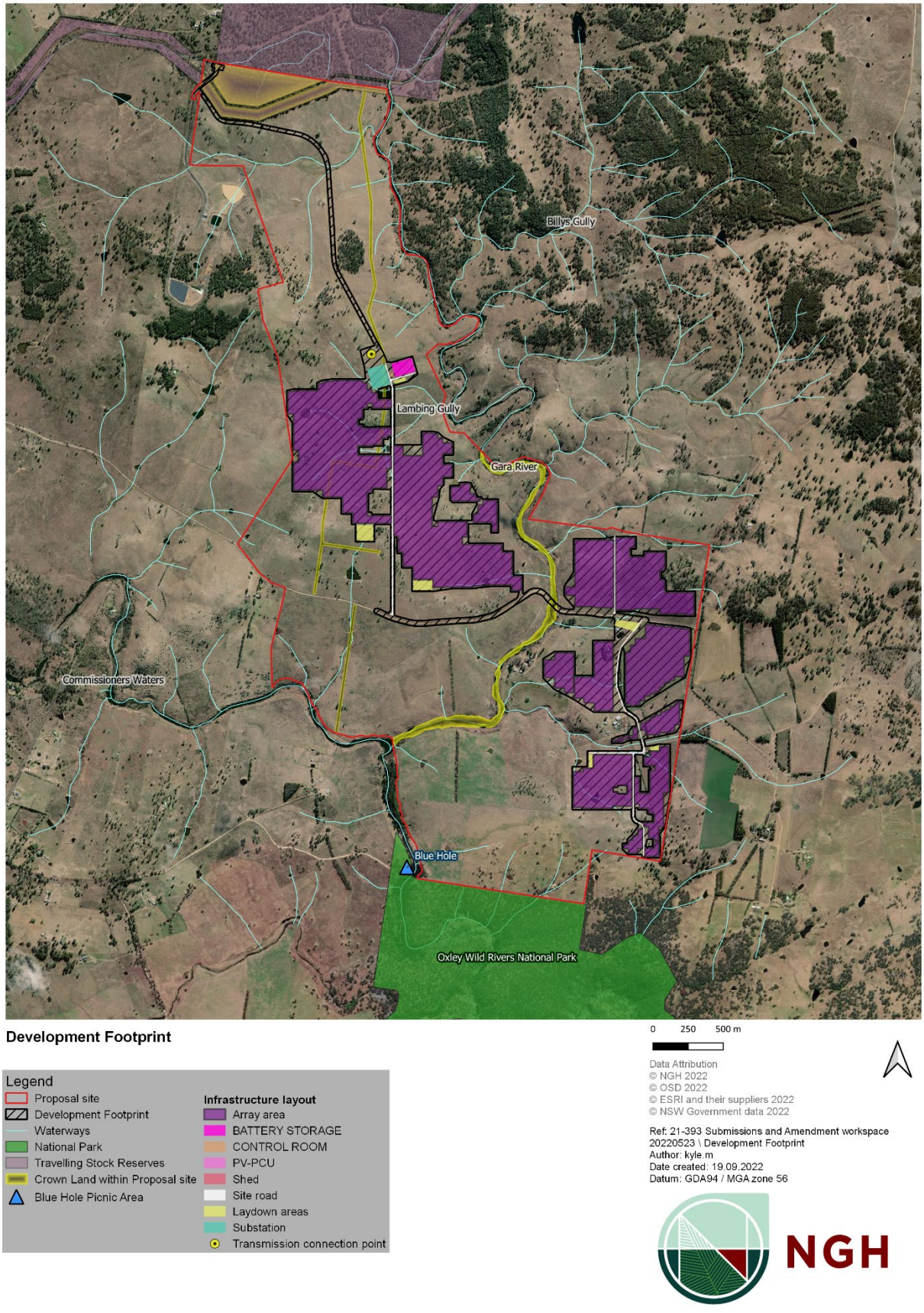

Figure 7-1 Indicative layout

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 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	TEC and/or threatened species habitat?	Area in development site (ha)	Maximum Area Impacted (ha)	Current vegetation Integrity Score	Future vegetation Integrity Score
1	84_Riparian	Nil.	32.44	0.29	49.8	0
2	510_Woodland	White Box Yellow Box Blakey's Red Gum Woodland	52.7	0.55	69.0	0
3	510_DNG	White Box Yellow Box Blakey's Red Gum Woodland	189.65	2.12	26.6	0
4	567_Woodland	White Box Yellow Box Blakey's Red Gum Woodland	66.45	1.13	37.7	0
5	567_DNG	White Box Yellow Box Blakey's Red Gum Woodland	196.34	88.58	24.6	0
6	84_Sedgeland	Nil.	6.22	0.11	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	0.12 ha of PCT 510_DNG (Zone 3) (within 200m of waterbody) 24.13 ha in Zone 4: PCT 567 DNG (within 200m of waterbody)
Picris evae Hawkweed	2.00	0.55 ha of PCT 510 Woodland (Zone 2)
Thesium australe Austral Toadflax	1.50	0.55 ha of PCT 510_Woodland (Zone 2) 2.12 ha of PCT 510_DNG (Zone 3) 1.13 ha of PCT 567_Woodland (Zone 4) 88.58 ha of PCT 567_DNG (Zone 5)
Adelotus brevis Tusked Frog population in the Nandewar and New England Tableland Bioregion	3.0	0.29 ha PCT 84 Riparian (Zone 1) 0.11 ha PCT 84 Sedgeland (Zone 6) 0.94 ha PCT 510 DNG (Zone 3) 32.73 ha PCT 567 DNG (Zone 5) 0.18 ha PCT 510 Woodland (Zone 2) 0.27 ha PCT 567 Woodland (Zone 4)
Litoria subglandulosus Glandular Frog	3.0	6.36 ha PCT 567 DNG (Zone 5) 0.29 ha PCT 84 Riparian (Zone 1) 0.11 ha PCT 84 Sedgeland (Zone 6)

7.1.3 Loss of hollow-bearing trees

31 hollow bearing trees (HBTs) were recorded in the development site. Seven of these would be impacted by 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	0
3	510_DNG	0
4	567_WD	1

ZONE	PCT ID	HBTs within zone
5	567_DNG	2
6	84_SEDGELAND	0
Scattered Trees		2
TOTAL		**5**

7.1.4 Indirect Impacts

As set out at the beginning of this chapter, in terms of how the impacts areas have been calculated, instead of buffering an indicative layout, a development footprint has been developed inclusive of all environmental controls and activities required to construct and operate the project. No soil or vegetation disturbance would occur outside of this area. There is high certainty about confining direct impacts to this area. In consideration of soil and water impacts, it is noted that greater setbacks from Gara River have now been included.

Indirect impacts from noise and vibration would occur primarily during the construction period for 12 – 18 months. The peak construction period would be a shorter period of about 6 to 9 months. They would be more intense than existing farm operations but are not considered to require offsetting. During operation, routine maintenance traffic and noise from inverters is anticipated to be not greatly higher than existing noise impacts generated by agricultural use. The map below shows the area of indirect impacts anticipated to be within 100m of the development footprint.

Indirect impacts of the proposal may include creation of barriers to fauna movement due to fences. A commitment to a Wildlife Corridor Connectivity Enhancement Plan, to improve connectivity in specific areas of the site and to maintain this improvement for the life of the project is now included.

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. Indirect impacts are considered to be minor and no offsets are considered to require offsetting.

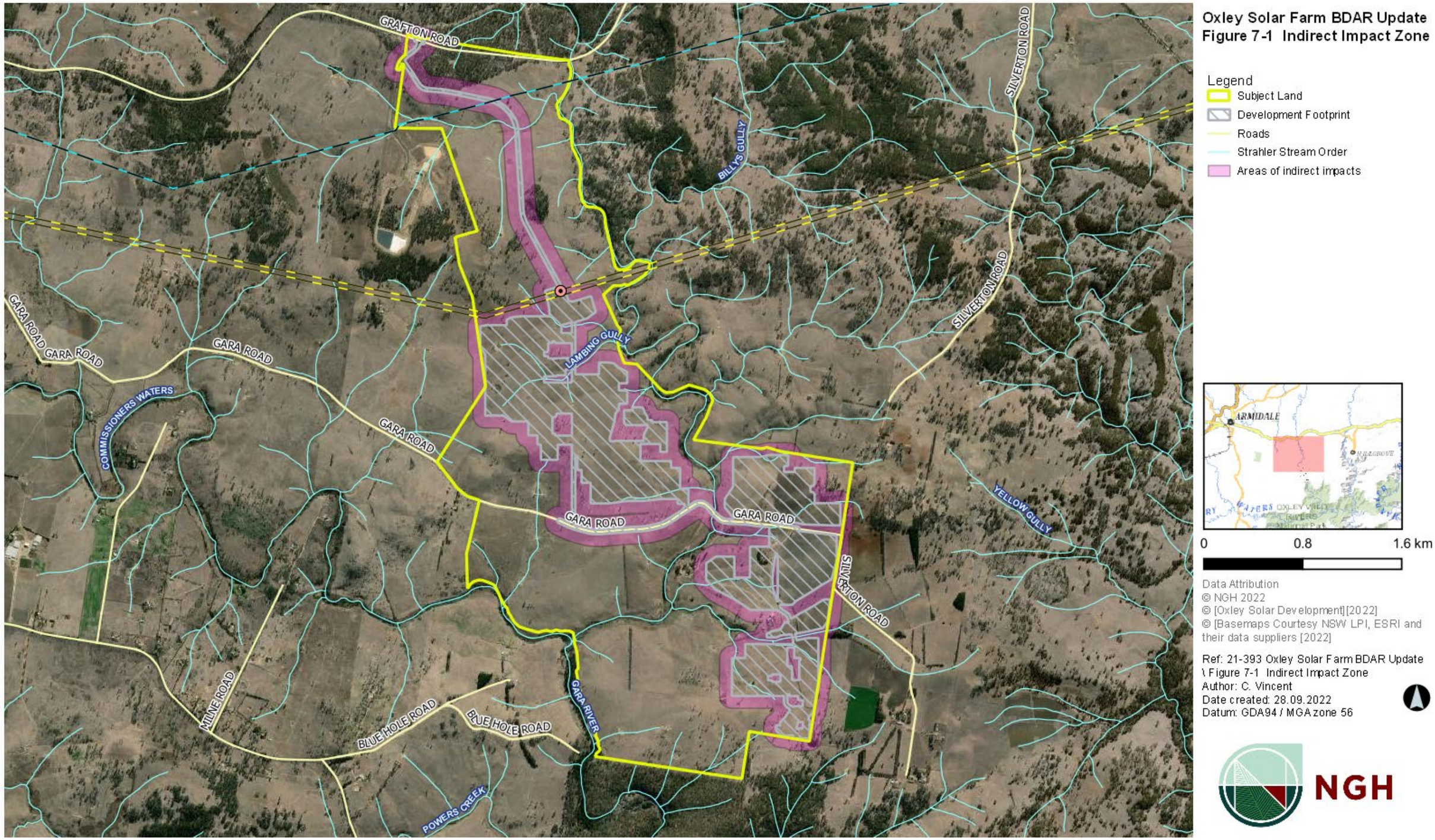

Figure 7-2 Indirect impact zone

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 • Ecosystem species listed in Table 4-1	• 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
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 • Ecosystem species listed in Table 4-1	• May alter fauna activities and/or movements • Loss of foraging or breeding habitat • Inhibit the function of plant species, soils and dams

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
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	• Ecosystem species listed in Table 4-1Tusked Frog • Glandular Frog • Southern Myotis •	• 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	5 HBTS	Constant	Construction Phase: Long-term	• Ecosystem species listed in Table 4-1 Tusked Frog • Glandular Frog • Southern Myotis	• Increased pressure and competition for remaining HBT resources from native and exotic hollow dependent fauna
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 • Ecosystem species listed in	• Solar arrays may provide potential habitat for pest species like rabbits and foxes to take refuge under panels.

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
				Table 4-1 • Tusked Frog • Glandular Frog • Southern Myotis	
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 • Ecosystem species listed in Table 4-1 • Tusked Frog • Glandular Frog	• Erosion and sediment deposition pollution on downstream habitats; and • Alternation of surface watercourses (isolating high biodiversity value communities).
Restriction of fauna movement	Perimeter fencing 2.3m high	Regular	Operation	• Larger ground dwelling mammals	• Low. Existing farm fencing and clearing make existing connectivity poor.

7.2 Prescribed Impacts

The prescribed biodiversity impacts listed in section 8.3 of the BAM 2020 are addressed in Table 7-6.

Table 7-6 Prescribed biodiversity impacts

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Prescribed biodiversity impacts (those listed below are included in the BAM)					
Impact on threatened entities associated with karst, caves, crevices, cliffs, rocks and other geological features of significance	No caves, cliffs or crevices identified within the development site. Large rocky outcrops occur throughout the development site.	N/A	N/A	N/A	N/A
Impacts on habitat of threatened entities associated with human made structures or non-native vegetation	174.91 ha (Category 1 Land exotic vegetation)	Operation period	Operation period	N/A	The non-native vegetation includes ploughed paddocks and exotic grassland which has limited foraging and/or breeding habitat for threatened species. The Given this the impact is unlikely to have an impact that could cause a decline in a threatened species, with a potential modification of

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
					their behaviour to avoid the development footprint area.
Impacts on connectivity of habitat of threatened entities	268ha (development footprint area)	Operation period	Operation period	PCT 510 WD and 567 WD Ecosystem Species listed in 4.1 The derived native grasslands and scattered trees and woodland habitat provide habitat for threatened birds of prey like the Little Eagle and Square-tailed Kite, especially around areas containing large dams and around the Gara River.	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. Connectivity would be minimally impacted due to presence of the infrastructure, and access tracks, but given these species are able to fly or move underneath the solar panels the impact is unlikely to have an impact that could cause a decline in a threatened species. A Wildlife Corridor Connectivity Enhancement Plan will be created which includes planting along the Gara River.
Impacts on water quality, water bodies and hydrological processes that sustain threatened entities.	Unknown	Construction and decommissioning	Construction and decommissioning	PCT 84 Tusked Frog Glandular Frog Species in 4.1	Construction and decommissioning of the Oxley solar farm would disturb soils and potentially lead to sediment or other pollutants being present in runoff, mobilising and entering local waterways or waterbodies, adversely impacting on water quality. A Soil and Water Management Plan (SWMP) with erosion and sediment control plans would be

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
					prepared, implemented, and monitored. Standard safeguards and best practice works in a near waterways ensure this risk is manageable. Mitigation measures to help maintain water quality are mentioned Section 7.3.5 and 8.1.3 of the EIS including the implementation of a sedimentation control plan, a spill control plan and progressive rehabilitation where possible. With these mitigation measures in place the works are unlikely to have an impact that could cause a decline in a threatened species.
Impacts of wind turbine strikes on protected animals identified in subsection 6.1.5 of the BAM.	N/A	N/A	N/A	N/A	N/A

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Impacts of vehicle strike to threatened fauna or flora that are a part of a TEC	Gara Road and unnamed public roads within the development site (22.7ha).	Irregular	During construction and operation	Tusked Frog Glandular Frog Ecosystem Species listed in 4.1	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.

7.3 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.

In addition, the development footprint represents a maximum area, to be resilient to changes in thedetailed design stage, subject to a competitive tender process. Hence the final layout is likely to be considerably smaller than the development footprint.

7.4 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 Threatened species and TEC 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* Spot-tailed Quoll – Endangered
- *Petrogale penicillata* Brush-tailed Rock-wallaby – Vulnerable
- *Phascolarctos cinereus* Koala – Endangered
- *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

An assessment of EPBC condition was not recorded so all PCT 510 woodland is considered to be EPBC quality CEEC White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland as a precautionary approach (52.7ha within the Subject Land). PCT 510 Derived Grassland did not meet the condition threshold for the EPBC CEEC due to there being less than 12 native forbs in the understory. 0.55 ha of PCT 510 woodland would be impacted by the proposal.. The majority of the impact area is within the north of the development footprint in association with the Grafton Road intersection.

The EPBC Act Referral Guidelines for the Koala (DoE 2014) documented the 'Koala habitat assessment tool' to assist proponents in determining if a proposal may impact on habitat critical to the survival of the Koala. This tool only applied while the Koala was listed as 'Vulnerable', as it is now listed as 'Endangered' the tool no longer applies. A habitat assessment was undertaken in Appendix F and concluded an assessment of significance was required. This is provided in Appendix G.

The summary in Table 7-7 below concludes significant impacts are not anticipated and therefore referral to the federal government is not recommended.

Table 7-7: 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 Spot-tailed Quoll	No	No	No	No	No	No	No	No	No	No
Petrogale 94enicillate Brush-tailed Rock-wallaby	No	No	No	No	No	No	No	No	No	No
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

7.5 Limitations to data, assumptions and predictions

7.5.1 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.

7.5.2 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

- Wildlife Corridor Connectivity Enhancement Plan to improve connectivity in specific areas of the site and to maintain this improvement for the life of the project.
- 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 Groundcover 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 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, and staged clearing with, 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	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.	dripline of any mature trees. • Access and laydown in areas of White Box Yellow Box Blakely's 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	Construction	Regular	Contractor	Moderate	Sedimentation in ephemeral waterways and dams

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	development site.					
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 between infected areas and uninfected areas.	• A Weed Management procedure would be developed for the proposal to prevent and minimise the spread of weeds. This would include: o Management protocol for declared priority weeds under the Biosecurity Act 2015 during and after construction. o 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.	Construction/Operation	Regular	Contractor	Moderate	Weed encroachment
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

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
						being followed
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. ○ Unexpected threatened species finds. ○ Exclusion of vehicles through sensitive areas. ○ Rehabilitation of disturbed areas.	Construction	One-off	Contractor	Moderate	Impacts to native vegetation or threatened species for Biodiversity Management Plan not being followed
• Wildlife corridor connectivity enhancement plan to improve connectivity in specific areas of the site and to maintain this improvement for the life of the project.	The plan must target areas including the Gara River riparian corridor and the boundary to the Oxley Wild Rivers National Park. It must detail appropriate: • Land use restrictions, such as restricting or removing grazing and appropriate fencing. • Width of planting (to be	Construction and Operation	Life of project	Operator	Moderate	No benefit of enhancement if vegetation fails to establish

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	effective as a vegetated buffer, facilitating wildlife movement and providing a buffer to protect the waterway and national park). • Density of plantings. • Method of planting, appropriate to the community and function of the planting. • Timing of planting, considering appropriate seasonal windows to maximise success. • Maintenance and monitoring requirements including monthly monitoring for the first 12 months and replacement of mortalities for the first 5 years. • Be adaptive, in response to monitoring, to improve the outcomes for the life of the project.					
Preparation of a 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.	Operation	Regular	Contractor	Moderate	Weed cover and erosion may increase Native species composition may decline

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	○ Preserve the native composition as much as possible.					
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
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	• Landscape plantings will be comprised of local indigenous	Operation	Regular	Client	Moderate	Plants not surviving

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
possible) within the development site.	species.					
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
Engage a suitably qualified ecologist to undertake ongoing biodiversity monitoring and make any reasonable and feasible enhancement recommendations.	• Involve a third-party organisation to monitor and maintain biodiversity enhancement activities. • Communicate outcomes with third parties to contribute knowledge of how biodiversity can be preserved on solar farms.	Operation	Regular	Contractor	Moderate	Lack of interest from third parties
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 nesting boxes for birds and	• Nesting boxes would be	Construction	Regular	Client	Low	Use of nesting

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
mammals across the development site.	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.					boxes by exotic pest animals

8.2 Management Plan Scope

The key vehicles to ensure the measures are implemented are the management plans. All three plans will commence in construction and continue throughout operation. An outline of their scope is summarised as follows in Table 8-2.

Table 8-2 Management plan scope outline

Plan	Aim	Areas to which this plan applies	Relevant targets
Biodiversity management plan	To manage vegetation and habitat impacts within development footprint and guide rehabilitation of areas not required for operation. To protect and enhance any exclusion zones being avoided by the project.	The development footprint including exclusion areas	• Adherence to development footprint boundary • Invasive weeds eradicated • Reuse of habitat resources • Enhancement of exclusion zones - native cover and composition to BAM benchmark and improving specific to each zone • Disturbed areas progressively rehabilitated in line with the Groundcover management plan.
Groundcover management plan	To assist to minimise impacts and thereby avoid extensive rehabilitation actions, provide clear triggers for action, and provide strategies to develop and maintain a resilient	All areas to be disturbed areas not required in operation and the under-panel areas	Where perennial native cover exists, this should be protected as much as possible to preserve stability and seed source for the operational phase of the project. The aim of the rehabilitation and revegetation is to stabilise disturbed areas and to return it to a condition that is similar to its pre-disturbance state, meaning that native groundcover comprising

Plan	Aim	Areas to which this plan applies	Relevant targets

	groundcover that will persist for the operational life of the project		vegetation plant communities are returned to these locations.
			The following targets have been established:
			• Rehabilitate all disturbed areas not required for the operation of the solar farm.
			• Revegetation of disturbed areas will have 70% ground cover over 90% of disturbed areas within 12 months of establishment and maintained throughout operation until contract completion:
			  ○ Failed vegetation patches greater than 5 m^2 will be revegetated.
			  ○ Ground cover will achieve seed set across at least 80% of area.
			  ○ Native species will be used for revegetation wherever practicable in areas identified as native grassland as well as exotic vegetation.
			• If less than 70% ground cover over 90% of disturbed areas within 12 months of establishment corrective actions would be implemented:
			  ○ Actions as mentioned above.
			  ○ Scours greater than 50 mm deep and 100 m long will be revegetated.
			  ○ Targeted weed control measures will be implemented if weed cover exceeds 10% of groundcover or if priority weeds are detected.
			  ○

Wildlife corridor connectivity enhancement plan	to improve connectivity in specific areas of the site and to maintain this improvement for the life of the project	Area yet to be defined but must include the Gara River riparian corridor and the boundary to the Oxley Wild Rivers National Park; see targets.	The plan must target areas including: • The Gara River riparian corridor: ○ Enhance tree cover and then shrub cover successionally to enhance bank stabilisation. Supplementing ground cover would be considered.

Plan	Aim	Areas to which this plan applies	Relevant targets
			○ Use species appropriate to the location of planting (PCT 84 close to the banks, PCT 510 at distance). • The boundary to the Oxley Wild Rivers National Park: ○ Enhance tree cover to improve the buffer between the park and adjacent land uses on the project site. ○ Use species appropriate to the location of planting (PCT 567 and PCT 510). • Detail appropriate: ○ Land use restrictions, such as restricting or removing grazing and appropriate fencing. ○ Width of planting (to be effective as a vegetated buffer, facilitating wildlife movement and providing a buffer to protect the waterway and national park). ○ Density of plantings. ○ Method of planting, appropriate to the community and function of the planting. ○ Timing of planting, considering appropriate seasonal windows to maximise success. ○ Maintenance and monitoring requirements including monthly monitoring for the first 12 months and replacement of mortalities for the first 5 years. • Be adaptive, in response to monitoring, to improve the outcomes for the life of the project. • Commence implementation concurrent with construction, to continue for the life of the project.

8.3 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)

9.1 Threatened ecological communities

One TEC will be impacted by the proposal that is listed as a potential SAII entity by BCD. This is the:

- White Box-Yellow Box- Blakely's Red Gum Woodland (Box-Gum Woodland).

The Box-Gum Woodland TEC is potentially at risk of a serious and irreversible impact according to Principles 1 and 2:

1. It 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.
2. It 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.

The higher quality areas contain trees and have a VIS score above 30. Accordingly, only these zones (2 & 4) are used in the SAII assessment, see section 0.

9.2 Threatened species

Two threatened species community will be impacted by the proposal that are listed as potential SAII entities in the Guidance to assist a decision-maker to determine a serious and irreversible impact. These species are:

- The Tusked Frog
- The Glandular Frog

The Tusked Frog is potentially at risk of a serious and irreversible impact according to Principles 2 and 4:

> 2.It 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.
>
> 4.The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity, and therefore its members are not replaceable.

The Glandular Frog is potentially at risk of a serious and irreversible impact according to Principle 4:

> 4.The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity, and therefore its members are not replaceable.

An assessment of impacts to the Tusked Frog and Glandular Frog is provided in section 9.4.1, and 0, respectively.

9.3 Additional potential entities

No further species were considered to be potential SAII entities.

9.3.1 Data and information used in SAII assessment

The following information sources were used in the SAII Assessments:

- DPE Threatened Species Profile (2022). Tusked Frog population in the Nandewar and New England Tableland Bioregions - profile https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10032
- DPE Threatened Species Profile (2022). White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions.
- NSW threatened Species Scientific Committee (TSSC), (2020) Final determination - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, NSW Government
- Threatened Biodiversity Database Collection (TBDC), NSW Government accessed at https://www.environment.nsw.gov.au/AtlasApp/Default.aspx June 2022
- Commonwealth Conservation Advice – Box Gum Grassy Woodland and derived native grasslands
- AmphibiaWeb 2008 Adelotus brevis: Tusked Frog <https://amphibiaweb.org/species/3484> University of California, Berkeley, CA, USA. Accessed Jun 5, 2022.
- NSW Scientific Committee (2001). Tusked frog (Adelotus brevis) population, Nandewar and New England Tablelands bioregions – endangered population listing. Final Determination. Accessed at https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2000-2003/tusked-frog-adelotus-brevis-endangered-population-listing June 2022.

9.4 Assessment of Serious and Irreversible Impacts

9.4.1 Tusked Frog

An assessment of impacts to the Tusked Frog is provided in Table 9-1 below. Figure 9-1 shows the predicted area of this species within the development site.

Table 9-1 Tusked Frog SAII Assessment

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
1.The assessor is required to provide further information in the BDAR or BCAR for any species at risk of an SAII, including the action and measures taken to avoid the direct and indirect impact on the species at risk of an SAII. Where these have been addressed elsewhere the assessor can refer to the relevant sections of the BDAR or BCAR.

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
The Tusked Frog was not detected within the development site but was unable to be adequately surveyed so in accordance with the BAM was assumed to be present on site. A species polygon was created using associated PCTS within a 500m buffer from the Gara River. The impacts to the Tusked Frog within the development footprint is comprised of clearing a small area along Gara Road, and in the far north of the development site for access. The remaining area would have solar panel placement and would not involve clearing works. All areas covered by the species polygon, except the area for access from Grafton Road, are surrounded by land that has been predominantly cleared, then grazed and/or cropped int the past. Consideration of water contamination has been undertaken in this BDAR V3.1 through having greater setbacks from Gara River. Impacts to this SAII population have been avoided where possible, with approximately 543.8 ha of potential habitat within the Development Site, and only 34.52ha (6.3%) potentially impacted. Much of the area where they are predicted to occur would involve panel placement not vegetation clearance. Post works, the species would be able to move underneath and between the panels.
2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including: **a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:** **i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or** **ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites**
The Tusked Frog is not listed as a SAII under Principle 1.
b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by: **i. an estimate of the species' current population size in NSW, and** **ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and** **iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations**
TBCD (2022) database states < 50 individuals or < 250 individuals where threats are known. An estimate of the decline in the species' population size in NSW is not available on the TBCD 2022 database or in the NSW Scientific Committee - final determination. Website 'Amphibiaweb' provided some detail, stating that the extent of occurrence for this species is approximately 480,700km2, however this includes QLD and NSW (there is no separated state data). The New England Tablelands and Nandewar population of Tusked Frog represents a distinct and disjunct high-elevation population that is at the western limit of the species' range in NSW. The Final determination (2001) states historically they occurred west in the Nandewar Bioregion (adjacent to the New England Tablelands) and were recorded in 'most parts' of the later mentioned bioregion. The Final Determination also states that after 10 years of surveys there was only

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
one record, which was from 1992 in the far south of the New England Tablelands. A search on BioNet for this endangered population on 6 June 2022 found 18 records ranging from 1992 to 2020. No data available on estimate number or percentage of mature individuals. There is no data available to determine if the species is likely to undergo extreme fluctuation.
c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: **i. extent of occurrence** **ii. area of occupancy** **iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and** **iv. whether the species' population is likely to undergo extreme fluctuations**
The Tusked Frog is not listed as a SAII under Principle 3.
d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because: **i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g., species is clonal) on, a biodiversity stewardship site** **ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g., karst systems) on a biodiversity stewardship site, or** **iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g., frogs severely impacted by chytrid fungus).**
TBCD (2020) states the following: "found near ponds, creek and ditches; call when hidden in vegetation or debris; breeding occurs Spring to Summer (peaking in late Spring; deposit their eggs in nests that are under leaf litter or other cryptic sites for e.g., old yabbie burrows". The NSW Guideline for Threatened Frogs (2020) notes potential habitat as 'breeding habitat including still or very slow-flowing sections of permanent streams or pools (e.g., farm dams) located on the subject land. Along with non-breeding habitat being 'suitable native vegetation surrounding the breeding site and located on the subject land'. They have been found in natural and artificial habitat in both pristine and highly degraded habitat (https://amphibiaweb.org/species/3484). They prefer relatively still water and have been found in large swamps, low woodlands, open grasslands, rainforest, wet and dry sclerophyll forest, in flooded depressions, ponds, temporary pools on the side of roads, in permanent fire dams, on small and on the banks of large and small streams (https://amphibiaweb.org/species/3484). Threats listed on the NSW threatened species profile include: • Historical population decline from chytrid fungus, particularly of higher altitude, cooler tableland populations. Note: unknown if works would cause further issues. Groundcover management would occur post works and a Wildlife corridor connectivity enhancement plan would be implemented which would include revegetation works along Gara River. • Reduced water quality including eutrophication from agricultural fertiliser and pesticides. Note: the

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
subject land is agricultural land, and these processes may have been occurring for some time. The project would lead to a reduction in agricultural practices and include the implementation of a wildlife corridor connectivity enhancement plan. • Destruction and disturbance of streamside and pond habitat by domestic or feral herbivores. Note: the project involves the introduction of the Wildlife corridor connectivity enhancement plan which includes revegetation along Gara River for habitat protection. • Predation of eggs and tadpoles by introduced fish species such as the Plague Minnow and Trout. It is unknown if this is an issue currently on the Subject Land. The works are not predicted to cause or increase this threat due to increased care of the land with the implementation of the Wildlife corridor connectivity enhancement plan • Habitat loss and degradation from agricultural and urban development. Note: the Subject Land has been used as agricultural land for some time. The project involves the introduction of the Wildlife corridor connectivity enhancement plan. Urban development is not a part of the project. • Altered hydrological regimes including irrigation, and diversion and impoundment of water affecting habitat, including water flow and retention. Note: Groundwater supplies and levels are unlikely to be affected by the proposal plant and no groundwater is anticipated to be intercepted or extracted. The project would involve erosion and sedimentation controls, as well as a Biodiversity Management Plan and Wildlife corridor connectivity enhancement plan which would encourage a healthy ecosystem. Consideration of water contamination has been undertaken in this BDAR V3.1 through having greater setbacks from Gara River. • Small population size with no recent sightings indicating its numbers are likely reduced to a critical level if not already extinct. Note: there have been no sightings of this species within 10km of the Subject Site. The works would involve a reduction in herbivore access to the Gara River and increase in native vegetation along the river with the implementation of the Wildlife corridor connectivity enhancement plan • Drought and stream drying affecting viable habitat, although potentially, climate change and increased temperatures may attenuate some impacts of chytrid fungus. Note: the land has been used for agricultural purposes for some time, it is likely these currently occur. The project would involve erosion and sedimentation controls, as well as a Biodiversity Management Plan and Wildlife corridor connectivity enhancement plan which would encourage a healthy ecosystem Activities listed on the NSW threatened species profile page relevant to the subject land include: • Help prevent the spread of introduced fish. • Take care with the use of pesticides and other chemicals near wetlands, ponds and streams. • Fence streams and ponds to protect from grazing stock and encourage regeneration. • Protect native vegetation bordering streams and ponds from clearing or disturbance. • Clean footwear, equipment and tyres before and after visiting frog sites. • Report any records to the DPE. The above mentioned can be included in the Wildlife corridor connectivity enhancement plan.
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.2(2.), the assessor must record this in the BDAR or BCAR.

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
There is no data provided in the TBDC
4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on: **a. the impact on the species' population (Principles 1 and 2) presented by:** **i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and** **ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or** **iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal**
This species has been assumed to be present based on the presence of potentially suitable habitat. Up to 34.52ha (6.3%) would be potentially impacted. 509.3 ha of potential habitat would be retained in the development site. The majority of the impact area would be available for the Tusked Frog post groundcover management works as it is considered likely the species could move under and around panels. A search on BioNet for this endangered population on 6 June 2022 found 18 records ranging from 1992 to 2020. The closest record is approximately 79.5km south of the Subject Land from 2007. Although there is potentially suitable habitat for this species within the development site, it is unlikely that there are individuals or a population of this species within the Development Footprint as there are no known populations of this species within a 10km radius of the development site.
b. impact on geographic range (Principles 1 and 3) presented by: **i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW** **ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted** **iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g., seed dispersal) and pollination distance for the species** **iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.**
The Tusked Frog is not listed as a SAII under Principles 1 or 3.

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
5. The assessor may also provide new information that can be used to demonstrate that the principle identifying the species as at risk of an SAII, is inaccurate.
n/a

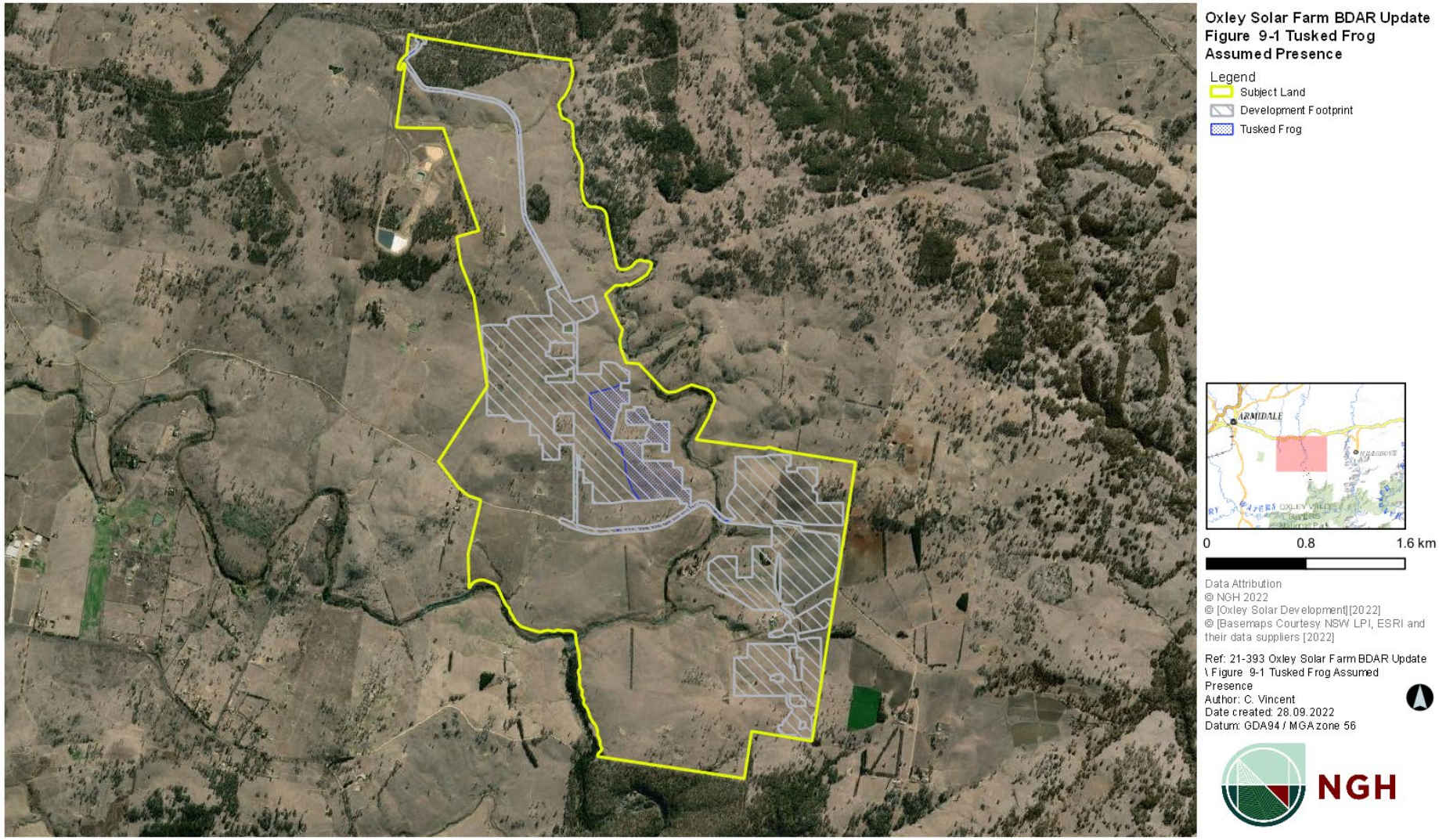

Figure 9-1 Tusked Frog Assumed Presence

9.4.2 Glandular Frog

An assessment of the impacts to the Glandular Frog was undertaken in Table 9-2 below. Figure 9-2 shows the predicted area of this species within the development site.

Table 9-2 Glandular Frog SAII Assessment

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
1.The assessor is required to provide further information in the BDAR or BCAR for any species at risk of an SAII, including the action and measures taken to avoid the direct and indirect impact on the species at risk of an SAII. Where these have been addressed elsewhere the assessor can refer to the relevant sections of the BDAR or BCAR.
The Glandular Frog was not detected within the development site but was unable to be adequately surveyed so in accordance with the BAM was assumed to be present on site. A species polygon was created using associated PCTS within a 200m buffer from the Gara River. The impacts to the Glandular Frog within the development footprint is comprised of clearing a small area along Gara Road, and in the far north of the development site for access. The remaining area would have solar panel are surrounded by land that has been predominantly cleared, then grazed and/or cropped int the past. Consideration of water contamination has been undertaken in this BDAR V3.1 through having greater setbacks from Gara River. There is approximately 301.45ha of potential habitat within the Development Site. Impacts to this SAII population have been avoided where possible, with approximately 301.45 ha of potential habitat within the Development Site, and only 6.76ha (2.24%) potentially impacted. Up to 294.7 ha 97.76%) would be retained within the development site. Much of the area where they are predicted to occur would involve panel placement not vegetation clearance. Post works, the species would be able to move underneath and between the panels.
2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including: **a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:** **i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or** **ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites**
The Glandular Frog is not listed as a SAII under Principle 1.
b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by: **i. an estimate of the species' current population size in NSW, and** **ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and**

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations
The Glandular Frog is not listed as a SAII under Principle 2.
c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: **i. extent of occurrence** **ii. area of occupancy** **iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and** **iv. whether the species' population is likely to undergo extreme fluctuations**
The Glandular Frog is not listed as a SAII under Principle 3.
d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because: **i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g., species is clonal) on, a biodiversity stewardship site** **ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g., karst systems) on a biodiversity stewardship site, or** **iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g., frogs severely impacted by chytrid fungus).**
No evidence to suggest point 'i' or 'ii'. TBCD (2020) says the following: "found along streams in rainforest, subalpine swamps or in dry and moist eucalypt forest; breeding in Summer, and possibly Spring" The following information was obtained from AmphibiaWeb database (2008): "generally start calling In August and stop early in December; recorded calling along permanent streams while on logs or in low vegetation e.g., Lomandra sp; eggs are attached to submerged vegetation in heavily shadowed stream sections". Threats listed on the NSW threatened species profile include: • Clearing of habitat for agriculture or development. Note: the Subject Land has been used as agricultural land for some time. The project would lead to a reduction in herbivores access along Gara River with the introduction of the Wildlife corridor connectivity enhancement plan. • Habitat disturbance from timber harvesting. Timber harvesting is not a part of the project. • Alteration to stream flows resulting from development. Note: Groundwater supplies and levels are unlikely to be affected by the proposal plant and no groundwater is anticipated to be intercepted or extracted. The project would involve erosion and sedimentation controls, as well as a Biodiversity Management Plan and Wildlife corridor connectivity enhancement plan which would encourage a healthy ecosystem. Consideration of water contamination has been undertaken in this BDAR V3.1 through having greater setbacks from Gara River.

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
• Reduction in water quality through pasture fertilisation and weed spraying. Note: the subject land is agricultural land and these processes may have been occurring for some time. The project would lead to a reduction in agricultural practices. • Reduction of leaf-litter and cover of fallen logs through grazing and associated burning. Over 95% of the area to be impacted by the works that is suitable for this species does not contain overstorey plants. The project would lead to a reduction in agricultural practices, and revegetation works would occur post construction. Including vegetation planting along Gara River through the implementation of the Wildlife corridor connectivity enhancement plan. • Chytrid fungal disease. Note: unknown if works would cause further issues. • Degradation of habitat by weeds. Note: weed control would occur as a part of the project. • Reduction in water quality from cattle access to streams. The project would lead to a reduction in herbivores access along Gara River with the introduction of the Wildlife corridor connectivity enhancement plan. • Impact of vertebrate pest species including pigs. Note: unknown. Gara River is predominantly fenced off from vertebrates currently. • Potential for predation on eggs and tadpoles by introduced trout. Note: It is unknown if this is an issue currently on the Subject Land. The works are not predicted to cause or increase this threat due to increased care of the land with the implementation of the Wildlife corridor connectivity enhancement plan • Poor knowledge of species' ecology and population dynamics. The species would be documented if seen on site. Activities listed on the NSW threatened species profile page relevant to the subject land include: • Avoid burning off in moist grassy habitats between December and April • Maintain vegetation and leaf-litter around ponds, dams, drainage lines and other moist areas • Conserve natural local patterns of flooding • Protect streams from pollution • Fence off suitable habitat to protect it from grazing and provide off-stream watering points for domestic stock • Exclude logging around breeding habitat • Control weeds • Manage and control pest species including feral pigs and introduced fish in accordance with approved Threat Abatement Plans • Clean footwear, equipment and tyres before and after visiting frog sites. What has not already been considered above can be included in the Wildlife corridor connectivity enhancement plan.
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.2(2.), the assessor must record this in the BDAR or BCAR.

Criteria for assessment of Threatened Species at risk of serious and irreversible impacts
There is very little information available on this species in the TBDC.
4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on: **a. the impact on the species' population (Principles 1 and 2) presented by:** **i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and** **ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or** **iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal**
The Glandular Frog is not listed as a SAII under Principle 1 or 2.
b. impact on geographic range (Principles 1 and 3) presented by: **i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW** **ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted** **iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g., seed dispersal) and pollination distance for the species** **iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.**
The Glandular Frog is not listed as a SAII under Principles 1 or 3.
5. The assessor may also provide new information that can be used to demonstrate that the principle identifying the species as at risk of an SAII, is inaccurate.
N/A

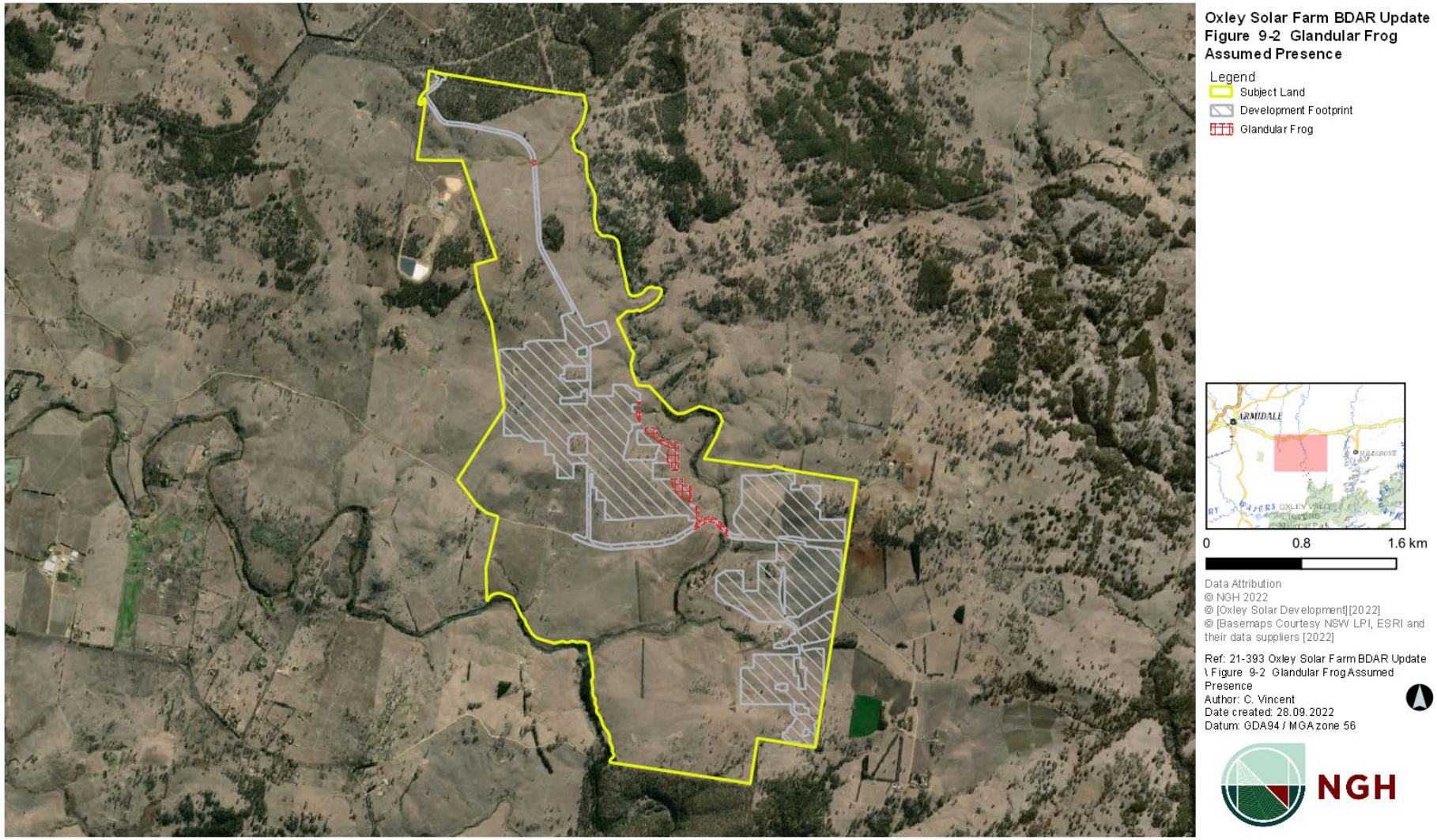

Figure 9-2 Glandular Frog Assumed Presence

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

An assessment of the impacts to Box-gum Woodland was undertaken in Table 9-3 below. Figure 9-3 shows the location of the SAII Box-gum Woodland within the development site.

Table 9-3 Box Gum Woodland SAII Assessment

Criteria for assessment of TECs at risk of serious and irreversible impacts
1. The assessor is required to provide further information regarding the impacts on each TEC at risk of SAII. This must include the actions and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAII.
The impacts to Box-Gum Woodland within the development site is comprised of clearing small patches of PCT 567 (a sum of 1.13 ha) and PCT 510 woodland (a sum of 0.55 ha), totalling 1.681ha. All patches except one in the far north are within the middle of a cleared agricultural paddock that undergoes regular cropping and grazing. There is 52.7ha of PCT 510 woodland within the development site, clearing equates to 1.02% of this PCT. There is 66.45 ha of PCT 567 woodland within the development site, clearing equates to 1.7% of this PCT. Impacts to this SAII TEC have been avoided where possible, with a maximum of 1.68ha (1.4 % of TEC within Development Site) proposed to be impacted, the large majority, approximately 117.48ha (98.6%), of SAII TEC within the Development Site will be retained. No solar panels would be installed in areas of the SAII Box Gum Woodland. The only impacts that cannot be avoided are now proposed within this vegetation, this includes some clearing in the access area from Grafton Road, limited fencing and access alignments. Small, isolated patches of woodland vegetation are unable to be avoided because the size constraints of the solar panels and trackers are unable to adapt around small patches of vegetation.
1. The assessor must consult the TBDC and/or other sources to report on the current status of the TEC, including: **a. Evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal).**
The reduction in Geographic Distribution is defined as greater than 80% in ten years or three generations. (TBDC, 2022). The current total geographic extent of the TEC in NSW and the estimated reduction in geographic extent of the TEC since 1970 is not defined in the TBDC, however a search of Bionet PCT data was undertaken. The percent reduction in extent for PCT 510 is 79% with an estimated 155,000ha pre-European extent and current extent to be 32,000 ha. The percent reduction in extent for PCT 567 is 62% with an estimated 47,000ha pre-European extent and current extent to be 18,000ha.
b. Extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by: **i. Change in community structure** **ii. Change in species composition**

Criteria for assessment of TECs at risk of serious and irreversible impacts
iii. Disruption of ecological processes **iv. Invasion and establishment of exotic species** **v. Degradation of habitat** vi. **Fragmentation of habitat.**
The TEC has been subjected to grazing and clearing for agricultural purposes since the early 1800s due to its occurrence on moderate to high fertility soils, leading to extensive structural and compositional degradation, including loss of the upper stratum during land clearing activities, and failure of the stratum to regenerate. Grazing is also associated with ground compaction, erosion, and ground enrichment of the topsoil, leading to degradation of the lower stratum, including the partial or complete replacement of tussock forming grasses, shrubs and forbs, and the proliferation in many places of bracken thickets. Grazing impacts have been further exacerbated by the application of chemical fertilisers, removal of large trees, tilling of the soil and sowing of exotic crop species. Remnants are placed further at threat by the invasion of naturalised exotic plants, dryland salinity due to elevated water tables, and elevated soil nitrogen as a result of the application of chemical fertilizers.
c. Provide evidence of restricted geographic distribution (Principle 3, clause 6.7(2)l BC Regulation), based on the TEC's geographic range in NSW according to the: **i. Extent of occurrence** **ii. Area of occupancy** iii. **Number of threat-defined locations.**
According to the Final Determination to list the TEC as Critically Endangered, the distribution of Box Gum Woodland is not restricted. The extent of occurrence of the TEC is 702,800 square km based on a minimum convex polygon enclosing known occurrences of the community using the method of assessment recommended by IUCN. The estimated area of occupancy (AOO) is 151,100 square km based on 10x10 km grid cells, the scale recommended for assessing AOO by IUCN and applying a minimum occupancy threshold of 1% (NSW TSSC, 2020).
d. Provide evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation).
The TEC is not listed as a SAII under Principle 4.
2. In relation to the impacts from the proposal on the TEC at risk of an SAII, the assessor must include data and information on: **a. The impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal** **i. In hectares** ii. **As a percentage of the current geographic extent of the TEC in NSW.**
1.68 ha of Box-Gum Woodland would be directly impacted by the proposal through vegetation

Criteria for assessment of TECs at risk of serious and irreversible impacts
clearing for fencing and access purposes, comprised of 1.13ha of PCT 567 and 0.55ha of PCT 510. No indirect impacts are considered to occur with the no changes in fire regime, fragmentation or changes to species composition anticipated for retained vegetation with the implementation of a Biodiversity Management Plan (BMP) and Wildlife Corridor Connectivity Enhancement Plan (WCCEP). NSW Threatened Species Scientific Committee (2020) estimates the AOO is 151,100km2 of Box-gum Woodland remaining in the NSW South Western Slopes IBRA Region. Approximately 2.61 ha is proposed to be removed which is <0.00017% of the estimated extent remaining.
b. The extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by i. **Estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the Development footprint or equivalent area for other types of proposals**
1.68 ha of SAII (zone 2 and 4 which have VIS scores above 30) Box-gum Woodland would be removed. Approximately 52.16ha of PCT 510 SAII woodland and 65.32 ha of PCT 567 SAII woodland within the development site would be avoided by the development which would improve in condition through biodiversity enhancement (BMP and WCCEP) proposed by the proponent and reduced impacts of cropping. The project would involve erosion and sedimentation controls, as well as a implementation of a Biodiversity Management Plan, a Groundcover Management Plan and a Wildlife corridor connectivity enhancement plan which would encourage a healthy ecosystem. Consideration of water contamination has been undertaken in this BDAR V3.1 through having greater setbacks from Gara River.
ii. Describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by: ○ **Detailing the distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed** ○ **Estimating maximum dispersal distance for native flora species characteristic of the TEC** ○ **Providing other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the Development.**
The Box-Gum Woodland within the development site and locality is highly fragmented occurring in small, isolated patches (Figure 9-3) due to previous clearing for agricultural purposes. The proposal would largely involve removing vegetation from patch edges rather than breaking apart large patches of vegetation into many smaller patches. The patches to be impacts are small. Eucalypts have low seed dispersal distances usually similar to the height of the tree (around 20m), so the patches are unlikely to be contributing to seed dispersal. The larger patch in the north is segregated by the road. This small area to clear is unlikely to impact on seed dispersal.
iii. Describing the condition of the TEC according to the vegetation integrity score for the

Criteria for assessment of TECs at risk of serious and irreversible impacts
relevant vegetation zone(s) (Chapter 4.3), including the relevant composition, structure and function condition scores for each vegetation zone.

1.68 ha of SAII Box-Gum Woodland (VIS score above 30) would be impacted by the proposal, comprising 1.13ha of PCT 567 and 0.55 ha of PCT 510.

Both PCTs occur in isolated patches, except for a section in the north of PCT 510. PCT 110 is in good condition.

Table 9-4 SAII Box-Gum Woodland impacted

Zone ID	Zone Description	Impact Area	Composition score	Structure score	Function score	Vegetation Integrity Score
2	PCT 510 Woodland	0.55	63.7	66.1	77.8	**69.0**
4	PCT 567 Woodland	1.13	29.6	32.9	54.9	**37.7**

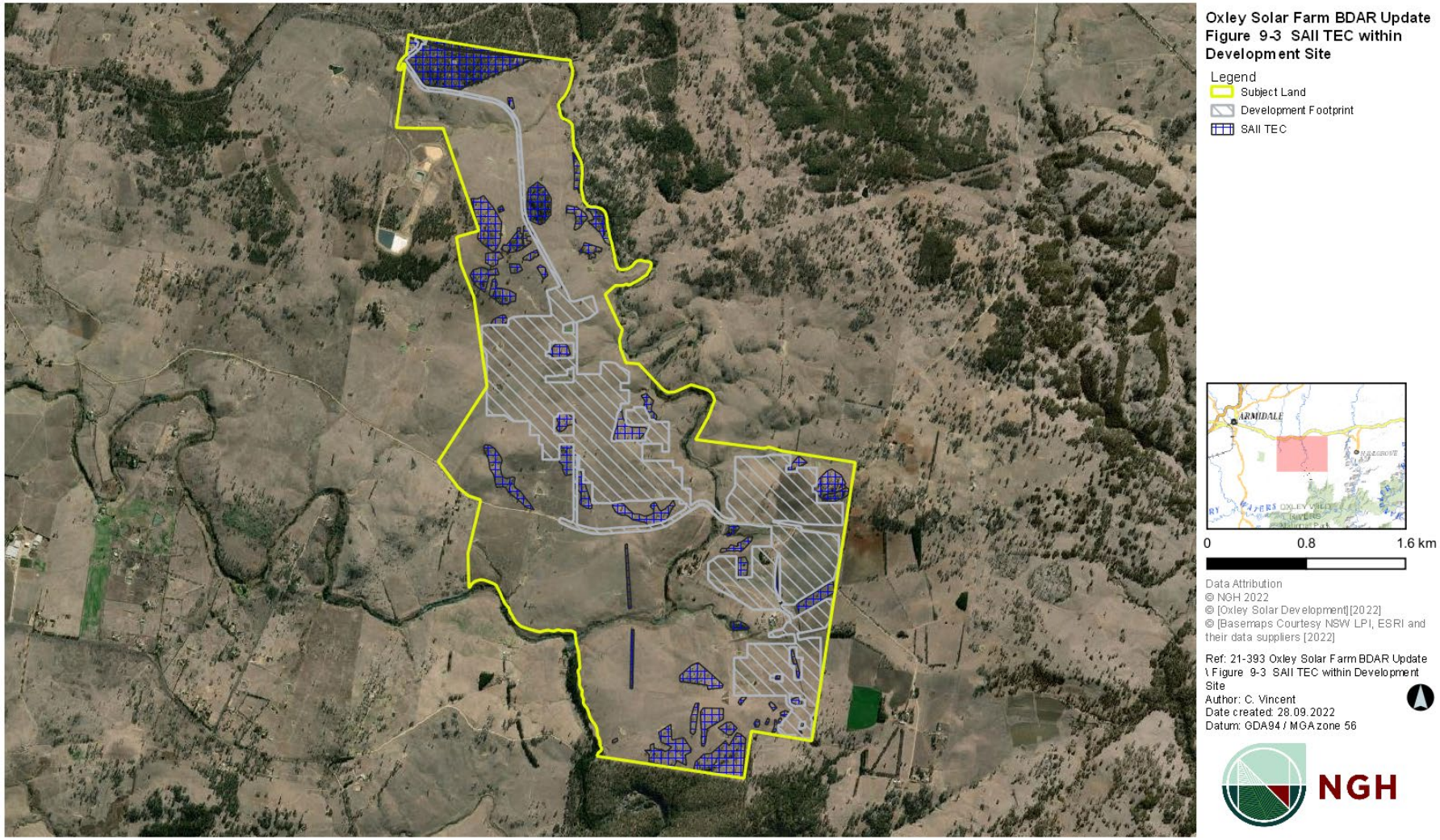

Figure 9-3 SAII TEC within Development Site

10. Impacts Requiring an Offset

10.1 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	Impact 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	0.29	49.8	5
2	510_Woodland	Blakely's Red Gum – Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	0.55	69.0	24
3	510_Derived Native Grassland	Blakely's Red Gum – Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	2.12	26.6	35
4	567_Woodland	Broad-leaved Stringybark – Yellow Box shrub/grass open forest of the New England Tableland Bioregion	1.13	37.7	27
5	567_Derived Native Grassland	Broad-leaved Stringybark – Yellow Box shrub/grass open forest of the New England Tableland Bioregion	88.58	24.6	1363
6	84_Sedgeland	River Oak – Rough-barked Apple – red gum – box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	0.11	76.4	3
Class number	**PCT ID**	**Class name**	**No. of trees impacted**	**Hollows**	**Ecosystem credits required**
3	510_scattered trees	510 Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion	2	Yes	2

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

10.1.1 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 (Assumed Presence)	Species credits required
Tusked Frog ***Adelotus brevis*** **(Endangered population in the Nandewar and New England Tableland Bioregions)**	3.0	0.29 ha PCT 84 Riparian (Zone 1) 0.11 ha PCT 84 Sedgeland (Zone 6) 0.94 ha PCT 510 DNG (Zone 3) 32.73 ha PCT 567 DNG (Zone 5) 0.18 ha PCT 510 Woodland (Zone 2) 0.27 ha PCT 567 Woodland (Zone 4)	657
Glandular Frog ***Litoria subglandulosa***	3.0	6.36 ha of PCT 567 DNG (Zone 5) 0.29 ha of PCT 84_Riparian (Zone 1) 0.11 ha of PCT 84_Sedgeland (Zone 6)	134
Southern Myotis ***Myotis macropus***	2.0	0.12 ha of PCT 510_DNG (Zone 3) (within 200m of waterbody) 24.13 ha of PCT 567 DNG (Zone 4) (within 200m of waterbody)	299
Hawkweed ***Picris evae***	2.0	0.55 ha of PCT 510 Woodland (Zone 2)	19
Austral toadflax ***Thesium australe***	1.5	0.55 ha of PCT 510 Woodland (Zone 2) 2.12 ha of PCT 510_DNG (Zone 3) 1.13 ha of PCT 567_Woodland (Zone 4) 88.58 ha of PCT 567_DNG (Zone 5)	869

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

10.1.2 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.

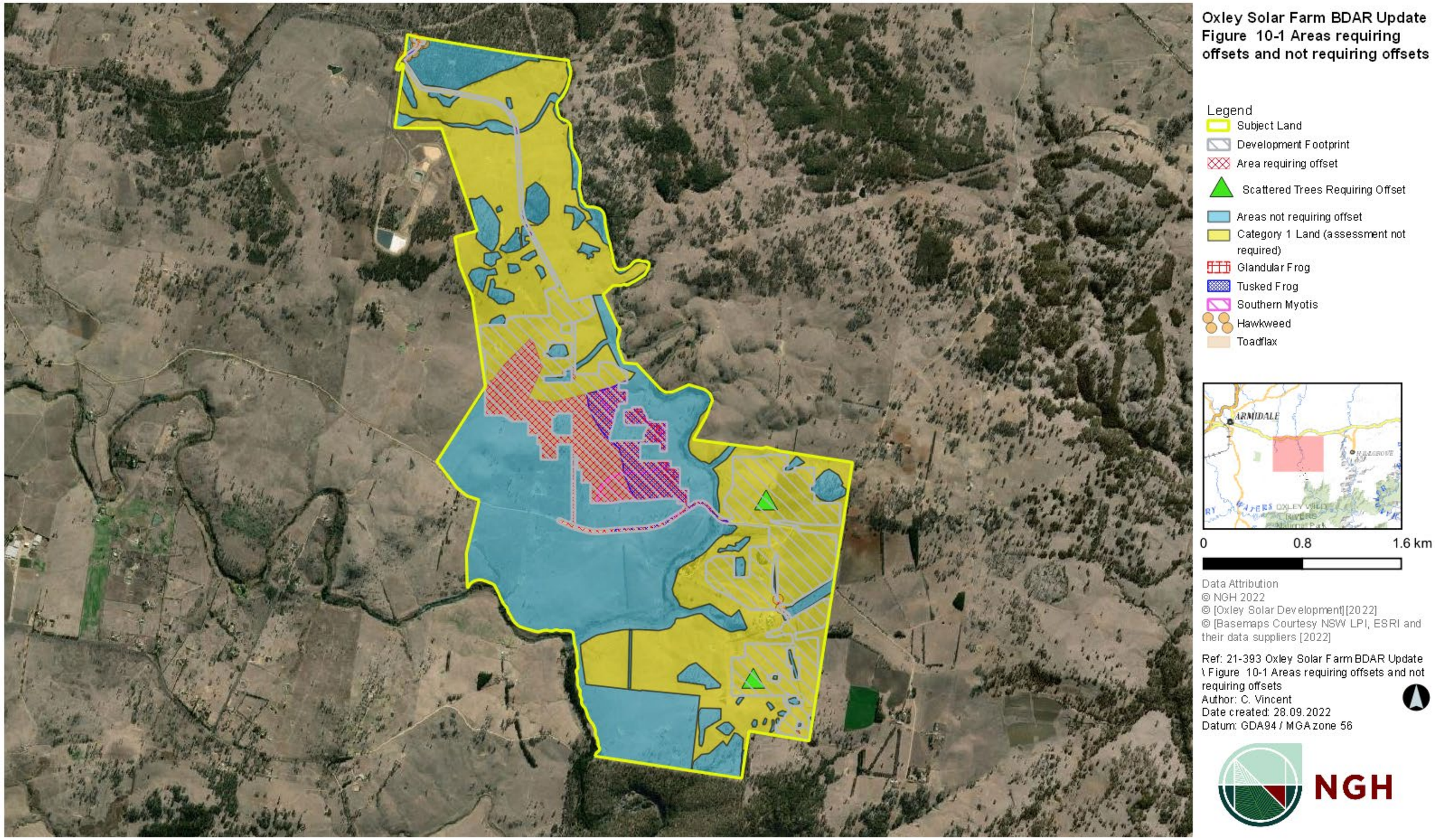

Figure 10-1 Impacts requiring offset, not requiring offset and not requiring assessment

11. Conclusion

11.1 NSW BAM assessment

NGH has prepared this BDAR for the Oxley Solar Farm. The purpose of this BDAR is 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

BDAR Version 2.2 was publicly exhibited to support the Environmental Impact Statement (EIS) lodged for this project in March 2021. In response to the public and agency submissions, the Oxley Solar Farm has made significant additional changes to the proposal including:

- Increased setbacks to Gara River and Oxley Wild Rivers National Park
- Reduced SAII impacts for Box-Gum Woodland
- More certainty in relation to impact areas
- Strengthened mitigation strategies in relation to biodiversity offsets and wildlife corridor connectivity.

In this updated assessment to support the Oxley Solar Farm Amendment Report, the key results of BDAR V3.0 are now:

- Impacts to 92.78 ha of native vegetation will generate ecosystem credits for the project. This includes:
    - 1.68 ha of Box Gum Woodland TEC (SAII)
    - 90.70 ha of Box Gum Woodland TEC derived grassland (around 70% of this would be impacted by panel shading rather than direct removal). (SAII now excluding zones with VIS below 30)
    - 0.28ha PCT 84 Riparian
    - 0.11ha of PCT 84 Sedgeland
    - 5 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*

- Five 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	5
2	510_Woodland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	24
3	510_Derived Native Grassland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	35
4	567_Woodland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	27
5	567_Derived Native Grassland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	1363
6	84_Sedgeland	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	3
Scattered Trees	510	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	2

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	0.29 PCT 84 Riparian (Zone 1) 0.11 PCT 84 Sedgeland (Zone 6) 0.94 PCT 510 DNG 32.73 PCT 567 DNG 0.18 PCT 510 Woodland 0.27 PCT 567 Woodland	657
Glandular Frog *Litoria subglandulosa*	3.0	0.29 PCT 84 Riparian (Zone 1) 0.11 PCT 84 Sedgeland (Zone 6) 6.36 PCT 567 DNG (zone 5)	134
Southern Myotis *Myotis macropus*	2.0	0.12 ha of PCT 510_DNG (Zone 3) (within 200m of waterbody)	299

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost	Species credits required
		24.13 ha in Zone 4: PCT 567 DNG (within 200m of waterbody)	
Hawkweed ***Picris evae***	2.0	0.55ha of PCT 510 Woodland (Zone 2)	19
Austral toadflax ***Thesium australe***	1.5	0.55 ha of PCT 510_Woodland (Zone 2) 2.12 ha of PCT 510_DNG (Zone 3) 1.13 ha of PCT 567_Woodland (Zone 4) 88.58 ha of PCT 567_DNG (Zone 5)	869

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. The project's first preference is to maximise the generation of credits on the residual areas of the project site, to be established as a new in perpetuity stewardship site under the Biodiversity Offsets Scheme (BOS). Where credits cannot be generated efficiently onsite, the remainder will be achieved by purchasing credits under the BOS or making payments into the Biodiversity Conservation Fund using the offset payments calculator.

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.

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

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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)
- Julie Gooding (BAM Assessor BAAS 18047) – Version 3.0

Appendix C BAM Calculator Credit Report

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 meters tall. The woodland has a predominantly grassy understory 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
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

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
Vincetoxicum woollsii **EPBC – E** **BC – E**	This species is found in the Northern Rivers (NSW) and Border Rivers Maranoa–Balonne (Queensland) Natural Resource Management Regions. It has been recorded from wet sclerophyll/rainforest margins (Harden, 1992), Eucalypt dominated open forests (Leigh et al., 1984; BRI, n.d.) and disturbed road verges (NPWS, 1999). It grows on brown clay over metasediments at altitudes between 10–750 m above sea level (Quinn et al., 1995). Associated species include Eucalyptus eugenioides, E. microcorys, E. saligna, E. biturbinata, Acacia hakeoides, A. lineate, Myoporum spp., and Casuarina spp. (Forster, 1992) in NSW.	Absent Clay soil however subject land is between 920-980 asl and no associated species present	Unlikely Site is between 920-980 asl.	No Suitable habitat would not be impacted
Eucalyptus rubida subsp. Barbigerorum **Blackbutt Candlebark**	Grassy woodland on medium or high fertility soils. Often on cold flats. Eucalyptus rubida subsp. barbigerorum occurs in grassy woodland on deep, fertile clay-loam soils. Associated species include Yellow Box (Eucalyptus melliodora), Ribbon Gum (E. viminalis), Mountain Gum (E. dalrympleana subsp. heptantha) and Rough-barked Apple (Angophora floribunda).	Present Grassy woodland with some associated species	Unlikely Subject land is not in a 'known' or 'likely' area according to BCD mapping and species was not identified during site visits	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.	**No** Presence eliminated during site survey.
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	The White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal	**Absent**	**Unlikely**	**No**

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
Cynanchum elegans **EPBC – E** **BC – E**	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. Flowering occurs between August and May, with a peak in November. Flower abundance on individual plants varies from sparse to prolific.	Species absent from the development site	Development site cleared. Presence eliminated during site survey	Suitable habitat would not be impacted
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.	**No** Presence eliminated during site survey
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 ***Eucalyptus nicholii***	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** Species absent from the development site	**Unlikely** Development site cleared.	**Presence eliminated during site survey**

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
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.			
Euphrasia arguta **EPBC – CE** **BC – CE**	Euphrasia arguta was rediscovered in the Nundle area of the NSW northwestern 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.	**No** Presence eliminated during site survey
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.	**No** Presence eliminated during site survey
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

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
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	**Possible** **Known in the region and to occur in modified habitats including paddocks.**	**Yes** **Presumed present. Species polygon created. No Suitable habitat would not be impacted** **They are assumed present because of this BDAR, and credits have been generated.**
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.	**Present** Some present but development site highly degraded	**Possible** In known distribution range	**Yes** **Presumed present. Species polygon created.** They are assumed present because of this BDAR, and credits have been generated.
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. Favors 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 Areas mapping	**No** Presence eliminated during site survey
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,	**Absent** No suitable water bodies within or in proximity to development site.	**Unlikely** No suitable habitat present	**No** Suitable habitat would not be impacted

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
	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.	The Gara River 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	White-throated Needletails occur in Australia only between late spring and early autumn, but mostly in summer, when they sometimes form	**Present**	**Possible**	**No**

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
Hirundapus caudacutus **EPBC – V**	large flocks, appearing as a swirling cloud of birds. They have been seen catching flying insects at heights of more than a kilometer. Sometimes they form mixed-species feeding flocks with other swifts, such as Fork-tailed Swifts or swallows. These feeding flocks may be associated with thunderstorms, the uplift of which may assist with their flight and carry insects high into the air.	Aerial species	Development site within known distribution of species	Exclusively aerial species and not 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 southwest slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favored 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. As a dual credit species under the BC act foraging is assumed, however, the development site is not within the Important Areas mapping.	**Yes** AoS completed despite survey not recording the species
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	**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

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
	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.			
Rostratula australis **Australian Painted Snipe** **BC – E** **EPBC – E** **IBRA Sub-region: Inland Slopes, Lower Slopes**	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 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.	**Present** artificial habitats, such as farm dams and occasional waterlogged grassland present.	**Possible** No suitable habitat present	**Yes** AoS completed
Cyclopsitta diophthalma coxeni **Coxen's Fig-Parrot** **EPBC – E**	Usually recorded from drier rainforests and adjacent wetter eucalypt forest but rarely seen due to its small size and cryptic habits. Also found in the wetter lowland rainforests that are now largely cleared in NSW. The bird shows a decided preference for fig trees, but also feeds on other fruiting rainforest species, lichen, nectar and grubs.	Absent Rainforests and wet eucalypt forests not present	Unlikely No suitable habitat present	No Suitable habitat would not be impacted

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
BC - CE				
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
Spot-tailed Quoll ***Dasyurus maculatus maculatus*** **EPBC – E**	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

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
BC – V				
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. Not detected during surveys.	**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 - E** **EPBC - VE**	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 woodlands of 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	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***	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	**Absent** Development site highly degraded. Middle-storey almost entirely	**Possible** Within known distribution	**No** Suitable habitat would not be impacted

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
EPBC – V	during early to mid-stages of vegetation succession typically induced by fire.	absent. Soil 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** **Presence eliminated during site survey**
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.	**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
	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.			
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	**Possible** Within species known range, BioNet records within 10 km but	**No** Not likely to occur in this locality

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
		would be impacted	maybe extinct in the wild	
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 offshore 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.

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
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. The Spectacled Monarch prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	**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.
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.	**Absent** Large patches of connected native vegetation would	**Unlikely** No suitable habitat in subject land.	**No** No suitable habitat would be impacted by the proposal.

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
	Found to roost in tree hollows in tall trees on ridge-tops, on bark or rock faces	not 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 inland open plains to wooded areas. They are mainly exclusively aerial flying from < 1m to 300 m above ground.	**Present** Aerial species	**Possible** Development site within known distribution of species	**No** Exclusively aerial species and not 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 southwest 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

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
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
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	**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

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
	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.			
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
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	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	**Present** Suitable damp grassland and	**Possible** Suitable habitat present	**Yes** AoS completed

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
Gallinago hardwickii **EPBC - M**	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.	farm dams within the development site		
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
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***	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	**Possible** Suitable habitat present	**Yes** AoS completed

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
EMPC – M		farm dams within the development site		

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 Important Habitat Map

Appendix H BCD Consultation

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

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.

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.

Phascolarctos cinereus Koala

The Koala was 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 a 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 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.

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 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.

Phascolarctos cinereus Koala

Fragmentation of an existing population of this species into two or more populations is unlikely to occur as this species was not 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 a 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 would adversely affect habitat 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 would adversely impact habitat critical to the survival of these 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

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 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.

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 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 and *Phascolarctos cinereus* Koala

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

Dasyurus maculatus maculatus Spot-tailed Quoll 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 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.

Phascolarctos cinereus Koala

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

- The area of occupancy and estimated size of populations that are declining, suspected to be
- declining, or predicted to decline are instead stabilised then increased.
- The area of occupancy and estimated size of populations that are suspected and predicted
- to be stable are maintained or increased

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 52.7 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 0.55 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, which 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.