

**Whitehaven
Solar Farm Project**

Environmental Impact Statement

WHITEHAVEN SOLAR FARM PROJECT
BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT



October 2024
Project No. WHC-21-87
Document No. 01258012

As required by section 6.15 (1) of the NSW *Biodiversity Conservation Act 2016*, I certify that this Biodiversity Development Assessment Report has been prepared on the basis of the requirements of (and information provided under) the biodiversity assessment method.



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8 October 2024

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DEFINITIONS

BAM: the Biodiversity Assessment Method.

BC Act: the NSW Biodiversity Conservation Act 2016.

BC Regulation: the NSW Biodiversity Conservation Regulation 2017.

Biodiversity Assessment Method Calculator/BAM Credit Calculator: the online computer program that provides decision support to assessors and proponents by applying the BAM and referred to as the BAM Credit Calculator. The BAM Credit Calculator contains biodiversity data from the BioNet Vegetation Classification and the Threatened Biodiversity Data Collection that the assessor is required to use in a BAM assessment. The BAM Credit Calculator applies the equations used in the BAM, including those to determine the number and class of biodiversity credits required to offset the impacts of a development, or created at a biodiversity stewardship site. It is published by the Department.

Biodiversity Development Assessment Report (BDAR): a report prepared by an accredited person in relation to proposed development or activity that would be authorised by a planning approval, or proposed clearing that would be authorised by a vegetation clearing approval, that:

- (a) assesses in accordance with the BAM the biodiversity values of the land subject to the proposed development, activity or clearing;
- (b) assesses in accordance with the BAM the impact of proposed development, activity or clearing on the biodiversity values of that land;
- (c) sets out the measures that the proponent of the proposed development, activity or clearing proposes to take to avoid or minimise the impact of the proposed development, activity or clearing; and
- (d) specifies in accordance with the BAM the number and class of biodiversity credits that are required to be retired to offset the residual impacts on biodiversity values of the actions to which the biodiversity offsets scheme applies.

Biodiversity Offsets: the gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development.

Biodiversity Stewardship Site: means the land that is designated by a biodiversity stewardship agreement to be a biodiversity stewardship site for the purposes of the BC Act.

Broad Condition State: areas of the same Plant Community Type that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same Plant Community Type into a vegetation zone for the purpose of determining the vegetation integrity score.

Class of Biodiversity Credit: biodiversity credits that share the same attributes (refer to Subsection 10.2 of the BAM 2020).

Development Footprint: the area of land that is directly impacted on by a proposed development, including access roads and areas used to store construction materials. The term development footprint is also taken to include clearing footprint, except where the reference is to a small area development or a major project development.

Ecosystem Credits: a measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development, activity, clearing or biodiversity certification site and the gain in biodiversity values at a biodiversity stewardship site.

EPBC Act: the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Mapped Important Areas: for a small number of species for which we have extensive, long-term datasets that indicate the importance of parts of the landscape, the species credit components of their habitat will be mapped as 'important areas'. Mapping these areas seeks to address the criticism that survey rarely detects these highly mobile species, resulting in the ongoing loss of core habitat. Mapping means that if impacted by development, these important areas required for the species to persist in the wild will be offset within a mapped important area.

Native Vegetation Cover: the percentage of native vegetation cover on the subject land and the surrounding buffer area. Cover estimates are based on the cover of native woody and non-woody vegetation. Native vegetation cover includes regrowth, derived native grasslands and plantations that are comprised of plants native to New South Wales.

Plant Community Type (PCT): a NSW plant community type identified using the Plant Community Type classification system.

Serious and Irreversible Impacts (SAII): impacts likely to contribute significantly to the risk of extinction of a threatened species or ecological community in NSW.

Species Credit Species: threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits.

Species Credits: the class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.

Subject Land: is land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the assessment area which surrounds the subject land (i.e. the area of land in the 1500 metre buffer zone around the subject land or 500 m buffer zone for linear proposals). In the case of a biodiversity certification proposal, subject land includes the biodiversity certification assessment area.

Vegetation Class: a level of classification of vegetation communities, as defined in Keith (2004).

Vegetation Formation: a broad level of vegetation classification as defined in Keith (2004). There are 16 vegetation formations and sub-formations in NSW.

Vegetation Integrity (VI): the condition of native vegetation assessed for each vegetation zone against the benchmark for the Plant Community Type.

Vegetation Integrity (VI) Score: the quantitative measure of vegetation condition calculated in accordance with Equation 23 or Equation 24.

Vegetation Zone: a relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same Plant Community Type and broad condition state.

EXECUTIVE SUMMARY

This Biodiversity Development Assessment Report (BDAR) forms part of an Environmental Impact Statement which has been prepared for the Whitehaven Solar Farm Project (the Project). The Project is located approximately 25 kilometres (km) south-east of Narrabri and approximately 60 km north-west of Gunnedah, within the Narrabri Shire Council Local Government Area, in the New England North West region of New South Wales (NSW). The Project is proposed to be located adjacent to the existing Narrabri Mine on Whitehaven Coal Limited (Whitehaven Coal)-managed land and would include approximately 26 megawatts direct current or 20 megawatts alternating current of solar electricity generation, with a 10 Megawatt Hours direct current Battery Energy Storage System and incorporating an agrisolar design for sheep grazing. The Project would provide behind-the-meter electricity supply to the Narrabri Mine via the existing 66 kilovolt electricity transmission line.

This BDAR does not provide an assessment of matters under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Whitehaven Energy Pty Ltd will separately consider the requirements under the EPBC Act as the Project is not being assessed bilaterally. Similarly, this BDAR does not assess impacts on species and communities listed under the NSW *Fisheries Management Act 1994*.

Landscape Features, Native Vegetation and Threatened Species

The Project is primarily located on an agricultural property with generally flat topography, with external infrastructure leading to the Narrabri Mine. Kurrajong Creek is an ephemeral waterway (3rd order) occurring to the south of the Project. There is an unnamed 1st order ephemeral drainage line to Kurrajong Creek running through the property.

The Project is across a number of paddocks that were cleared of native vegetation historically for farming, and presently used for a mix of livestock grazing and dry land cropping (oats, barley and/or wheat). The cultivated land meets the definition of Category 1 – Exempt Land as it lacks biodiversity values. Some paddocks contain secondary native grasslands that have regrown since the last crop. The trees present are a mixed age. Most of the trees in the road reserve are regrowth or revegetation (no trees with hollows). There are some paddock trees/shrubs.

The native vegetation present is in various broad condition states of Belah Woodland (Plant Community Type [PCT] 55), Poplar Box - Belah Woodland (PCT 56), Pilliga Box - Buloke Woodland (PCT 88) and Poplar Box Grassy Woodland (PCT 101). There are patches of woodland outside of the Development Footprint which are threatened ecological communities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and EPBC Act (*Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes Bioregions Endangered Ecological Community* [Myall Woodland EEC under the BC Act] and *Weeping Myall Woodlands Endangered Ecological Community* [Myall Woodland EEC under the EPBC Act] as well as the *Poplar Box Grassy Woodland on Alluvial Plains Endangered Ecological Community* [Poplar Box Grassy Woodland EEC under the EPBC Act]). The Project has been specifically designed to avoid impacting these threatened ecological communities.

There are two threatened flora species listed under the BC Act that have also been avoided by the Development Footprint (Finger Panic Grass [*Digitaria porrecta*] mostly in the road reserve and Pine Donkey Orchid [*Diuris tricolor*] south of the Project near Kurrajong Creek). A portion of the larger area of suitable habitat associated with the records would be impacted and therefore species credits would be required (even though the species may not be present in the suitable habitat). No threatened flora species listed under the EPBC Act were recorded.

There is limited potential habitat for threatened fauna species listed under the BC Act in the Development Footprint. The Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*), Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*) and Large Bent-winged Bat (*Miniopterus orianae oceanensis*) were the only threatened fauna species recorded during surveys of the habitats in and surrounding the Development Footprint. These species have a wide distribution in NSW. No relevant¹ fauna species credit species were recorded in the Subject land. No threatened fauna species listed under the EPBC Act were recorded.

Measures to Avoid and Minimise Impacts

The Project has been designed to avoid and minimise clearance of native vegetation/habitats. The key measures to avoid and/or minimise impacts are:

- avoidance of clearance of any TECs;
- avoidance of water ways (except for unavoidable crossings);
- locating the proposed Project largely within areas previously cleared for agricultural use;
- minimising the clearance of native vegetation (woodland and derived native grassland) by re-arranging and moving solar arrays; and
- adoption of a partial clearing management zone where only trees and shrubs would be removed leaving understory and ground cover.

Potential Impacts

Approximately 97.2 percent (86.08 hectare [ha]) of the total Development Footprint is located in areas previously cleared for agricultural use (containing either non-vegetation or secondary grassland). The Project would require complete clearance of 19.52 ha of native vegetation and partial clearance (removal of trees/shrubs) of 2.87 ha of native vegetation. The native vegetation to be impacted is more widespread in the area, and no threatened ecological communities would be cleared.

Indirect impacts and prescribed impacts resulting from the Project are likely to be minimal, given the location of the Project relative to surrounding habitat.

No potential serious and irreversible impact entities are likely to be impacted by the Project.

Measures to Mitigate and Manage Impacts

A range of measures to mitigate and manage impacts on biodiversity are provided and these would be documented in a management plan for the Project as required. The key measures to mitigate and manage impacts include:

- Staff and personnel involved in vegetation clearance works would be made aware of clearing (disturbance) limits and of restricted access areas to prevent inadvertent damage.
- A suitably trained and qualified ecologist or wildlife handler would be present during the clearing of habitat to manage animals that may be encountered during land clearing.

¹ The Large Bent-winged Bat (*Miniopterus orianae oceanensis*) is a species credit species but no breeding habitat is present within 2 km of the Subject land so it is not a relevant species to generate species credits.

- The unnamed 1st order ephemeral drainage line to Kurrajong Creek would be planted with local native riparian trees during construction of the Project (1.8 ha), or next suitable planting season if the time of year is unsuitable for planting.
- Qualified and experienced weed management personnel would map the locations of weeds requiring control, identifying species, cover and extent.
- Grazing would be managed such that ground cover is retained beneath panels where practical (with best practice forage height), to resist erosion and weeds.
- Bushfire prevention and control measures.

Biodiversity Offset Requirement

Ecosystem credits have been calculated for the clearance of native vegetation/habitat. Species credits are required for the Pine Donkey Orchid (*Diuris tricolor*) based on suitable habitat (although the species was detected outside of the Development Footprint). The biodiversity credit requirement is summarised in Table ES-1.

Table ES-1
Summary of the Biodiversity Credit Requirement

Credit Type	Development Footprint Area (ha)	Total Development Footprint Credits
Ecosystem Credit – PCT 55	6.13	119
Ecosystem Credit – PCT 56	0.28	9
Ecosystem Credit – PCT 88	0.11	3
Ecosystem Credit – PCT 101	15.89	273
Species Credit – Pine Donkey Orchid (<i>Diuris tricolor</i>)	0.15	2

Conclusion

This Project aims to provide a renewable electricity supply to the Narrabri Mine, whilst continuing agriculture on the farming property. The Project is suitably located near to where the energy is needed (the Narrabri Mine) on land that has been historically cleared.

The Project has been refined to avoid and minimise impacts on biodiversity values, and a range of mitigation and management measures have been provided. In particular, local native riparian trees are proposed to be planted along the unnamed 1st order ephemeral drainage line to Kurrajong Creek running through the property.

Residual impacts that are not mitigated would be offset via the NSW Biodiversity Offset Scheme. Whitehaven Coal already hold some of the biodiversity credits that would be required for the Project, through established land-based offset areas (Biodiversity Stewardship Sites).

1 INTRODUCTION

This Biodiversity Development Assessment Report (BDAR) forms part of an Environmental Impact Statement (EIS) which has been prepared for the Whitehaven Solar Farm Project (the Project).

1.1 PROJECT OVERVIEW

The Project is located approximately 25 kilometres (km) south-east of Narrabri and approximately 60 km north-west of Gunnedah, within the Narrabri Shire Council Local Government Area (LGA), in the New England North West region of New South Wales (NSW) (Figure 1).

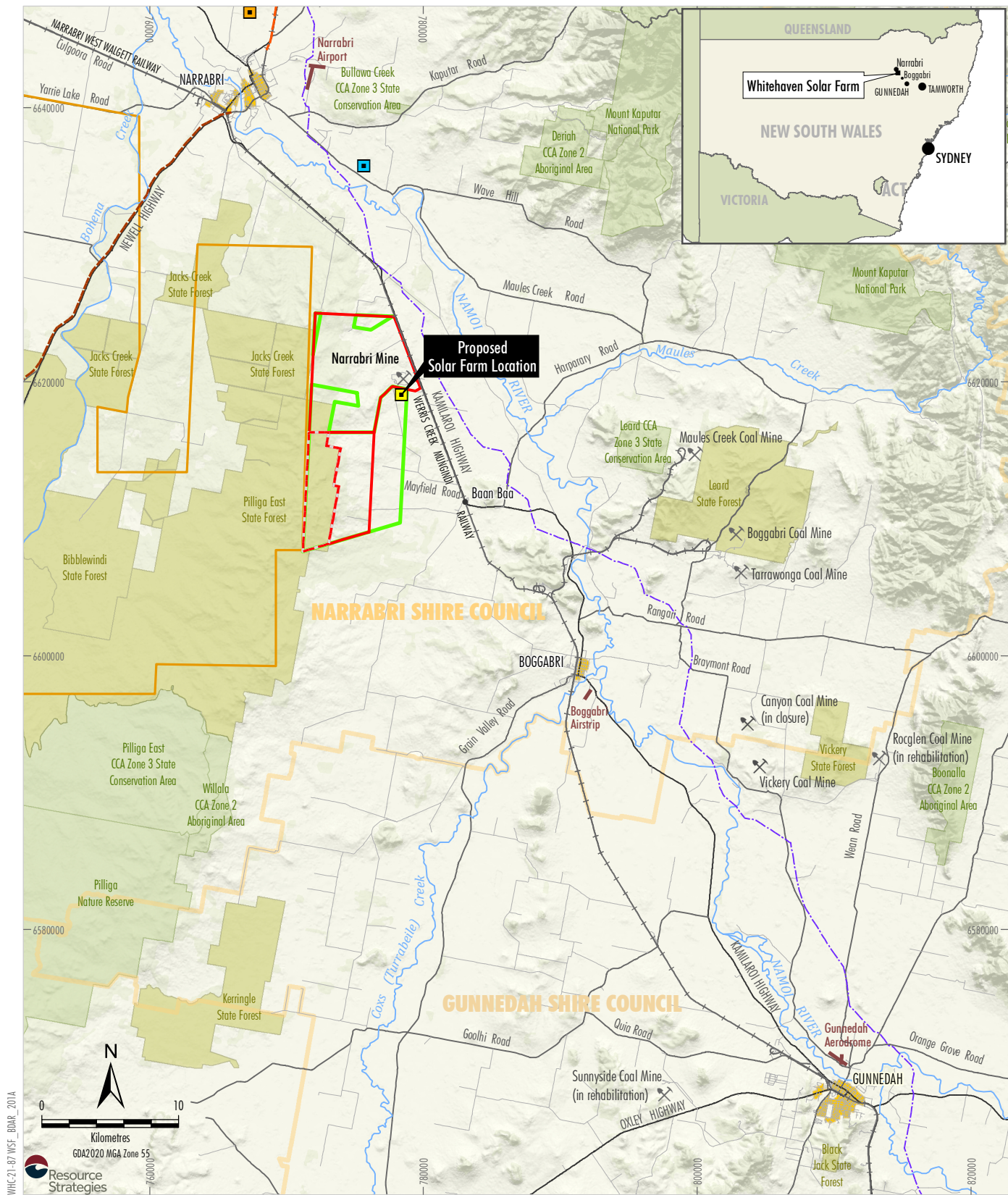
The Project is proposed adjacent to the existing Narrabri Mine on Whitehaven Coal Limited (Whitehaven Coal)-managed land and would include approximately 26 megawatts (MW) direct current (DC) or 20 MW alternating current (AC) of solar electricity generation and the construction of a 10 Megawatt Hour DC Battery Energy Storage System (BESS). The Project would provide behind-the-meter electricity supply to the Narrabri Mine via the existing 66 kilovolt (kV) electricity transmission line (ETL).

Whitehaven Energy Pty Ltd (Whitehaven Energy) is the proponent of the Project and is seeking approval for the Project as a State Significant Development under section 4.36 of the NSW *Environmental Planning and Assessment Act 1979*.

The Project would include the following primary components and activities (Figure 2):

- construction and operation of approximately 50,000 solar photovoltaic (PV) panels to provide electricity supply for the Narrabri Mine;
- construction of a substation that facilitates connection to the existing 66 kV overhead ETL;
- construction of an overhead ETL to connect the proposed substation to the existing 66 kV overhead ETL, north of Kurrajong Creek Rd;
- construction and operation of ancillary infrastructure including access roads, inverter stations, temporary staging areas, perimeter fencing and operations and maintenance buildings;
- construction and operation of a BESS;
- ongoing maintenance activities; and
- decommissioning and rehabilitation of the Project area.

Table 1 provides a summary of the key attributes of the Project.




WHITEHAVEN SOLAR FARM
 Regional Location

Figure 1

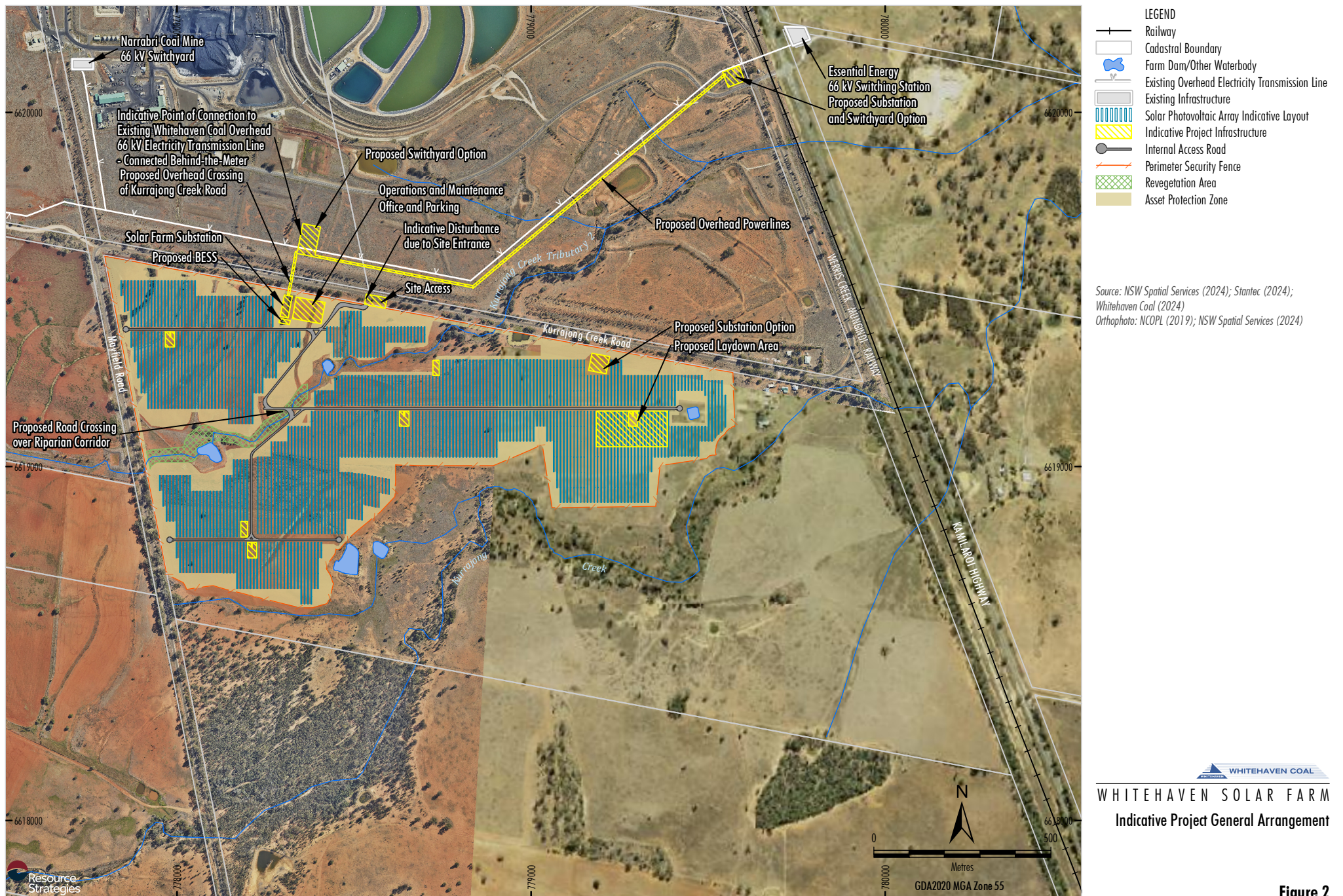


Figure 2

Table 1
Summary of Key Project Attributes

Project Component	Summary Description
Size and Purpose	26 MW DC or 20 MW AC for behind-the-meter electricity supply to the Narrabri Mine.
Project Area	Development site footprint of approximately 100 hectares (ha).
Solar Configuration	Approximately 50,000 PV panels in a north to south alignment. East to west tracking system (single axis).
Access Route	The proposed access route is via the Kamilaroi Highway and Kurrajong Creek Road.
Power Infrastructure	Substation and switchyard. 66 kV connector to the existing 66 kV ETL. Batter Energy Storage System.
BESS	10 Megawatt Hour DC. Centralised system. Lithium battery.
Site Entry	Site entry would be via a constructed access point on Kurrajong Creek Road.
Construction	Construction period of approximately six to nine months. Employment of approximately 30 personnel on average during its construction, with peak construction requiring approximately 65 personnel. Construction undertaken during daylight hours.
Operational Life	The design operational life is approximately 50 years.
Decommissioning and Rehabilitation	Decommissioning at the end of the Project life, involving the removal of all infrastructure with a proposed final land use to comprise a combination of native vegetation and agricultural (pasture).
Capital Investment	Approximately \$55 million.
Hours of Operation	24 hours per day with scheduled maintenance activities generally undertaken during daytime hours.

1.2 GENERAL DESCRIPTION OF THE SUBJECT LAND

The land subject to the development (the Subject land) has been cleared historically and is mostly cultivated land. The Subject land is approximately 90 ha. The Project is predominantly located on the 'Naroo' property (Lot 9 DP 757104) with the proposed ETL crossing Kurrajong Creek Road into the mining lease for the Narrabri Mine (151/DP816020 and 152/DP816020).

The Development Footprint is defined as the area of land that is directly impacted on by a proposed development and is equivalent to the Subject land for this assessment. The Development Footprint encompasses the footprint required for construction and operation, including any temporary/auxiliary clearance areas. The Development Footprint includes the transport route road upgrade.

The Development Footprint is comprised of two management zones (Figure 3):

- Management Zone 1 – Complete clearing for construction and operation.
- Management Zone 2 – Partial clearing² for asset protection/removal of shading issues. This would involve removal of trees/shrubs by chain-saw rather than heavy machinery, resulting in no ground disturbance.

² The Assessing Partial Loss of Biodiversity Values - Biodiversity Assessment Method Guide (Consultation Draft) (NSW DCCEEW, 2024g) is not relevant to the Project as the Secretary's Environmental Assessment Requirements were issued prior to October 2024.

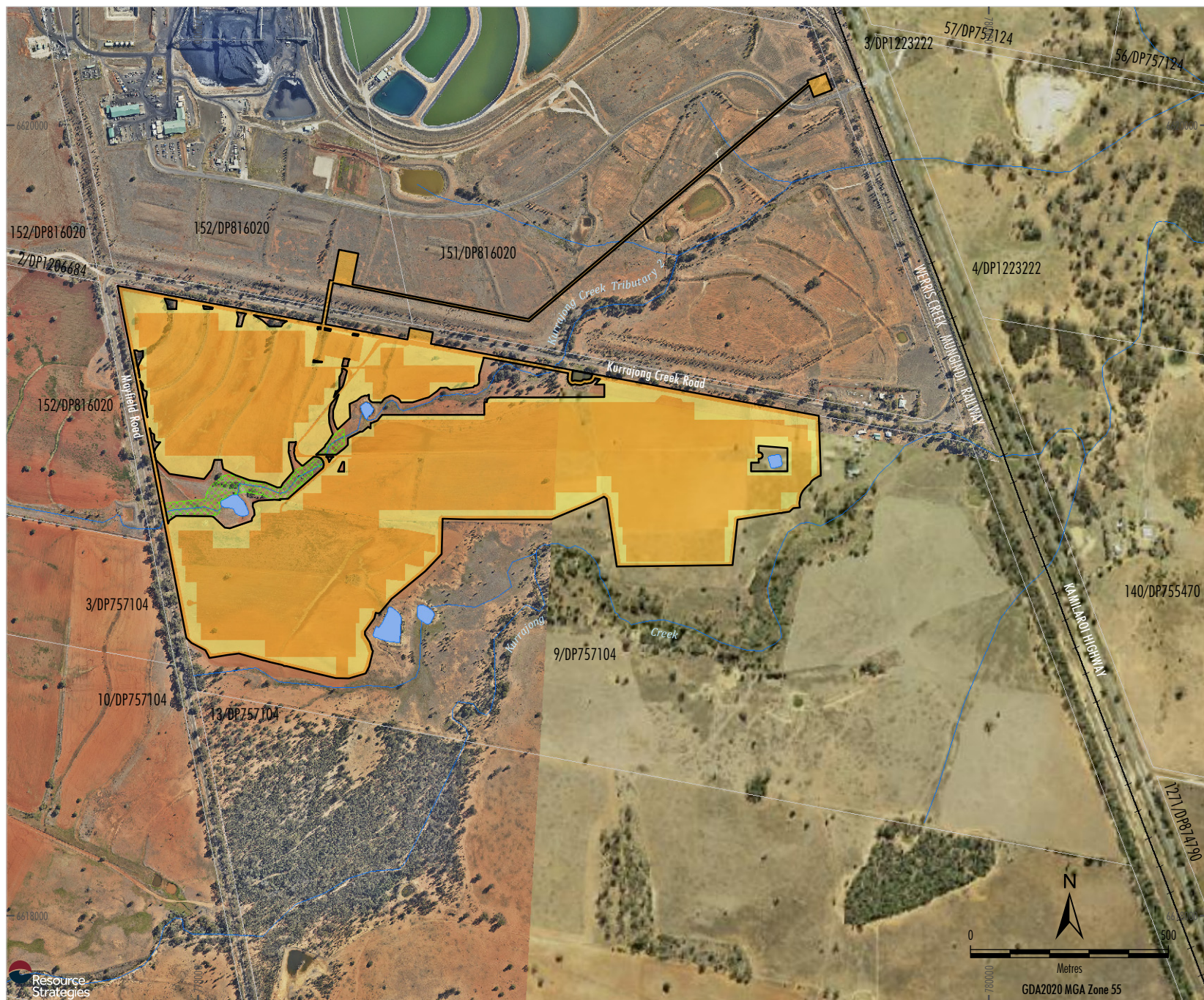


Figure 3

While a complete clearance footprint has been assumed for the solar panels (due to potential disturbance during construction), a ground cover would be established beneath the panels for sheep grazing. In addition, a complete clearance footprint has been assumed for the ETL as the precise location of the clearance pads for the poles are not known.

In accordance with the *Biodiversity Assessment Method 2020* (BAM) (Department of Planning, Industry and Environment [DPIE], 2020a) measures were taken by the proponent to '*avoid or minimise clearing of native vegetation and threatened species habitat during proposal design, including placement of temporary and permanent ancillary construction and maintenance facilities*'. The initial Development Footprint design is shown on Figure 4 compared to the final Development Footprint assessed in this BDAR.

1.3 ASSESSMENT REQUIREMENTS/APPROACH

This BDAR has been prepared by Jamie Gleeson (BSc [Hons] CEnvP [Ecology Specialist]) (Resource Strategies Pty Ltd), who is an accredited assessor (assessor accreditation number BAAS17080).

This BDAR is required as the Project is assessed as a State Significant Development and would involve impacts to biodiversity values. The Project has been assessed in accordance with the BAM (DPIE, 2020a) established under Section 6.7 of the NSW *Biodiversity Conservation Act 2016* (BC Act). Compliance with minimum information requirements (DPIE, 2020a) is provided in Attachment A. The optional BAM (DPIE, 2020a) streamlined assessment modules have not been applied to this Project.

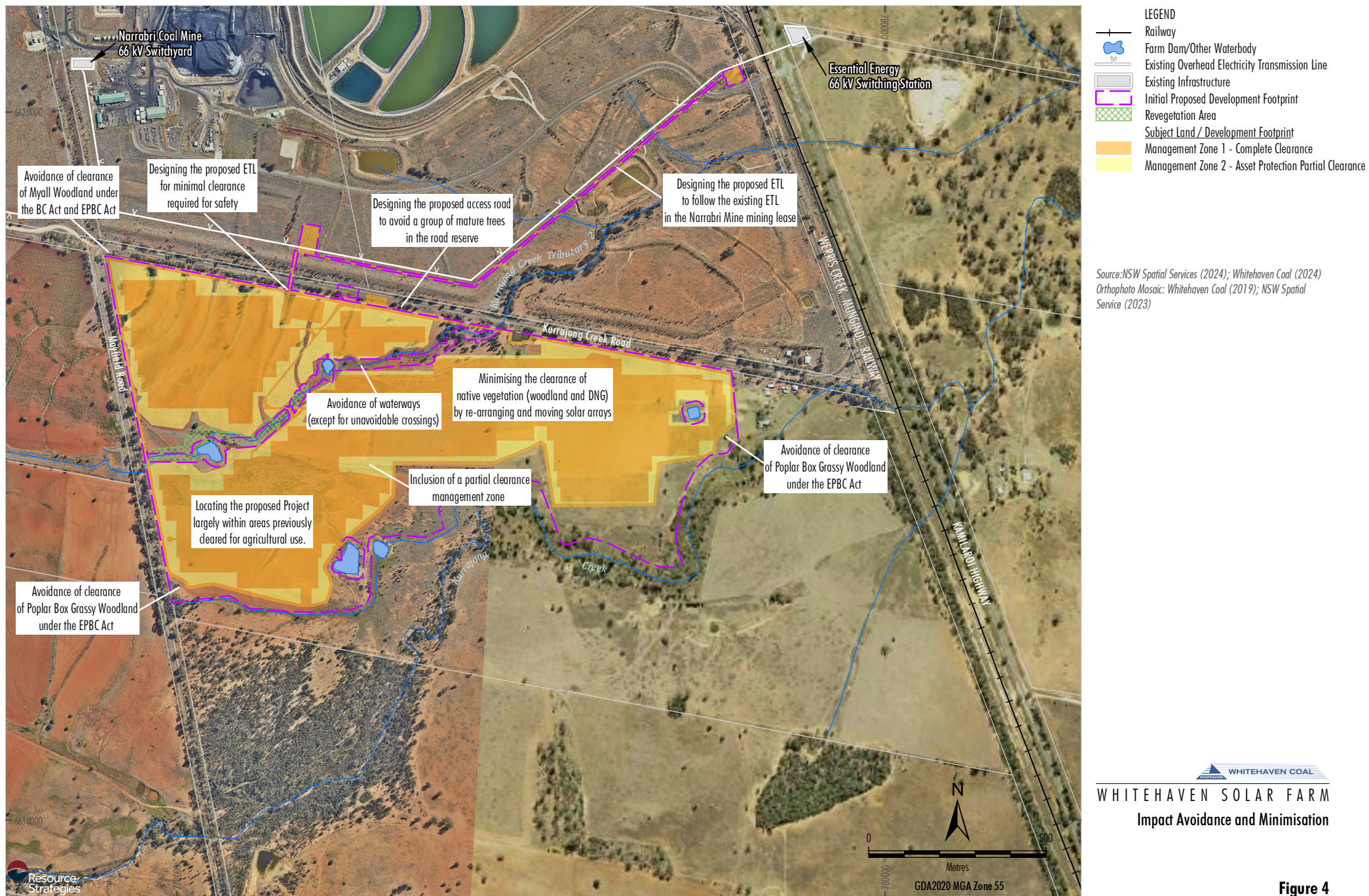
Flora and fauna field surveys were undertaken by Ausecology Pty Ltd (Ausecology) (2024) (Attachment B) by qualified ecologists; Andrew Dawson with 14 years' experience (BSc[Biodiversity and Conservation]), M[Wildlife Conservation]), Braden Macdonald with 4 years' experience (BEnvSc[Honours]), Bradley Jeffers with 13 years' experience (BAppSc), Brendan Schembri with 15 years' experience (BEnvSc), Dr Emma Gray with 4 years' experience (BAppSc[Ecology], PhD, BAM Accredited Assessor [BAAS19069]), Lachlan Beil with 3 years' experience (BSc[Zoology and Ecology]) and Lauren Eade with 8 years' experience (BSc[Ecology]). Greg Ford (Balance Environmental) with 25 years' experience (BAppSc [Biology], GradDip[Resource Management]) undertook the bat call analysis. Further details are provided in Attachment B.

This BDAR does not provide an assessment of matters under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Whitehaven Energy will separately consider the requirements under the EPBC Act as the Project is not being assessed bilaterally. Similarly, this BDAR does not assess impacts on species and communities listed under the NSW *Fisheries Management Act 1994*.

The Planning Secretary's Environmental Assessment Requirements state that the BDAR must be prepared using the approved BDAR template. The *Biodiversity Development Assessment Report Template* was first release in April 2022. The Biodiversity Offset Strategy (BOS) Update No. 3 (12 April 2022) states:

The template is not compulsory but is recommended for use by accredited assessors... The template will be reviewed after 12 months to consider user feedback.

There has been no update to the initial BDAR template and many Accredited Assessors choose not to use the template. The BAM (DPIE, 2020a) does not require the template to be used and the templates states: '*It is not compulsory for assessors to prepare their BDAR using the template*'. A modified version of the template (April 2022) was used.



WHITEHAVEN COAL
 WHITEHAVEN SOLAR FARM
 Impact Avoidance and Minimisation

Figure 4

1.4 EXCLUDED IMPACTS (CATEGORY 1 – EXEMPT LAND)

The BAM (DPIE, 2020a) does not assess native vegetation and habitat loss on Category 1 – Exempt Land (within the meaning of Part 5A of the *Local Land Services Act 2013* [LLS Act]), other than the additional biodiversity impacts under clause 6.1 of the *NSW Biodiversity Conservation Regulation 2017* (BC Regulation) (referred to as prescribed impacts in the BAM).

Under Part 5A of the LLS Act, "category 1-exempt land" is defined to mean:

...areas of the State to which this Part applies designated as category 1-exempt land on the native vegetation regulatory map.

In this regard, section 60H of the LLS Act states:

- (1) *Land is to be designated as category 1-exempt land if the Environment Agency Head reasonably believes that—*
 - (a) *the land was cleared of native vegetation as at 1 January 1990, or*
 - (b) *the land was lawfully cleared of native vegetation between 1 January 1990 and the commencement of this Part.*
- (2) *Land is to be designated as category 1-exempt land if the Environment Agency Head reasonably believes that—*
 - (a) *the land contains low conservation value grasslands, or*
 - (b) *the land contains native vegetation that was identified as regrowth in a property vegetation plan referred to in section 9 (2) (b) of the Native Vegetation Act 2003, or*
 - (c) *the land is of a kind prescribed by the regulations as category 1-exempt land.*
- (3) *Land is to be designated as category 1-exempt land if the land is biodiversity certified under Part 8 of the Biodiversity Conservation Act 2016 or under any Act repealed by that Act.*
- (4) *However—*
 - (a) *land described in subsection (1) or (2) is not to be designated as category 1-exempt land if section 60I (2) requires the land to be designated as category 2-regulated land, and*
 - (b) *land described in subsection (1) (a) is not to be designated as category 1-exempt land if the land was unlawfully cleared of native vegetation after 1 January 1990, and*
 - (c) *land described in subsection (2) (a) is not to be designated as category 1-exempt land if the land was unlawfully cleared of native vegetation after 1 January 1990.*
- (5) *The regulations may make provision for the purposes of determining whether grasslands are low conservation value grasslands for the purposes of this Division.*

The Project is predominantly located on land that is currently used for cropping (also grazing) and was cleared for agricultural use prior to 1990. The *Draft Native Vegetation Regulatory Map* (NSW Department of Climate Change, Energy, the Environment and Water [NSW DCCEEW], 2024a) shows Category 1 – Exempt Land in the Project Area (Figure 5). The *Draft Native Vegetation Regulatory Map* (NSW DCCEEW, 2024a) is consistent with the *Transitional Native Vegetation Regulatory Map* (NSW DCCEEW, 2022). While the *Draft Native Vegetation Regulatory Map* (NSW DCCEEW, 2024a) does not have legal effect, it is discussed here because the *Transitional Native Vegetation Regulatory Map* (NSW DCCEEW, 2022) does not include mapping of Category 1 – Exempt Land.

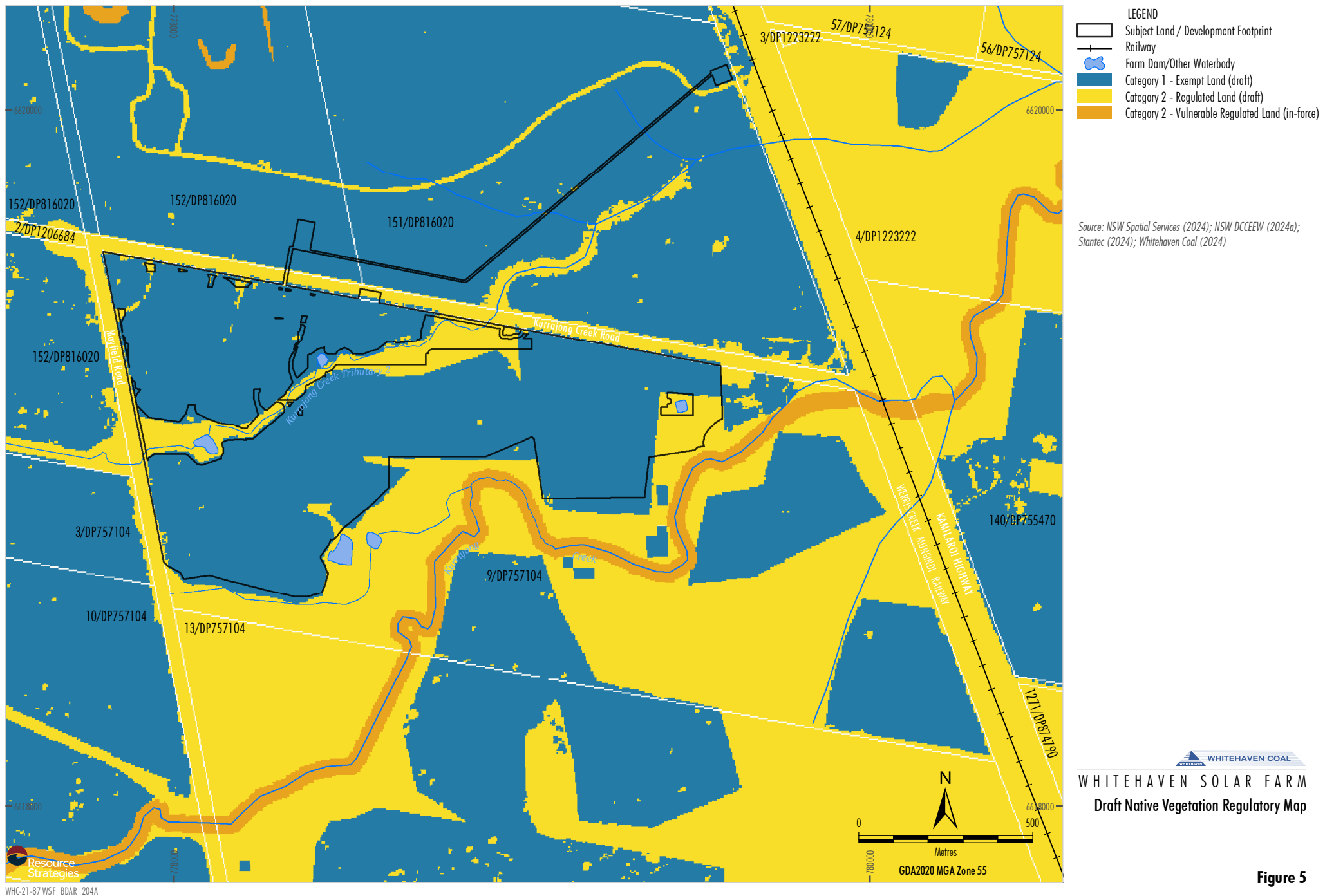


Figure 5

Ausecology (2024) (Attachment B) undertook a desktop review and on-site investigations in regard to land categorisation in accordance with the *Determining Native Vegetation Land Categorisation for Application in the Biodiversity Offsets Scheme* (Department of Planning and Environment [DPE], 2023a) and in consideration of the following sources of information:

- *Narrabri Local Environmental Plan 2012* Land Zones;
- Current and historical aerial photography demonstrating that the land was cleared prior to 1 January 1990;
- *NSW Landuse 2017 v1.5* (NSW DCCEEW, 2023a);
- woody vegetation extent;
- photos that show clearing or cropping activities; and
- site-based floristic assessment to verify the absence of critically endangered ecological communities and critically endangered flora species.

Passing Stage 1 of the *Interim Grasslands and Other Groundcover Assessment Method* (IGGAM) (Office of Environment and Heritage [OEH], 2017), Ausecology (2024) (Attachment B) undertook exotic assessment surveys as per IGGAM in vegetation zones that were identified as cropping, grazing paddock and grasslands, in order to inform if these areas meet the definitions of low conservation grasslands. A total of 20 IGGAM assessments were undertaken in the Subject land and surrounds (Table 2; Figure 6). Where cultivation or active cropping was in progress, the assessment data was captured from a vantage point at the edge of the cultivation so as not to damage the crops.

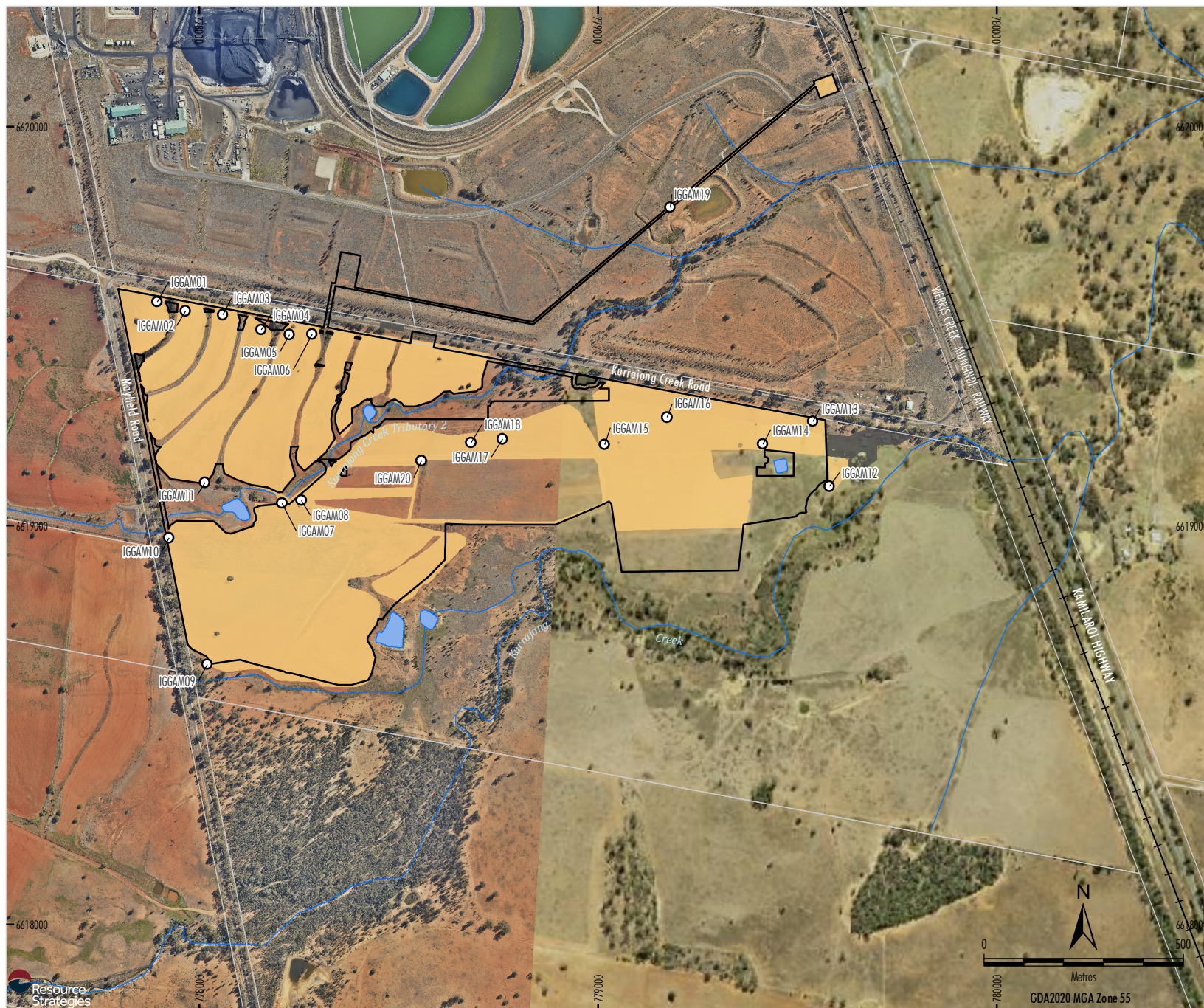
No land under private conservation agreement, or that has been rehabilitated as part of an existing approval, is relevant to the Subject land.

As a result of the land categorisation analysis, a total of approximately 71 ha of land was categorised as Category 1 – Exempt Land (Figure 6). The *Draft Native Vegetation Regulatory Map* (NSW DCCEEW, 2024a) is reasonably accurate for the Project Area but less Category 1 – Exempt Land is mapped by Ausecology compared to the *Draft Native Vegetation Regulatory Map* (NSW DCCEEW, 2024a) (Attachment B). The land is to be designated as Category 1 – Exempt Land because it is:

- RU1 zoned land under the *Narrabri Local Environmental Plan 2012* Land Zones (Figure 7);
- historical aerial photography demonstrates that the land was cleared prior to 1 January 1990 (Figure 8);
- land that is mapped as ‘cropping’ and ‘irrigated cropping’ according to the NSW Land Use mapping (NSW DCCEEW, 2023a) (Figure 7).
- land is not Category 2 – Vulnerable Regulated Lands or Category 2 – Sensitive Regulated Lands according to the *Draft Native Vegetation Regulatory Map* (NSW DCCEEW, 2024a);
- land outside of the woody vegetation extent mapping³;
- photographic evidence of clearing or cropping activities (Ausecology [2024] [Attachment B]) (example - Plate 1);
- surveys by Ausecology (2024) (Attachment B) confirmed that a portion of the Subject land comprises cleared land without native vegetation (i.e. low conservation value groundcover [Table 2⁴]); and
- surveys by Ausecology (2024) (Attachment B) confirmed that no critically endangered ecological communities and critically endangered flora species are present.

³ The woody vegetation exempt mapping is not located in the vicinity of the Project Area.

⁴ Note: Prior to clearance, the area was likely formerly a combination of PCT 55 and PCT101. It is not possible to split into a pre-clearance vegetation zone and if it were the result would not change.



LEGEND

- Subject Land / Development Footprint
- Railway
- Farm Dam/Other Waterbody
- IGGAM Plot
- Category 1 - Exempt Land
- Infrastructure

Source: Ausecology (2024); NSW Spatial Services (2024);
 Stantec (2024); Whitehaven Coal (2024)
 Orthophoto: NCOPL (2019); NSW Spatial Services (2024)

WHITEHAVEN COAL
WHITEHAVEN SOLAR FARM
 Category 1 - Exempt Land Based on
 Ausecology Survey Results

Figure 6

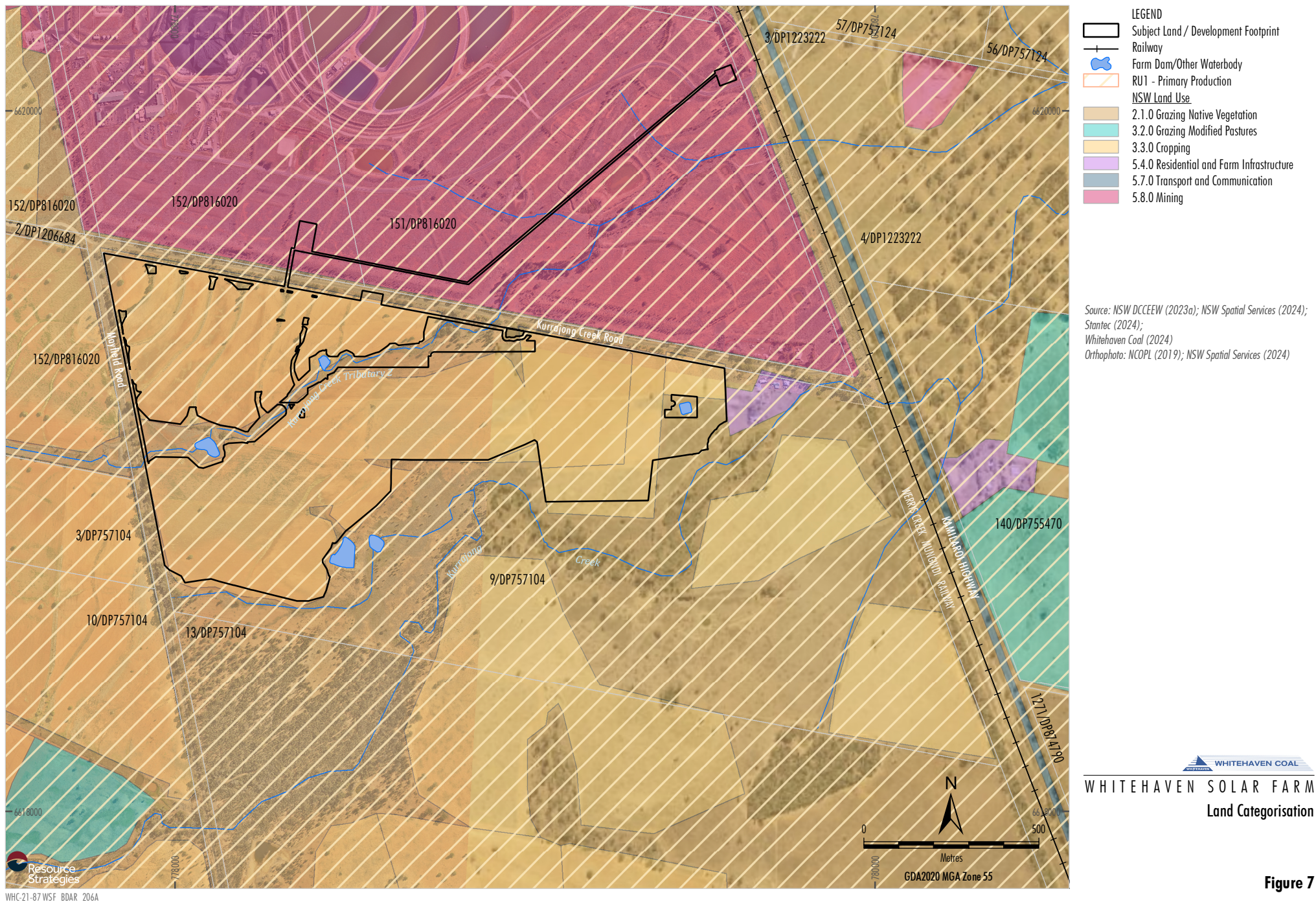
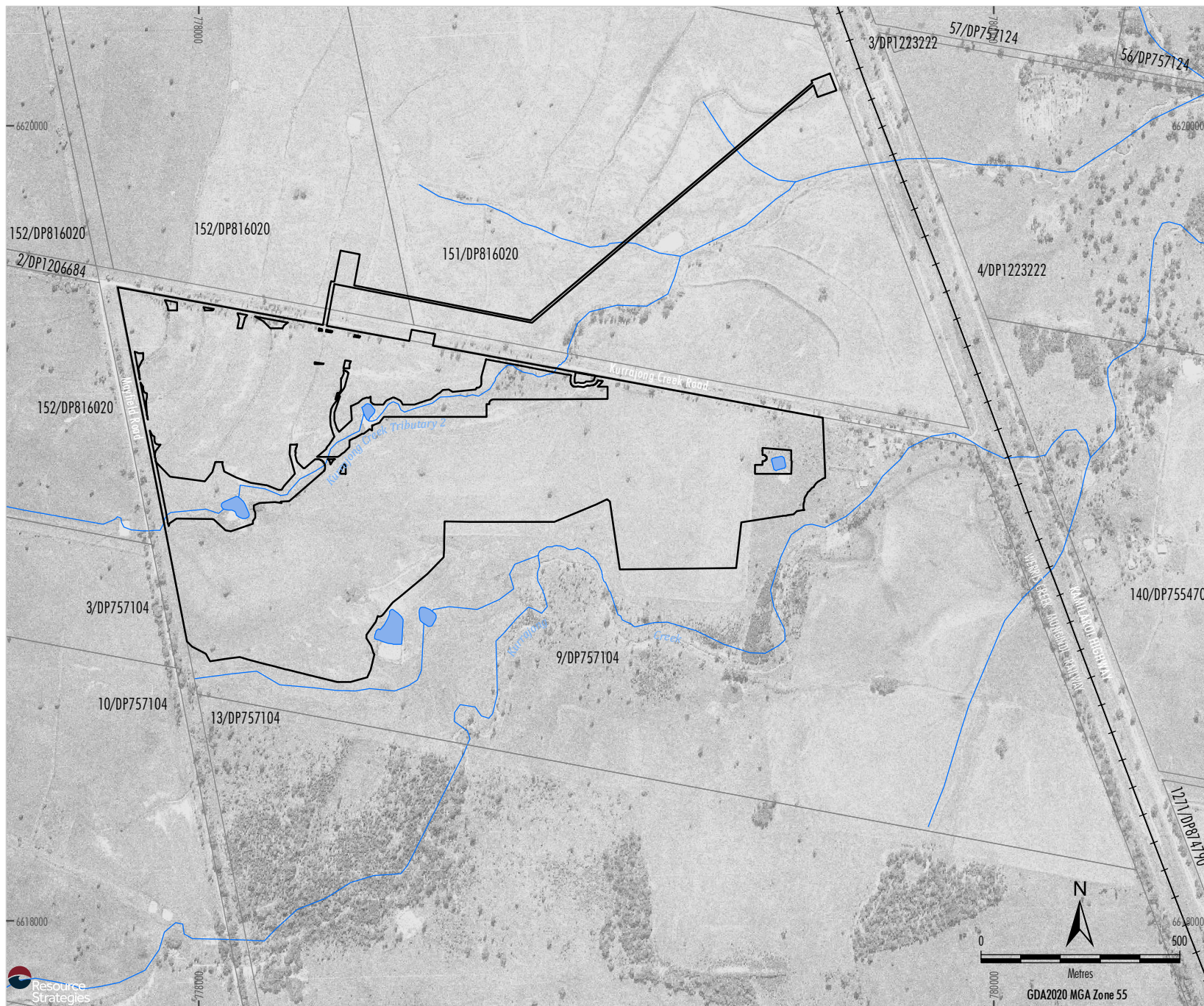


Figure 7



- LEGEND
- Subject Land / Development Footprint
 - Railway
 - ~ Farm Dam/Other Waterbody

Source: NSW Spatial Services (2024); Stantec (2024);
Whitehaven Coal (2024)
Orthophoto: NSW Spatial Services (2024)


WHITEHAVEN SOLAR FARM
 Past Aerial Image (1988)

Figure 8



Plate 1 – Example of Category 1 – Exempt Land

**Table 2
IGGAM Survey Results**

Transect	Native % Cover	Non-native % Cover	Non-vegetative % Cover	Determination
IGGAM1	0	100 % Cropping/Cultivation		Exotic
IGGAM2	0	100 % Cropping/Cultivation		Exotic
IGGAM3	0	100 % Cropping/Cultivation		Exotic
IGGAM4	0	100 % Cropping/Cultivation		Exotic
IGGAM5	0	100 % Cropping/Cultivation		Exotic
IGGAM6	0	100 % Cropping/Cultivation		Exotic
IGGAM7	0	100 % Cropping/Cultivation		Exotic
IGGAM8	0	100 % Cropping/Cultivation		Exotic
IGGAM9	0	100 % Cropping/Cultivation		Exotic
IGGAM10	0	100 % Cropping/Cultivation		Exotic
IGGAM11	0	100 % Cropping/Cultivation		Exotic
IGGAM12	4	78	18	Exotic
IGGAM13	6	59	35	Exotic
IGGAM14	2	72	26	Exotic
IGGAM15	8	28	64	Exotic
IGGAM16	4	30	66	Exotic
IGGAM17	4	35	61	Exotic
IGGAM18	8	48	44	Exotic
IGGAM19	17	70	13	Exotic
IGGAM20	0	100 % Cropping/Cultivation		Exotic
Average	2.65	81	-	Exotic

Source: Ausecology (2024).

The proposed land categorisation method was submitted to the Biodiversity, Conservation and Science Directorate (BCS) within NSW DCCEEW. On 4 July 2024, Whitehaven Energy received communication from BCS that stated ‘We have reviewed the land categorisation report and generally consider the proposed land categorisation mapping to be reasonable. However, there are some key aspects of consideration which must be addressed during the preparation of a BDAR for the Project.’ In relation to those aspects, the Category 1-Exempt Land does not include:

- any habitat for threatened species listed under the EPBC Act, including the Spiny Peppercreep (*Lepidium aschersonii*);
- Weeping Myall Woodlands Endangered Ecological Community (Myall Woodland EEC under the EPBC Act); or
- Poplar Box Grassy Woodland on Alluvial Plains Endangered Ecological Community (Poplar Box Grassy Woodland EEC under the EPBC Act).

1.5 INFORMATION SOURCES USED IN THIS ASSESSMENT

This BDAR has been prepared using various data sources as described below. A reference list is provided in Section 10.

1.5.1 Field Surveys

The flora and fauna survey data was independently collected by Ausecology (2024) (Attachment B) in accordance with relevant State and Commonwealth survey guidelines. Ausecology collected the relevant ecological survey data in accordance with the NSW BAM (DPIE, 2020a). Seven flora field surveys were undertaken by Ausecology in November 2022, January 2023, September 2023, January 2024 and February 2024. Five fauna field surveys were undertaken by Ausecology in November 2022, January 2023, August 2023 and September 2023. The methods and results of these surveys are all provided in Attachment B (Ausecology, 2024).

Jamie Gleeson has over 22 years’ experience and has been undertaking ecological work for the nearby Narrabri Mine since around 2010. An additional site inspection on the 14 May 2024 to identify habitat, review vegetation mapping and identify options to avoid and minimise impacts.

1.5.2 Published Databases

Published databases used in this assessment include:

- *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b);
- *BioNet Vegetation Classification* (NSW DCCEEW, 2024c);
- *BioNet Atlas* (NSW DCCEEW, 2024d); and
- *Directory of Important Wetlands of Australia* (Commonwealth Department of Climate Change, Energy, the Environment and Water [Cth DCCEEW], 2023a).

It was not necessary to use local data to deviate from the NSW DCCEEW databases.

1.5.3 Spatial Data

Spatial data used in this assessment include:

- *NSW Landscapes (Mitchell 2002) Version 3.1* (NSW DCCEEW, 2024e);
- *Interim Biogeographic Regionalisation for Australia (Subregions) v. 7 (IBRA)* (Cth DCCEEW, 2023b);
- *NSW Landuse 2017 v1.5* (NSW DCCEEW, 2023a); and
- *NSW State Vegetation Type Map* (DPE, 2023c).

1.5.4 BAM Credit Calculator

The BAM Credit Calculator (App last updated: 13/04/2023 10:00 (Version: 1.4.0.00) BAM data last updated: 4/03/2024 (Version: 67) was used in this assessment. The BAM Credit Calculator was finalised on 8 October 2024.

2 LANDSCAPE CONTEXT

This section provides information on the landscape features within the Subject land or surrounding assessment area in accordance with the BAM (DPIE, 2020a) and *Biodiversity Assessment Method 2020 Operational Manual Stage 1* (DPIE, 2020b). The below information is based on various information sources including the surveys by Ausecology (2024) (Attachment B) and a site inspection.

The solar panels and relevant associated infrastructure excluding part of the ETL are proposed on the Naroo property. The paddocks associated with the Subject land were cleared of native vegetation historically for farming, and presently the land use is a mix of livestock grazing and dry land cropping (oats, barley and/or wheat).

2.1 REGIONAL SETTING

The Subject land is located in Narrabri Shire Council LGA (Figure 9) within the Liverpool Plains Interim Biogeographical Regionalisation for Australia (IBRA) subregion of the Brigalow Belt South IBRA region (Cth DCCEEW, 2023b) (Figure 9).

2.2 TOPOGRAPHY, HYDROLOGICAL SETTING, GEOLOGY AND SOILS

The Subject land is comprised of generally flat topography, predominantly cleared of vegetation for agricultural use. The Subject land is located directly north of Kurrajong Creek, which is a tributary of the Namoi River and is located approximately 7 km east of the Project.

The Project Area is located within the Mullaley Sub-basin, which forms part of the larger Gunnedah Basin. Soil surveys have been undertaken in the Subject land by Minesoils (2023). Minesoils (2023) describes two dominant soil units within the Subject land – Sodosols and Dermosols.

2.3 RIVERS, STREAMS, ESTUARIES AND WETLANDS

The waterways within the assessment area are mapped on Figures 9 and 10. The creeks and drainage lines in the Subject land are ephemeral, with flow likely occurring only during heavy rainfall events. There is an unnamed 1st order ephemeral drainage line to Kurrajong Creek which occurs in the Subject land, with no defined banks (Plates 2 and 3; Figure 10). Other ephemeral drainage lines would be traversed by the proposed ETL.



Plate 2 – Unnamed Drainage Line to Kurrajong Creek (Note: the creek is inside the existing fencing)



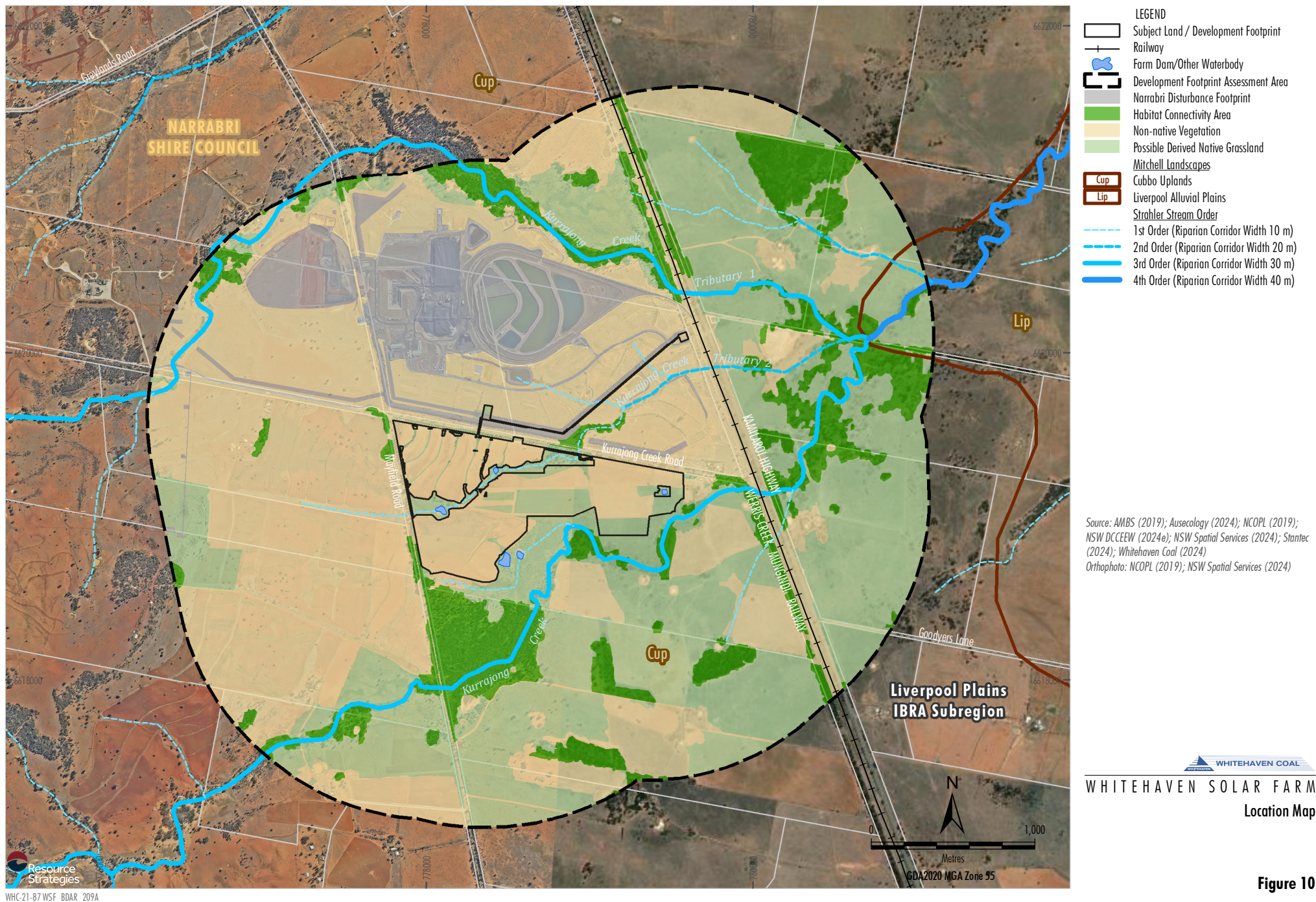




Plate 3 – Existing Crossing of the Unnamed Drainage Line to Kurrajong Creek (Note: the Project crossing would be near this existing crossing)

There are no rivers, estuaries or wetlands in the Subject land or assessment area. There are no State or Commonwealth mapped wetlands on, or adjacent to, the Subject land (after Cth DCCEEW, 2023a; NSW Department of Environment, Climate Change and Water, 2010). Various farm dams are mapped on Figure 9.

2.4 HABITAT CONNECTIVITY

The scattered and clumped trees in the Subject land provide minimal habitat connectivity. The aerial photo from 1988 (Figure 8) shows less woodland vegetation in the past. The road reserve contains scattered trees as well as regrowth and a revegetation (visual screen for the Narrabri Mine from Kurrajong Creek Road).

2.5 KARST, CAVES, CREVICES, CLIFFS AND ROCKS

No karst, caves, crevices, cliffs or rocks associated with threatened species occur in the Subject land or assessment area. The rocky habitat mapped by AMBS Ecology & Heritage Pty Ltd (AMBS) (2020a) for the Narrabri Mine are all greater than 2 km west of the Subject land.

2.6 AREAS OF OUTSTANDING BIODIVERSITY VALUE

There are no Areas of Outstanding Biodiversity Value listed under the BC Regulation associated with the Subject land or assessment area.

2.7 NSW (MITCHELL) LANDSCAPES

The Subject land is within the Cubbo Uplands Mitchell Landscapes (NSW DCCEEW 2024e; Mitchell, 2002) (Figure 9).

2.8 ADDITIONAL FEATURES

There are no additional features listed in the Planning Secretary's Environmental Assessment Requirements.

2.9 NATIVE VEGETATION COVER

Native vegetation cover (woody and non-woody) is assessed on the Subject land and within a 1,500 metre (m) buffer area surrounding the outside edge of the boundary of the Development Footprint (Figure 10)⁵. The extent of native vegetation cover (including areas of planted native vegetation), as mapped by site surveys (Ausecology, 2024) (Attachment B) and regional mapping (DPE, 2023c) is shown on Figure 10. Areas mapped outside the Subject land and not mapped by DPE (2023c) are conservatively assumed to be native vegetation. There is approximately 47 percent (%) native vegetation cover within the 1,500 m buffer area (i.e. the >30-70% cover class is relevant).

⁵ A figure scale appropriate for the size of the 1,500 m assessment area has been selected.

3 NATIVE VEGETATION

This section provides a description of the native vegetation relevant to the Subject land.

3.1 NATIVE VEGETATION EXTENT

The Subject land has been cleared historically for agricultural use with cultivation, cropping and exotic species with some fragmented scattered trees and shrub cover. The native vegetation extent of the Subject land is shown on Figure 9. There are no differences between the actual native vegetation extent and that shown in the imagery (dated 2018 and 2019). Areas in the Subject land without native vegetation include the Category 1 – Exempt Land (Section 1.4), farm dams, and farm infrastructure (e.g. fences, tracks).

3.2 EXISTING INFORMATION ON NATIVE VEGETATION

The *NSW State Vegetation Type Map* (DPE, 2023c) does not show any native vegetation within the Subject land, except along the boundary of the property where it intersects the unnamed drainage line to Kurrajong Creek (Figure 11). AMBS (2020b) undertook flora surveys at the Narrabri Mine and the closest area to the Project was mapped as predominantly exotic grassland and derived native grassland from former Poplar Box woodland.

3.3 VEGETATION SURVEYS

Ausecology (2024) (Attachment B) undertook contemporary systematic field-based floristic vegetation surveys across the Subject land. Surveys were undertaken in November 2022, January 2023, September 2023, January 2024 and February 2024. The surveys included sampling from vegetation integrity (VI) plots and Interim Grasslands and other Groundcover Assessments. Data collected to measure the condition of the vegetation included attributes relating to composition, structure, and function.

The Plant Community Types (PCTs) and vegetation zones on the Subject land were identified and mapped by Ausecology (2024) (Attachment B) in accordance with the BAM (DPIE, 2020a) and the *BioNet Vegetation Classification* (NSW DCCEEW, 2024c) (Figure 12). Detailed methods and results are provided in Attachment B.

3.4 PLANT COMMUNITY TYPES AND VEGETATION ZONES

Five PCTs were identified by Ausecology (2024) (Attachment B). The PCTs (and vegetation zones of broad condition states) are listed in Table 3 and shown on Figure 12. Ausecology (2024) (Attachment B) assigned the PCTs a site-specific vegetation community name.

As shown in Table 3, most of the Subject land is cleared land/non-native vegetation (52.14 ha [72 %]). Plate 4 shows the native grassland in the paddocks. Vegetation Communities 1 and 5a would be avoided and as such do not occur in the Subject land. The vegetation zones that would be most impacted are Vegetation Communities 5c and 2c, both derived native grassland in poor condition. Other vegetation communities would be impacted in small quantities, mostly due to the ETL crossing the road reserve (Plate 5), the site access road (Plate 6), and isolated paddock trees/shrubs.

Within Management Area 2 (Partial Clearance [Ongoing Maintenance]), it is assumed that trees, shrubs and regeneration would be removed for construction and maintenance as such trees and shrubs were manually removed from the future VI score calculation in the BAM Credit Calculator (VI attribute score of zero).

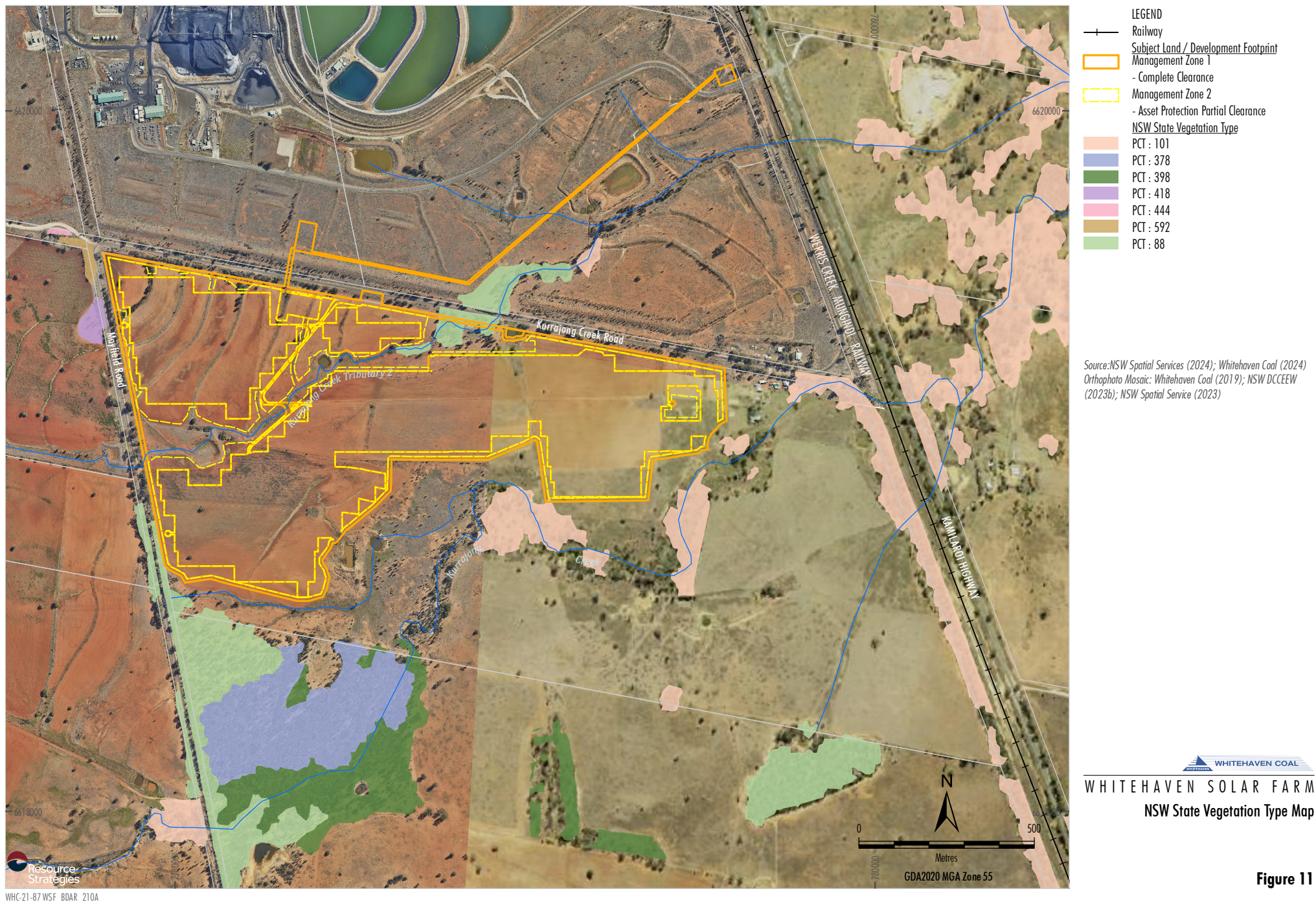


Figure 11



- LEGEND**
- Railway
 - Development Footprint
 - Management Zone 1
- Complete Clearance
 - Management Zone 2
- Asset Protection Partial Clearance
 - Riverine Plain Woodlands**
 - 1 Weeping Myall Woodland (Good) (PCT 27)
 - North-west Floodplain Woodlands**
 - 2a Belah Woodland (Good) (PCT 55)
 - 2b Belah Woodland (Semi-Cleared) (PCT 55)
 - 2c Derived Grassland (Poor) (PCT 55)
 - Floodplain Transition Woodlands**
 - 3 Poplar Box - Belah Woodland (Good) (PCT 56)
 - Pilliga Outwash Dry Sclerophyll Forests**
 - 4a Pilliga Box - Buloke Woodland (Good) (PCT 88)
 - 4b Pilliga Box - Buloke Woodland (Semi-Cleared) (PCT 88)
 - 4c Pilliga Box - Buloke Woodland (Revegetation) (PCT 88)
 - Brigalow Clay Plain Woodlands**
 - 5a Poplar Box - Yellow Box - Western Grey Box Grassy Woodland (Good) (PCT 101)
 - 5b Poplar Box - Yellow Box - Western Grey Box Grassy Woodland (Semi-Cleared) (PCT 101)
 - 5c Derived Grassland (Poor) (PCT 101)
 - Other**
 - Exotic
 - Farm Dam
 - Infrastructure

Source: Ausecology (2024); NSW Spatial Services (2024);
Stantec (2024); Whitehaven Coal (2024)
Orthophoto Mosaic: Whitehaven Coal (2019); NSW Spatial
Service (2023)

WHITEHAVEN COAL
WHITEHAVEN SOLAR FARM
Vegetation Communities

Figure 12



Plate 4 – Example of Derived Grassland (Poor) (PCT 101) in the Paddocks



Plate 5 – Native Vegetation (PCT 55 Good) in the Road Reserve traversed by the Proposed ETL



Plate 6 – Native Vegetation (PCT 88 Semi-cleared) in the Road Reserve at the Proposed Site Access Road

Table 3
Plant Community Types within the Subject Land

Vegetation Community (Ausecology, 2024) (Attachment B)		PCT ID *	Managem ent Zone 1 - Complete Clearance (ha)	Management Zone 2 - Partial Clearance (Ongoing Maintenance) (ha)	Total Area (ha)	Percent Cleared in NSW (%)*
Semi-arid Woodlands (Grassy sub-formation) - Riverine Plain Woodlands Class						
1	Weeping Myall Woodland (Good) (PCT 27) ¹	PCT 27 Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	0	0	0	86% +/- 60%
Semi-arid Woodlands (Grassy sub-formation) - North-west Floodplain Woodlands Class						
2a	Belah Woodland (Good) (PCT 55)	PCT 55 Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions	0.66	0.13	0.79	83% +/- 50%
2b	Belah Woodland (Semi- Cleared) (PCT 55)		0.69	0.15	0.84	
2c	Derived Grassland (Poor) (PCT 55)		3.84	0.64	4.48	
Grassy Woodlands - Floodplain Transition Woodlands Class						
3	Poplar Box - Belah Woodland (Good) (PCT 56)	PCT 56 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	0.25	0.03	0.28	78% +/- 80%
Dry Sclerophyll Forests (Shrub/grass sub-formation) - Pilliga Outwash Dry Sclerophyll Forests Class						
4a	Pilliga Box - Buloke Woodland (Good) (PCT 88)	PCT 88 Pilliga Box - White Cypress Pine - Buloke shrubby woodland in the Brigalow Belt South Bioregion	0	0	0	38% +/- 80%
4b	Pilliga Box - Buloke Woodland (Semi-Cleared) (PCT 88)		0.08	0	0.08	
4c	Pilliga Box - Buloke Woodland (Revegetation) (PCT 88)		0.03	0	0.03	
Semi-arid Woodlands (Grassy sub-formation) - Brigalow Clay Plain Woodlands Class						
5a	Poplar Box Grassy Woodland (Good) (PCT 101) ²	PCT 101 Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	0	0	0	75% +/- 60%
5b	Poplar Box Grassy Woodland (Semi-Cleared) (PCT 101)		0.27	0.12	0.39	
5c	Derived Grassland (Poor) (PCT 101)		13.7	1.8	15.5	
Total Woodland			1.98	0.43	2.41	
Total Derived Native Grassland			17.54	2.44	19.98	
Overall Total Native Vegetation			19.52	2.87	22.39	
Cleared Land/Non-Native Vegetation			52	14.1	66.1	
Overall Total Subject Land/Development Footprint			71.52	16.97	88.49 (~ 90)	

* NSW DCCEEW (2024c).

1 Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes Bioregions Endangered Ecological Community (Myall Woodland EEC under the BC Act) and Weeping Myall Woodlands Endangered Ecological Community (Myall Woodland EEC under the EPBC Act)

2 Poplar Box Grassy Woodland on Alluvial Plains Endangered Ecological Community (Poplar Box Grassy Woodland EEC under the EPBC Act)

The PCTs were identified by comparing the floristic composition recorded from the vegetation sampling methods above with PCT descriptions provided in *BioNet Vegetation Classification* (NSW DCCEEW, 2024c). Justifications for the PCTs are provided in Table 4.

Table 4
Justification for Identification of Plant Community Types

PCT	PCT Name	Justification of Identification in the Subject Land and/or Surrounds
27	Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	- Occurs in IBRA region Brigalow Belt South, sub-region Liverpool Plains. - Low woodland dominated by weeping myall (<i>Acacia pendula</i>). Shrub species include <i>Alectryon oleifolius</i> and ground layer dominated by grasses including <i>Austrostipa aristiglumis</i>. - Identified out of nine potential PCTs (i.e. 27, 35, 49, 55, 77, 145, 433, 511, 1766) as most suitable due to PCT 27 having the highest percentage of species present in the Upper Stratum (i.e. dominated by <i>Acacia pendula</i>) and Ground Stratum species lists. The vegetation formed a low woodland, characteristic of PCT 27, compared to tall woodland of other potential PCTs.
55	Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions	- Occurs in IBRA region Brigalow Belt South, sub-region Liverpool Plains. - PCT 55 is mapped as occurring within the vicinity of the Subject land (NSW DCCEEW, 2024a; AMBS, 2020a). - Several species characteristic of PCT 55 were recorded in these patches including <i>Casuarina cristata</i>, <i>Acacia pendula</i>, <i>Geijera parviflora</i>, <i>Eremophila mitchellii</i>, <i>Dichanthium sericeum</i> sub species (subsp.) <i>sericeum</i>, <i>Alternanthera denticulata</i>, <i>Enteropogon acicularis</i>, <i>Sclerolaena muricata</i>, <i>Enchylaena tomentosa</i>, <i>Austrostipa scabra</i> subsp. <i>scabra</i>, <i>Chloris truncata</i>, and <i>Wahlenbergia gracilis</i>. - Identified as the most suitable PCT from seven (i.e. 27, 55, 56, 228, 244, 378, 1291) due to suitable species in the Upper Stratum, Mid Stratum and Ground Stratum Species lists. Two alternative PCTs were discounted due to incongruous vegetation formation and differing dominant upper stratum species.
56	Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	- Occurs in IBRA region Brigalow Belt South, sub-region Liverpool Plains. - PCT 56 is mapped as occurring within the vicinity of the Subject land (NSW DCCEEW, 2024a). - Several species characteristic of PCT 56 were recorded in these patches including <i>Eucalyptus populnea</i>, <i>Casuarina cristata</i> and <i>Callitris glaucophylla</i>. - Identified out of four possible PCTs (i.e. 47, 56, 67, 200) by diagnostic features including being a tall to mid-high woodland occurring on red or red-brown loams or light clay, and a higher percentage of suitable species across all strata.
88	Pilliga Box - White Cypress Pine Buloke shrubby woodland in the Brigalow Belt South Bioregion	- Occurs in IBRA region Brigalow Belt South, sub-region Liverpool Plains. - PCT 88 is mapped as occurring within vicinity of Subject land (NSW DCCEEW, 2023b; AMBS, 2020a). - Several shrub and ground species characteristic of PCT 88 were recorded in these patches including <i>Geijera parviflora</i>, <i>Myoporum montanum</i>, <i>Enchylaena tomentosa</i>, <i>Austrostipa scabra</i>, and <i>Enteropogon acicularis</i>. - Pilliga Box (<i>Eucalyptus pilligaensis</i>) is the dominant canopy species. Other possible PCTs (i.e. 35, 88, 145) were typically dominated by a different canopy species, none of which were present at the site.

Table 4 (Continued)
Justification for Identification of Plant Community Types

PCT	PCT Name	Justification of Identification in the Subject Land and/or Surrounds
101	Poplar Box Grassy Woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	- Occurs in IBRA region Brigalow Belt South, sub-region Liverpool Plains. - Area is mapped as PCT 101 (NSW DCCEEW, 2023b). - Several species characteristic of PCT 101 were recorded in these patches including <i>Eucalyptus populnea</i>, <i>Callitris glaucophylla</i>, <i>Maireana microphylla</i>, <i>Aurolistia scabra</i> subsp. <i>scabra</i>, <i>Chrysocephalum apiculatum</i>, <i>Einadia hastata</i>, <i>Geijera parviflora</i>, <i>Oxalis perennans</i>, <i>Carex inversa</i>, <i>Calotis lappulacea</i>, <i>Plantago debilis</i>, <i>Sclerolaena birchii</i>, <i>Chloris truncata</i>. - Identification of the PCT was defined from other potential PCTs (i.e. 244, 56, 397, 418, 435, 458, 594, 56, 101, 397, 27, 35, 49, 52, 56, 101, 145, 211, 397, 433, 484, 81, 88, 202, 397, 421, 599, 35, 49, 52, 56, 88, 101, 145, 397, 454, 511) by the soil, position in landscape, dense ground cover and highest percentage of suitable species present in the Upper Stratum, Mid Stratum and Ground Stratum Species lists.

Source: Ausecology (2024) (Attachment B).

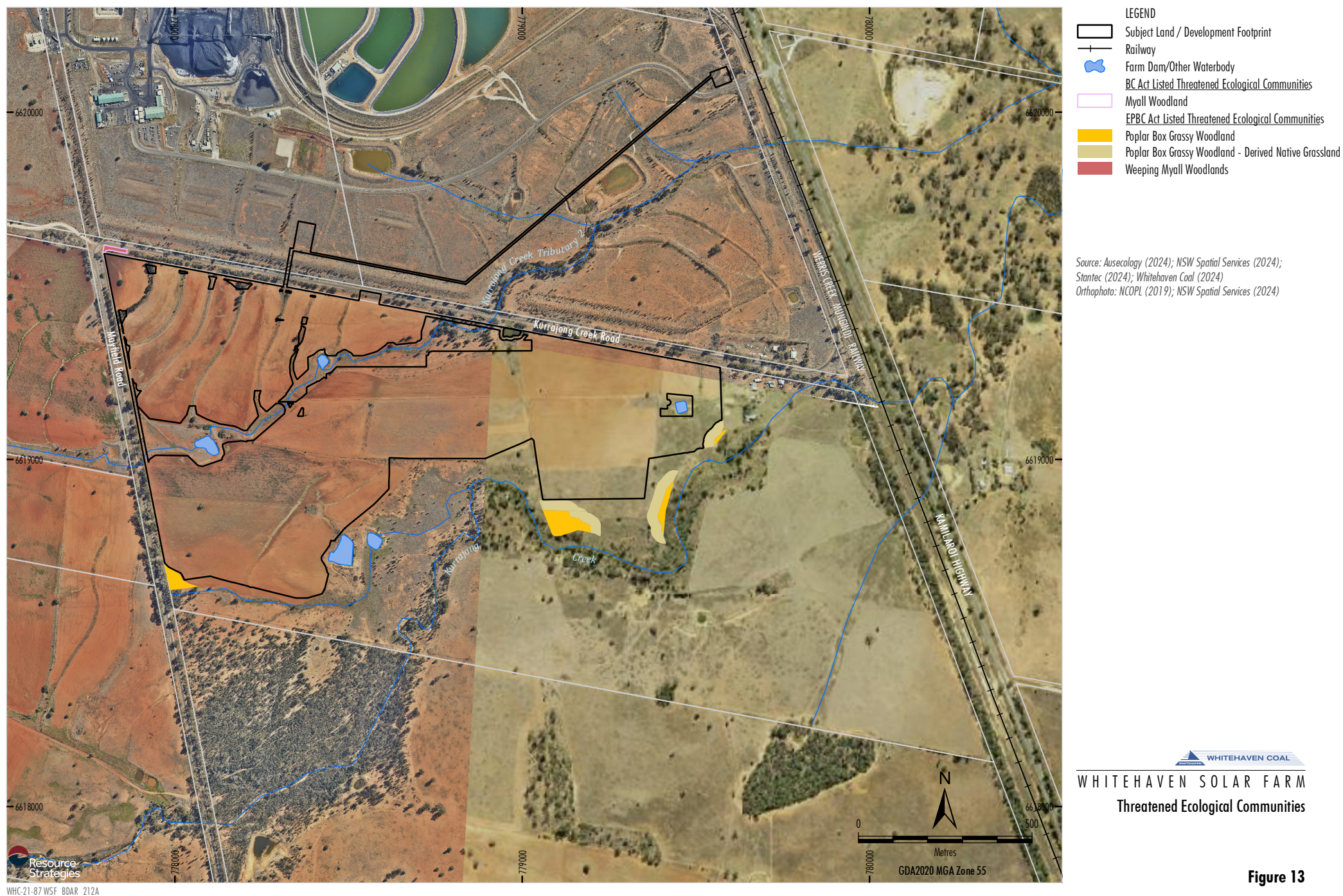
Vegetation zones are described as ‘good’, ‘semi-cleared’, ‘derived native grassland’ and ‘revegetation’. Paddock trees/shrubs are present and have been included within vegetation zones for the purpose of calculating credits for impacts on paddock trees/shrubs (Plate 7).



Plate 7 – Example of a Paddock Tree

3.5 THREATENED ECOLOGICAL COMMUNITIES

Ausecology (2024) (Attachment B) undertook targeted surveys for potentially occurring threatened ecological communities (TECs) listed under the BC Act or the EPBC Act. There are patches of woodland outside of the Development Footprint which are TECs listed under the BC Act and EPBC Act (Myall Woodland EEC under the BC Act and EPBC Act, as well as the Poplar Box Grassy Woodland EEC under the EPBC Act) (Figure 13). The Project has been specifically designed not to impact these areas. There are no TECs listed under the BC Act or EPBC Act in the Subject land.



In other parts of NSW, PCT 55 can be associated with one of four TECs listed under the BC Act⁶, however the occurrence of PCT 55 in the Subject area does not meet listing criteria for these TECs based on species composition and soil types (Ausecology, 2024) (Attachment B). In other parts of NSW, PCT 56 can be associated with one of three TECs listed under the BC Act⁷, however the occurrence of PCT 56 in the Subject area does not meet listing criteria for these TECs based on species composition (Ausecology, 2024) (Attachment B). In other parts of NSW, PCT 101 can be associated with *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions* listed under the BC Act, however the occurrence of PCT 101 in the Subject area does not meet listing criteria for this TEC based on species composition (Ausecology, 2024) (Attachment B).

3.6 VEGETATION INTEGRITY ASSESSMENT

VI is a measure of the condition of native vegetation. The VI plot data was independently collected by Ausecology (2024) (Attachment B) (Figure 14). The VI plots used in the BAM Credit Calculator are shown on Figure 14. A total of 12 plots were used in this assessment (Attachment C), with the number of plots meeting the requirements per area of each zone in the BAM (DPIE, 2020a). Some additional plots collected by Ausecology (2024) (Attachment B) were not used in the BAM-C because the plots were in vegetation that is not proposed to be impacted.

Eight vegetation zones (i.e. areas of native vegetation that are the same PCT and similar broad condition states) were mapped in the Subject land (Table 5). Vegetation zones were assigned a condition class value of 'good', 'semi-cleared', 'revegetation', or 'derived native grassland (poor)' (Table 5).

The patch size is >101 ha for each vegetation zone (Table 5). The BAM Credit Calculator calculates the 'composition condition score', 'structure condition score' and 'function condition score' for each vegetation zone using input from the plot data (Table 5). No hollow bearing trees are present (Table 5; Plates 4 and 5). An overall score of the VI for each vegetation zone is calculated in the BAM Credit Calculator using input from the plot data. According to the BAM Credit Calculator, all of the vegetation zones require an offset.

It was not necessary to use local benchmark data to deviate from the NSW DCCEEW benchmark data database.

⁶ *Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions, Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penepplain and Mulga Lands Bioregions, Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penepplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions and Native Vegetation on Cracking Clay Soils of the Liverpool Plains.*

⁷ *Artesian Springs Ecological Community in the Great Artesian Basin, Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions, and Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions.*

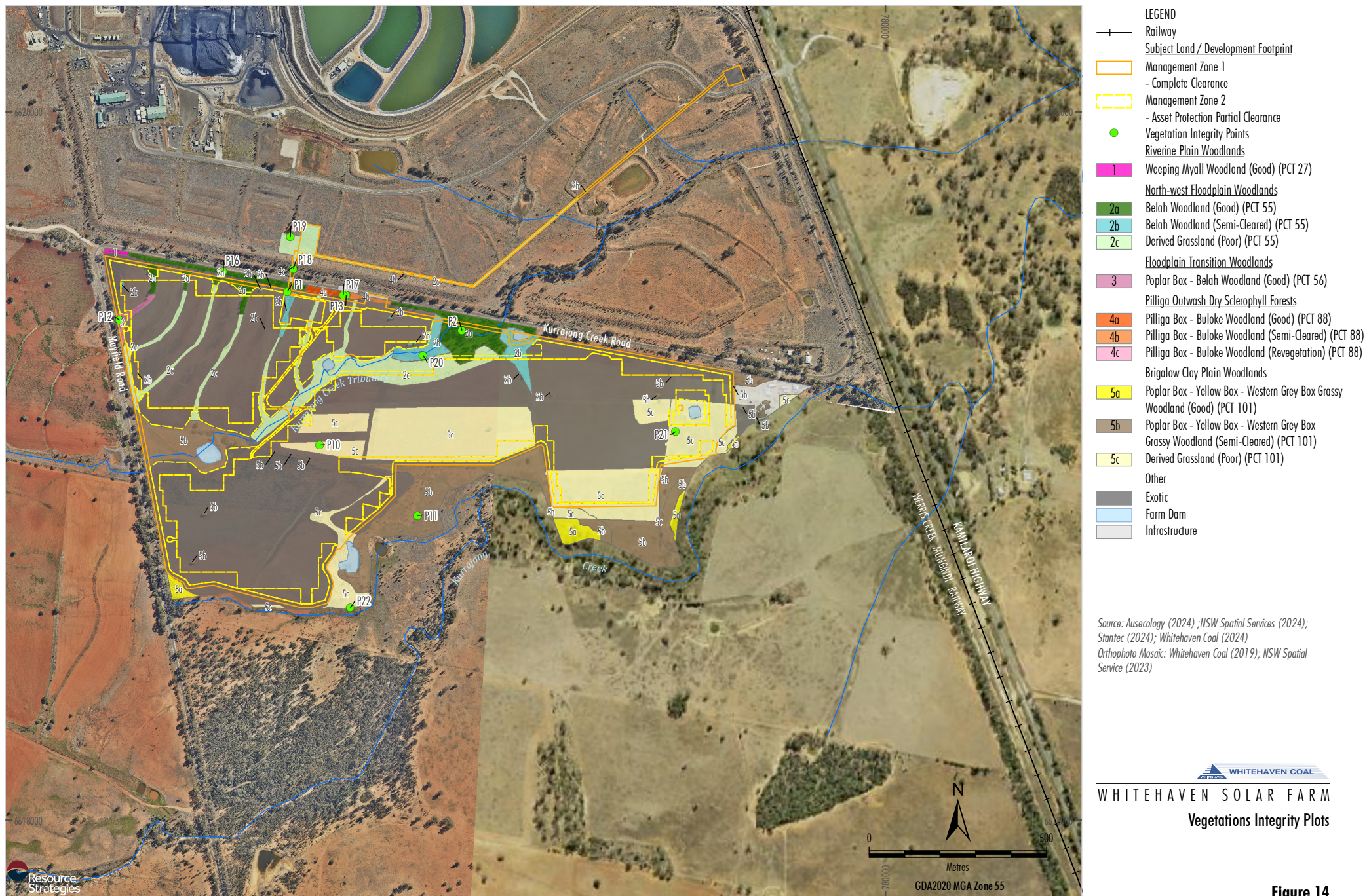


Table 5
Vegetation Integrity Score Detail

#	Vegetation Community (Ausecology, 2024) (Attachment B)		Total Area (ha)	Number of Plots Required and Completed	Patch Size (ha)	Sensitivity to Loss*	Biodiversity Risk Weighting*	Composition Condition Score*	Structure Condition Score*	Function Condition Score*	Trees with Hollows	Vegetation Integrity Score*	Offset Required?
1	2a	Belah Woodland (Good) (PCT 55)	0.79	1 (1)	>101	1	2	77.6	56	66.3	No	66	Yes
2	2b	Belah Woodland (Semi-Cleared) (PCT 55)	0.84	1 (2)	>101	>101	2	74.3	64.7	43.4	No	59.3	Yes
3	2c	Derived Grassland (Poor) (PCT 55)	4.48	2 (2)	>101	>101	2	74.4	39.9	14.5	No	35.1	Yes
4	3	Poplar Box - Belah Woodland (Good) (PCT 56)	0.28	1 (1)	>101	>101	2.5	98.8	92.9	29.3	No	64.5	Yes
5	4b	Pilliga Box - Buloke Woodland (Semi-Cleared) (PCT 88)	0.08	1 (1)	>101	>101	2.5	91.2	66.5	30.2	No	56.8	Yes
6	4c	Pilliga Box - Buloke Woodland (Revegetation) (PCT 88)	0.03	1 (1)	>101	>101	2.5	79.9	41.2	22.1	No	41.7	Yes
7	5b	Poplar Box Grassy Woodland (Semi Cleared) (PCT 101)	0.39	1 (1)	>101	>101	2.5	67.6	48.4	26	No	44	Yes
8	5c	Derived Grassland (Poor) (PCT 101)	15.5	3 (3)	>101	>101	2.5	49.2	59.3	17.2	No	36.9	Yes

* BAM Credit Calculator.

4 THREATENED SPECIES

Threatened species that are ecosystem credit species and/or species credit species are pre-determined by the DPE in the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b). The BAM (DPIE, 2020a) states:

Ecosystem credit species are threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys. The TBDC identifies the threatened species assessed for ecosystem credits. A targeted survey is not required to identify or confirm the presence of ecosystem credit species.

...

Species credit species are threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits.

...

In some circumstances, the TBDC [BioNet Threatened Biodiversity Data Collection] may identify a threatened species that requires assessment for ecosystem credits and species credits (referred to as dual credit species).

4.1 ECOSYSTEM CREDIT SPECIES

In accordance with the BAM (DPIE, 2020a), assessing the habitat suitability for an ecosystem credit species involves the following steps:

- Step 1: Identify threatened species for assessment.
- Step 2: Assessment of the habitat constraints and vagrant species on the Subject land.

These steps are applied below.

4.1.1 Step 1: Identify Ecosystem Credit Species for Assessment

A total of 33 ecosystem credit species for assessment are listed in Table 6 from the BAM Credit Calculator.

There are a number of ecosystem credit species listed in Table 6 with a maximum of high sensitivity to potential gain (as defined by NSW DCCEEW [2024b]). The ecosystem credit calculation uses the highest 'sensitivity to potential gain' class in the credit calculation for a vegetation zone. In this case, the species having high 'sensitivity to potential gain' is used in the BAM Credit Calculator to generate the ecosystem credits. No species were removed from the BAM Credit Calculator because the Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*) has a high 'sensitivity to potential gain' (so removing species from the BAM Credit Calculator would have no effect on the outcome). The 'sensitivity to loss' risk weighting only relates to the PCT (Table 3). Species shaded in blue in Table 6 are species with records in the Subject land on Figure 15.

The Large Bent-winged Bat (*Miniopterus orianae oceanensis*) is an ecosystem and species credit species but no breeding habitat is present within 2 km of the Subject land so it is not a relevant species to generate species credits.

Databases were reviewed for any nearby potentially relevant ecosystem species records (NSW DCCEEW, 2024d; Atlas of Living Australia, 2024; BirdLife Australia, 2024) as were relevant survey reports (Section 4.2.1.1). All potentially relevant species are in Table 6 and none were added.

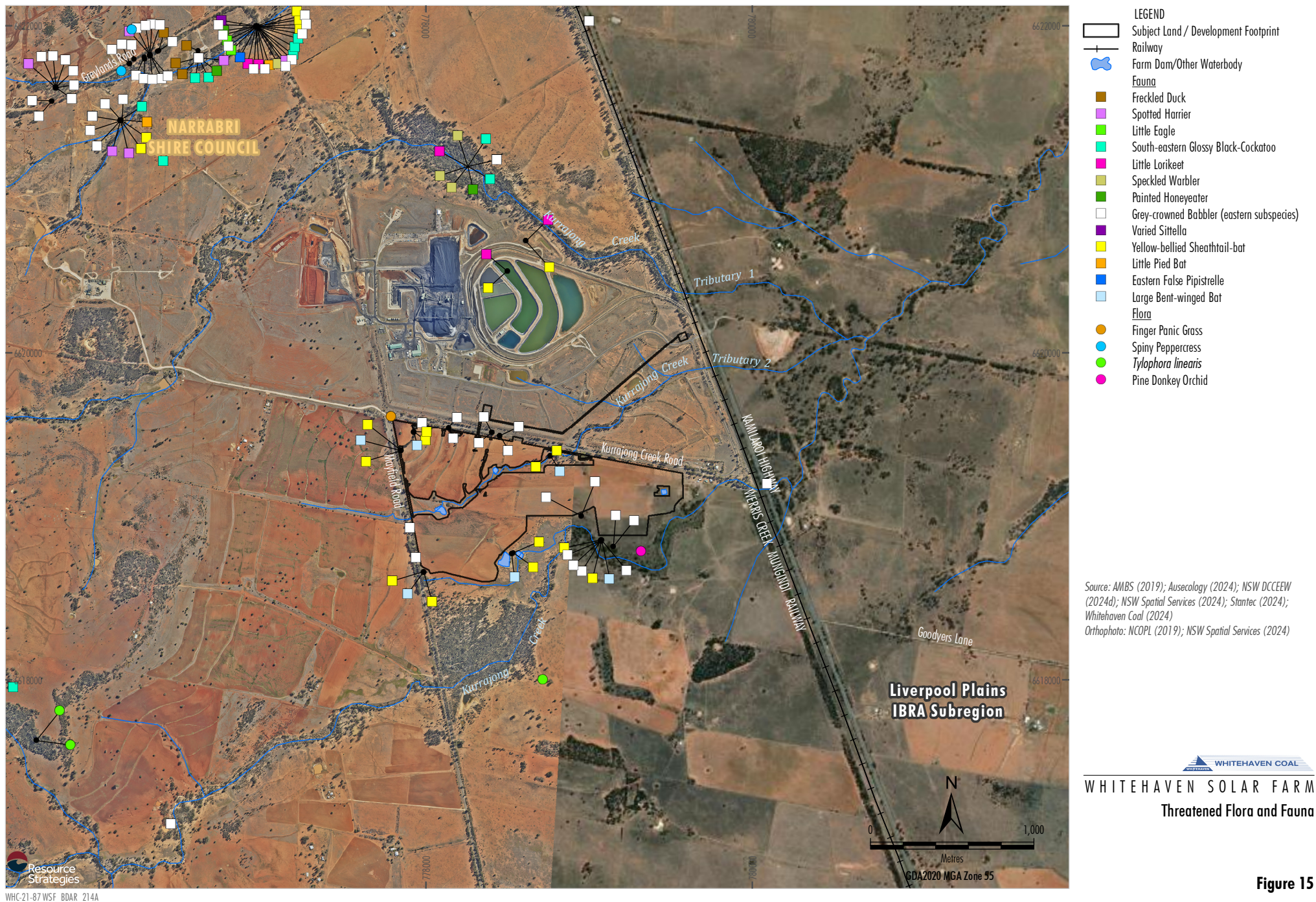


Figure 15

Table 6
Ecosystem Credit Species from the BAM Credit Calculator

Scientific Name	Common Name	Conservation Status ¹		Biodiversity Credit Class ²	Sensitivity to Potential Gain ³
		BC Act	EPBC Act		
Reptiles					
<i>Anomalopus mackayi</i>	Five-clawed Worm-skink	E	V	Ecosystem	High
Birds					
<i>Falco hypoleucos</i>	Grey Falcon	V	V	Ecosystem	Moderate
<i>Falco subniger</i>	Black Falcon	V	-	Ecosystem	Moderate
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	Species/Ecosystem	Moderate
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	V	-	Species/Ecosystem	Moderate
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	-	Species/Ecosystem	High
<i>Circus assimilis</i>	Spotted Harrier	V	-	Ecosystem	Moderate
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	Species/Ecosystem	Moderate
<i>Calyptorhynchus lathami lathami</i>	South-eastern Glossy Black-Cockatoo	V	V	Species/Ecosystem	High
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	Ecosystem	High
<i>Neophema pulchella</i>	Turquoise Parrot	V	-	Ecosystem	High
<i>Lathamus discolor</i>	Swift Parrot	E	CE	Species/Ecosystem	Moderate
<i>Polytelis swainsonii</i>	Superb Parrot	V	V	Ecosystem	Moderate
<i>Hirundapus caudacutus</i>	White-throated Needletail	V	V	Ecosystem	High
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V	V	Ecosystem	High
<i>Chthonicola sagittata</i>	Speckled Warbler	V	-	Ecosystem	High
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V	-	Ecosystem	Moderate
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	Species/Ecosystem	High
<i>Grantiella picta</i>	Painted Honeyeater	V	V	Ecosystem	Moderate
<i>Certhionyx variegatus</i>	Pied Honeyeater	V	-	Ecosystem	Moderate
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	E	E	Ecosystem	Moderate
<i>Petroica boodang</i>	Scarlet Robin	V	-	Ecosystem	Moderate
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V	-	Ecosystem	Moderate
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	Ecosystem	Moderate
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V	-	Ecosystem	Moderate
<i>Stagonopleura guttata</i>	Diamond Firetail	V	V	Ecosystem	Moderate
Mammals					
<i>Sminthopsis macroura</i>	Stripe-faced Dunnart	V	-	Ecosystem	High
<i>Macropus dorsalis</i>	Black-striped Wallaby	E	-	Ecosystem	High
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Species/Ecosystem	High
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-	Ecosystem	High
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V	Ecosystem	High

Table 6 (Continued)
Ecosystem Credit Species from the BAM Credit Calculator

Scientific Name	Common Name	Conservation Status ¹		Biodiversity Credit Class ²	Sensitivity to Potential Gain ³
		BC Act	EPBC Act		
Mammals (Continued)					
<i>Chalinolobus picatus</i>	Little Pied Bat	V	-	Ecosystem	High
<i>Pseudomys pilligaensis</i>	Pilliga Mouse	V	V	Ecosystem	High

Note: Highlighted species are species shown in the Subject land on Figure 15.

¹ Conservation status listed under the BC Act and EPBC Act (current as at October 2024).

CE Critically Endangered; E Endangered; V Vulnerable.

² Biodiversity credit class under the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b) (current as at October 2024).

³ Sensitivity to potential gain under the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b) (current as at October 2024).

There are a number of species that have been listed under the BC Act (some since early 2023) that the NSW DCCEEW has not included in the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b) or BAM Credit Calculator, such as the Grey Snake (*Hemiaspis damelii*), Blue-winged Parrot (*Neophema chrysostoma*) and the Southern Whiteface (*Aphelocephala leucopsis*) and Latham's Snipe (*Gallinago hardwickii*). The BOS Helpdesk was contacted in regard to the Southern Whiteface and it advised the species information would not be available until October 2024. None of these species have been recorded during surveys for this Project or during surveys in the surrounds (Section 4.2.2.1).

4.1.2 Step 2: Assessment of the Habitat Constraints and Vagrant Species

The BAM (DPIE, 2020a) states:

The assessor may opt to undertake an additional assessment of the habitat constraints on the subject land for the threatened species predicted for assessment.

No ecosystem credit species were removed from the BAM Credit Calculator as the species with the highest 'sensitivity to potential gain' class (i.e. 'high') are likely to occur and therefore, removal, of any other species would not change the ecosystem credit requirement.

4.2 SPECIES CREDIT SPECIES

Assessing the habitat suitability for a species credit species involves the following steps:

- Step 1: Identify species credit species for assessment.
- Step 2: Assessment of the habitat constraints for species credit species on the Subject land.
- Step 3: Identify candidate species credit species for further assessment.
- Step 4: Determine presence or absence of a candidate species credit species.
- Step 5: Determine the area or count, and location of suitable habitat for a species credit species.
- Step 6: Determine the habitat condition within the habitat (Species Polygon) for species assessed by area.

These steps are discussed below.

4.2.1 Step 1: Identify Species Credit Species for Assessment

A total of 31 species credit species are listed in Table 7 for initial assessment from the BAM Credit Calculator. None of the threatened records on Figure 15 occur within the Subject land.

Table 7
Species Credit Species from the BAM Credit Calculator

Scientific Name	Common Name	Conservation Status		Biodiversity Credit Class ³	BioNet Associated PCT ³
		BC Act ¹	EPBC Act ²		
Flora					
Cyperus conicus	-	E	-	Species	55, 56, 88, 101
Dichanthium setosum	Bluegrass	V	V	Species	55, 56, 101
Digitaria porrecta	Finger Panic Grass	E	-	Species	55, 56, 101
Diuris tricolor	Pine Donkey Orchid	V	-	Species	56, 88
Lepidium aschersonii	Spiny Peppercress	V	V	Species	55, 56, 88
Lepidium monoplacoides	Winged Peppercress	E	E	Species	56, 88
Polygala linariifolia	Native Milkwort	E	-	Species	88
Swainsona murrayana	Slender Darling Pea	V	V	Species	55, 56, 101
Thesium australe	Austral Toadflax	V	V	Species	101
Tylophora linearis	-	V	E	Species	88
Reptiles					
Uvidicolus sphyrurus	Border Thick-tailed Gecko	V	V	Species	88
Hoplocephalus bitorquatus	Pale-headed Snake	V	-	Species	56, 88, 101
Birds					
Lophoictinia isura	Square-tailed Kite	V	-	Species/Ecosystem	55, 56, 88, 101
Hamirostra melanosternon	Black-breasted Buzzard	V	-	Species/Ecosystem	55, 56, 88, 101
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	Ma	Species/Ecosystem	55, 56, 88, 101
Hieraaetus morphnoides	Little Eagle	V	-	Species/Ecosystem	55, 56, 88, 101
Ardeotis australis	Australian Bustard	E	-	Species	55, 56
Burhinus grallarius	Bush Stone-curlew	E	-	Species	88, 101
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	V	V	Species/Ecosystem	55, 56, 88
Lathamus discolor	Swift Parrot	E	CE	Species/Ecosystem	55, 56, 88, 101
Polytelis swainsonii	Superb Parrot	V	V	Species/Ecosystem	55, 56, 88, 101
Tyto novaehollandiae	Masked Owl	V	-	Species	55, 56, 88, 101
Ninox connivens	Barking Owl	V	-	Species	55, 56, 88, 101
Anthochaera phrygia	Regent Honeyeater	CE	CE	Species/Ecosystem	101
Mammals					
Phascolarctos cinereus	Koala	E	E	Species	55, 56, 88, 101
Cercartetus nanus	Eastern Pygmy-possum	V	-	Species	88, 101
Petaurus norfolcensis	Squirrel Glider	V	-	Species	88

Table 7 (Continued)
Species Credit Species from the BAM Credit Calculator

Scientific Name	Common Name	Conservation Status		Biodiversity Credit Class ³	BioNet Associated PCT ³
		BC Act ¹	EPBC Act ²		
Mammals (Continued)					
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Species	56, 88
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Species/Ecosystem	55, 56, 101
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	E	E	Species	88
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	-	Species	56, 88, 101

¹ Conservation status under the BC Act (current as at October 2024). CE = Critically Endangered; E = Endangered; V = Vulnerable.

² Conservation status under the EPBC Act (current as at October 2024). CE = Critically Endangered; E = Endangered; V = Vulnerable; Ma = Marine.

³ Biodiversity credit class under the NSW DCCEEW (2024a) (current as at October 2024).

4.2.1.1 Review of Databases and Past Flora and Fauna Surveys

Databases were reviewed for any nearby potentially relevant threatened species records (NSW DCCEEW, 2024d; Atlas of Living Australia, 2024; BirdLife Australia, 2024).

Flora studies previously undertaken in Mining Lease 1609 (ML 1609) and surrounds (Table 8) were also reviewed for any nearby potentially relevant threatened flora species records.

Table 8
Previous Flora Studies in the Surrounds

Surveys	Timing	Location	Reference
Flora surveys for Narrabri Underground Mine Stage 1	2005	Inside ML 1609	Ecotone Ecological Consultants Pty Ltd (Ecotone) (2007)
Flora surveys for Narrabri Underground Mine Stage 2	2009	Inside ML 1609	Ecotone (2009) and FloraSearch (2009)
Narrabri Underground Mine ecological monitoring surveys	Between 2011 and 2019	Inside ML 1609	ELA (2012, 2013a, 2013b, 2015a, 2015b, 2015c, 2015d, 2016a, 2016c, 2017a, 2017b, 2018a, 2018b, 2018c, 2018d and 2020)
Initial flora surveys for Narrabri Underground Mine Stage 3 Extension	2016	South of ML 1609	ELA (2016b)

Note: ELA = Eco Logical Australia Pty Ltd

Attachment F provides a summary of the threatened flora species records in the locality from database and survey records. Threatened flora species records are shown on Figure 15.

A description of the previous flora studies is provided below.

Flora Surveys for Narrabri Underground Mine Stage 1

Ecotone (2007) conducted flora surveys over two days in October 2005 for the Narrabri Coal Project Stage 1. The surveys were focused on the Pit Top Area. The flora survey involved a traverse on foot to assess the range of floristic variation, vegetation structure and condition of the vegetation (Ecotone, 2007). Coolabah Bertya (*Bertya opposens*) was recorded⁸; no other threatened flora species were recorded.

No potential habitat for Coolabah Bertya occurs in the Subject land.

Flora Surveys for Narrabri Underground Mine Stage 2

Flora surveys were undertaken over five days in January 2009 by Ecotone (2009). The surveys were conducted in select areas within ML 1609. The flora survey techniques involved 400 square metres (m²) flora quadrats, random meanders, targeted search for threatened flora species and vegetation mapping (Ecotone, 2009). Coolabah Bertya was not listed as a threatened species at the time of the survey, no other threatened flora species were recorded.

A supplementary flora survey was undertaken in September 2009 by FloraSearch (2009). The survey involved vehicle and foot traverses within ML 1609 (FloraSearch, 2009). FloraSearch (2009) recorded a large population of Coolabah Bertya along the western and northern boundaries of ML 1609, extending into the Jacks Creek and Pilliga East State Forests and to the north of the Subject land. No other threatened flora species were recorded.

As stated above, no potential habitat for Coolabah Bertya occurs in the Subject land.

Ecological Monitoring Surveys (Between 2011 and 2019)

Ongoing ecological monitoring surveys have been conducted in ML 1609 to monitor subsidence impacts on native vegetation, fauna and aquatic biota (ELA, 2012; 2013a; 2013b; 2015a; 2015b; 2015c; 2015d; 2016a; 2017a; 2018b; 2018c; 2018d and 2020). The monitoring programme is documented in the *Narrabri Mine Biodiversity Management Plan* (BMP) (ELA, 2019a). The flora survey methods included: remote sensing, woodland and riparian vegetation monitoring via flora plots and targeted threatened flora species surveys.

There are four existing offset areas within ML 1609. The offset areas have been subject to management activities since 2014. Management activities undertaken in the offset areas include, weed control via spraying, feral animal management via baiting and trapping and fire break maintenance.

Ecological monitoring surveys have been conducted in the existing offset areas (ELA, 2016c; 2017b and 2018a). The monitoring involves standardised plot surveys and targeted searches for threatened flora species.

The Spiny Peppercress (*Lepidium aschersonii*) and *Tylophora linearis* have been recorded during the ecological monitoring surveys. Coolabah Bertya is known to occur in the Narrabri Mine existing offset areas (ELA, 2016c; 2017b and 2018a).

The Spiny Peppercress is already listed as a candidate species in Section 4.2.1. No potential habitat for *Tylophora linearis* or Coolabah Bertya occurs in the Subject land.

⁸ Coolabah Bertya was listed on 4 December 2009.

Initial Flora Surveys for Narrabri Underground Mine Stage 3 Extension Project

Flora surveys have been conducted in an area south of ML 1609 for the Project, and preparatory exploration activities. Initial flora surveys in this area were undertaken by ELA (2016b) in June 2015 and January 2016. Two threatened flora species were recorded during the 2016 surveys, namely Coolabah Bertya and *Tylophora linearis*.

As stated above, no potential habitat for Coolabah Bertya or *Tylophora linearis* occurs in the Subject land.

Flora Surveys for Narrabri Underground Mine Stage 3 Extension

AMBS was commissioned by Narrabri Coal Operations Pty Ltd to undertake flora surveys for the Narrabri Underground Mine Stage 3 Extension Project. Nine field surveys were undertaken in June 2019, July 2019, August 2019, October 2019 and January 2020. The following four threatened plant species were recorded:

- Coolabah Bertya (*Bertya opposens*) (BC Act - Vulnerable, EPBC Act - Vulnerable);
- Spiny Peppercress (*Lepidium aschersonii*) (BC Act – Vulnerable, EPBC Act - Vulnerable);
- *Pomaderris queenslandica* (BC Act – Endangered); and
- *Tylophora linearis* (BC Act - Vulnerable, EPBC Act - Endangered).

As stated above, Spiny Peppercress is already listed as a candidate species in Section 4.2.1. No potential habitat for *Tylophora linearis* or Coolabah Bertya occurs in the Subject land. No potential habitat for *Pomaderris queenslandica* occurs in the Subject land.

Fauna studies previously undertaken in ML 1609 and surrounds (Table 9) were also reviewed for any nearby potentially relevant threatened fauna species records.

Table 9
Previous Fauna Studies in the Surrounds

Surveys	Timing	Location	Reference
Fauna surveys for Narrabri Underground Mine Stage 1	2007	Inside ML 1609	Ecotone (2007)
Fauna surveys for Narrabri Underground Mine Stage 2	2009	Inside ML 1609	Ecotone (2009)
Narrabri Underground Mine ecological monitoring surveys	Between 2011 and 2019	Inside ML 1609	ELA (2012, 2013a, 2013b, 2015a, 2015b, 2015c, 2015d, 2016a, 2016c, 2017a, 2017b, 2018a, 2018b, 2018c, 2018d and 2020)
Initial fauna surveys for Narrabri Underground Mine Stage 3 Extension	2016	South of ML 1609	ELA (2016b)

Attachment F provides a summary of the threatened fauna species records in the locality from database and survey records. Threatened fauna species records are shown on Figure 15.

A description of the previous fauna studies is provided below.

Fauna Surveys for Narrabri Annual Reviews

During the winter bird surveys for the Narrabri Annual Reviews 2020 to 2023, a total of three threatened bird species were recorded, including the Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*), Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) and Speckled Warbler (*Chthonicola sagittata*) (Narrabri Coal Operations Pty Ltd, 2021; 2022; 2023; 2024).

Fauna Surveys for Narrabri Underground Mine Stage 1

Ecotone (2007) conducted fauna surveys over two days in October 2005 for the Narrabri Coal Project Stage 1 Ecological Assessment. The surveys were focused on the Pit Top Area and along Kurrajong Creek. The survey techniques included habitat assessments, Anabat detectors, harp traps, spotlighting, call playback, diurnal bird surveys, active reptile and amphibian surveys and opportunistic observations (Ecotone, 2007). No species credit species were recorded within the Subject land during the 2005 surveys.

Fauna Surveys for Narrabri Underground Mine Stage 2

Ecotone (2009) conducted fauna surveys over five days in January 2009 within ML 1609 and over two days along the pipeline corridor. The survey techniques included habitat assessments, Elliot traps, cage traps, pitfall traps, hair funnel traps, Anabat detectors, harp traps, spotlighting, nocturnal call playback, diurnal bird surveys, active reptile and amphibian surveys, searches for signs of fauna (e.g. scats and scratches) and opportunistic observations (Ecotone, 2009).

Five threatened species credit species were identified by Ecotone (2009), namely the Pale-headed Snake (*Hoplocephalus bitorquatus*), Superb Parrot (*Polytelis swainsonii*)⁹, South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*), Koala (*Phascolarctos cinereus*) and Eastern Pygmy-possum (*Cercartetus nanus*). All of these species are already listed as a candidate species in Section 4.2.1.

Ecological Monitoring Surveys (Between 2011 and 2019)

Ongoing ecological monitoring surveys have been conducted in ML 1609 to monitor predicted subsidence impacts on native vegetation, fauna and aquatic biota (ELA, 2012; 2013a; 2013b; 2015a; 2015b; 2015c; 2015d; 2016a; 2017a; 2018b; 2018c; 2018d and 2020). The monitoring programme is documented in the BMP (ELA, 2019a). The fauna survey methodologies employed during the monitoring included diurnal bird surveys, Koala searches, baited hair funnel traps, infra-red motion cameras, Anabat detectors, cage traps and spotlighting.

Threatened species credit species found during ecological monitoring surveys are the Little Eagle (*Hieraaetus morphnoides*), South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*), and Large Bent-winged Bat (*Miniopterus orianae oceanensis*) (ELA, 2012; 2013a; 2013b; 2015a; 2015b; 2015c; 2015d; 2016a; 2017a and 2018b).

Ecological monitoring surveys have been conducted in the existing offset areas (ELA, 2016c; 2017b and 2018a). The South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*), and Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Eastern Cave Bat (*Vespadelus troughtoni*) were recorded within the Mine Biodiversity On-site Offset Areas during 2016 and 2017 monitoring (ELA, 2016c; 2017b and 2018a). No rocky outcrops with bat habitat are known to occur around the existing on-site offset areas. All of these species are already listed as a candidate species in Section 4.2.1.

⁹ In 2009, Cenwest (2009) undertook a review and describes that the site is near the northern range extremity of the Superb Parrot and it does not breed within the locality.

Initial Fauna Surveys for Narrabri Underground Mine Stage 3 Extension

Fauna surveys commenced in 2015 in an area south of ML 1609 for the Project, and preparatory exploration works. Initial fauna surveys in this area were undertaken by ELA (2016b) in June 2015. The surveys involved targeted threatened species searches as well as exploration of potential threatened fauna habitat such as hollow-bearing trees and fallen logs (ELA, 2016b). One threatened species credit species was identified by ELA (2016b), namely the South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*). This species is already listed as a candidate species in Section 4.2.1.

Fauna Surveys for Narrabri Underground Mine Stage 3 Extension

AMBS was commissioned by Narrabri Coal Operations Pty Ltd to undertake fauna surveys for the Narrabri Underground Mine Stage 3 Extension Project. Numerous fauna surveys have been undertaken between June 2019 and January 2020. The following threatened fauna species were recorded:

- South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*) (BC Act – Vulnerable, EPBC Act – Vulnerable);
- Little Lorikeet (*Glossopsitta pusilla*) (BC Act – Vulnerable);
- White-throated Needletail (*Hirundapus caudacutus*) (EPBC Act – Vulnerable);
- Speckled Warbler (*Chthonicola sagittata*) (BC Act – Vulnerable);
- Painted Honeyeater (*Grantiella picta*) (BC Act – Vulnerable, EPBC Act – Vulnerable);
- Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*) (BC Act – Endangered, EPBC Act – Endangered);
- Scarlet Robin (*Petroica boodang*) (BC Act – Vulnerable);
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) (BC Act – Vulnerable);
- Varied Sittella (*Daphoenositta chrysoptera*) (BC Act – Vulnerable);
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*) (BC Act – Vulnerable);
- Diamond Firetail (*Stagonopleura guttata*) (BC Act – Vulnerable, EPBC Act – Vulnerable);
- Koala (*Phascolarctos cinereus*) (BC Act – Endangered, EPBC Act – Endangered);
- Eastern Pygmy-possum (*Cercartetus nanus*) (BC Act – Vulnerable);
- Black-striped Wallaby (*Macropus dorsalis*) (BC Act – Endangered);
- Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*) (BC Act – Vulnerable);
- Corben's Long-eared Bat (*Nyctophilus corbeni*) (BC Act – Vulnerable, EPBC Act – Vulnerable);
- Large-eared Pied Bat (*Chalinolobus dwyeri*) (BC Act – Vulnerable, EPBC Act – Vulnerable);
- Little Pied Bat (*Chalinolobus picatus*) (BC Act – Vulnerable);
- Eastern Cave Bat (*Vespadelus troungtoni*) (BC Act – Vulnerable); and
- Pilliga Mouse (*Pseudomys pilligaensis*) (BC Act – Vulnerable, EPBC Act – Vulnerable).

No additional potentially occurring species credit species were added to Table 7.

4.2.1.2 Geographic Constraints

No geographic constraints are identified in the BAM Credit Calculator for any of the species credit species.

4.2.2 Step 2: Assessment of the Habitat Constraints and Vagrant Species

Habitat constraints are identified in the BAM Credit Calculator for some fauna species credit species, and the absence of the habitat constraints precludes the species from further assessment. Step 2 is not applicable to a species where no habitat constraints are listed for that species in the BAM Credit Calculator. Table 10 shows that 13 species are removed as candidate species due to the absence of habitat constraints – the blue shaded species. This many species were able to be removed as candidate species because the Subject land has been cleared historically and habitats that occur in the locality have been specifically avoided.

4.2.3 Step 3: Identify Candidate Species Credit Species for Further Assessment

4.2.3.1 Microhabitats Degraded or Absent

Section 5.2.3 of the BAM (DPIE, 2020a) states:

2. A candidate species credit species is considered unlikely to occur on the subject land (or specific vegetation zones) if one of the following applies:
 - a. After carrying out a field assessment:
...
 - ii. the assessor determines that the habitat constraints or microhabitats are degraded to the point that the species is unlikely to use the subject land (or specific vegetation zones).
3. A candidate species credit species that does not have suitable habitat as per (2.a.) or (2.b.) does not require further assessment.

Table 10
Species Credit Species – Habitat Constraints Assessment

Scientific Name	Common Name	Conservation Status		Biodiversity Credit Class ³	Habitat Constraint (NSW DCCEEW, 2024b)	Assessment
		BC Act ¹	EPBC Act ²			
Birds						
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	Species/Ecosystem	Nest trees.	The Subject land does not contain potential nest trees (Ausecology, 2024 [Attachment B]).
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	V	-	Species/Ecosystem	Land within 40 m of riparian woodland on inland watercourses/waterholes containing dead or dying eucalypts.	The Subject land does not contain eucalypts within 40 m of riparian woodland (Ausecology, 2024 [Attachment B]).
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	-	Species/Ecosystem	Living or dead mature trees within suitable vegetation within 1 km of rivers, lakes, large dams or creeks, wetlands and coastlines.	Habitat constraint present (Ausecology, 2024 [Attachment B]).
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	Species/Ecosystem	Nest trees – live (occasionally dead) large old trees within vegetation.	The Subject land does not contain potential nest trees (Ausecology, 2024 [Attachment B]).
<i>Burhinus grallarius</i>	Bush Stone-curlew	E	-	Species	Fallen/standing dead timber including logs.	Habitat constraint present (Ausecology, 2024 [Attachment B]).
<i>Calyptorhynchus lathami lathami</i>	South-eastern Glossy Black-Cockatoo	V	V	Species/Ecosystem	Living or dead tree with hollows greater than 15 cm diameter and greater than 8 m above ground. Presence of <i>Allocasuarina</i> and <i>casuarina</i> species.	Habitat constraint absent. Targeted surveys were undertaken by Ausecology (2024) (Attachment B) due to the ongoing surveys for the species at the Narrabri Mine.
<i>Lathamus discolor</i>	Swift Parrot	E	CE	Species/Ecosystem	Breeding habitat defined by Important Habitat Map.	The Subject land is not within a mapped important habitat area for this species (NSW DCCEEW, 2024f).
<i>Polytelis swainsonii</i>	Superb Parrot	V	V	Species/Ecosystem	Living or dead <i>E. blakelyi</i> , <i>E. melliodora</i> , <i>E. albens</i> , <i>E. camaldulensis</i> , <i>E. microcarpa</i> , <i>E. polyanthemus</i> , <i>E. mannifera</i> , <i>E. intertexta</i> with hollows greater than 5 cm diameter; greater than 4 m above ground or trees with a DBH of greater than 30cm.	The Subject land does not contain suitable tree species with suitable hollows (Ausecology, 2024 [Attachment B]).
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	Species	Living or dead trees with hollows greater than 20 cm diameter.	The Subject land does not contain trees with hollows greater than 20 cm diameter (Ausecology, 2024 [Attachment B]).

Table 10 (Continued)
Species Credit Species – Habitat Constraints Assessment

Scientific Name	Common Name	Conservation Status		Biodiversity Credit Class ³	Habitat Constraint (NSW DCCEEW, 2024b)	Assessment
		BC Act ¹	EPBC Act ²			
<i>Ninox connivens</i>	Barking Owl	V	-	Species	<i>Living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground.</i>	The Subject land does not contain trees with hollows greater than 20 cm diameter (Ausecology, 2024 [Attachment B]).
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	Species/Ecosystem	<i>Breeding habitat defined by Important Habitat Map.</i>	The Subject land is not within a mapped important habitat area for this species (NSW DCCEEW, 2024f).
Mammals						
<i>Phascolarctos cinereus</i>	Koala	E	E	Species	<i>Presence of koala use trees.</i>	Habitat constraint present (Ausecology, 2024 [Attachment B]).
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Species	<i>Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines.</i>	Habitat constraint absent (Ausecology, 2024 [Attachment B]).
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Species/Ecosystem	<i>Breeding camps.</i>	Habitat constraint absent. No nearby camps, the nearest known Grey-headed Flying-fox camp is near Tamworth approximately 120 km away (DAWE, 2020).
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	E	E	Species	<i>Cliffs; within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops or crevices, or within 2 km of old mines or tunnels.</i>	Habitat constraint absent (Ausecology, 2024 [Attachment B]).
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	-	Species	<i>Caves; within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within 2 km of old mines, tunnels, old buildings or sheds.</i>	Habitat constraint absent (Ausecology, 2024 [Attachment B]).

Note: DBH = Diameter at Breast Height; cm = centimeter.

¹ Conservation status under the BC Act (current as at October 2024). CE = Critically Endangered; E = Endangered; V = Vulnerable.

² Conservation status under the EPBC Act (current as at October 2024). CE = Critically Endangered; V = Vulnerable.

³ Biodiversity credit class under the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b) (current as at October 2024).

The Subject land has been cleared historically. As described below, two species have been removed as candidate species as microhabitats are degraded to the point that the species is unlikely to use the Subject land.

Border Thick-tailed Gecko

The Border Thick-tailed Gecko (*Uvidicolus sphyrurus*) can be associated with PCT 88 according to the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b). This species has no defined habitat constraints by the NSW Government (NSW DCCEEW, 2024b), however, the species does have microhabitat requirements. The Border Thick-tailed Gecko typically occurs on steep rocky or scree slopes (especially granite) and favours forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter (NSW DCCEEW, 2024b).

The closest BioNet record of this species to the Project is in Mount Kaputar National Park, over 30 km north-east. There is 0.12 ha of PCT 88 within the Subject land, in semi-cleared, revegetation and regrowth condition. There are no steep rocky or scree slopes, and no boulders or rock slabs. Fallen timber is scarce (as trees are young) and leaf litter is shallow.

Ausecology (2024) (Attachment B) did undertake targeted searches for this species to be conservative but it is unlikely that the species is present and microhabitats are degraded to the point that the species is unlikely to use the Subject land (Plate 6).

Pale-headed Snake

The Pale-headed Snake (*Hoplocephalus bitorquatus*) can be associated with PCT 56 and 88 according to the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b). This species has no defined habitat constraints by the NSW Government (NSW DCCEEW, 2024b), however, the species does have microhabitat requirements.

The Pale-headed Snake live in trees (living or dead) with hollows and/or loose bark. No hollow-bearing trees were recorded in the Subject land. There is 0.12 ha of PCT 88 with the Subject land, in semi-cleared, revegetation and regrowth condition. There is 0.33 ha of PCT 56 with the Subject land.

It is noted that the Pale-headed Snake (*Hoplocephalus bitorquatus*) will use paddock trees within 500 m of intact habitat (NSW DCCEEW, 2024b), however, the paddock trees/shrubs in the Subject land (Plate 7) are surrounded by cultivated land.

Ausecology (2024) (Attachment B) did undertake spotlighting for this species but microhabitats are degraded to the point that the species is unlikely to use the Subject land. More suitable habitat occurs to the west associated with the State Forest and to the south along Kurrajong Creek (which has been avoided for the Project).

4.2.4 Step 4: Determine Presence or Absence of a Candidate Species Credit Species

4.2.4.1 Species Important Habitat Mapping

No Important Habitat Mapping occurs in the Subject land (NSW DCCEEW, 2024f).

4.2.4.2 Species Assumed to be Present

No species credit species are assumed to be present.

4.2.4.3 Expert Report

No expert reports have been prepared for species credit species.

4.2.4.4 Targeted Threatened Species Surveys

Ausecology (2024) (Attachment B) undertook targeted searches for threatened flora and fauna species. Survey techniques included:

- parallel flora transects;
- Anabat bat echolocation recorders;
- baited glider camera traps;
- harp traps;
- Koala Spot Assessment Technique (SAT) surveys;
- bird surveys;
- habitat assessments; and
- spotlighting.

The location of survey sites is shown on Figure 16.

Table 11 contains a list of threatened species and populations that were targeted during surveys. As described above in Section 4.2.4.4, surveys for reptiles were undertaken in addition to the surveys below.

Threatened Flora Species

Ausecology (2024) (Attachment B) undertook targeted searches for threatened flora in November 2022, as well as January and September 2023 in accordance with *Surveying Threatened Plants and Their Habitats: NSW Survey Guide for the Biodiversity Assessment Method* (DPIE, 2020c). The timing of the surveys coincided with the optimum survey time in the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b) for each target species as shown in Table 11.

The searches were undertaken in November 2022 by Andrew Dawson and Brendan Schembri, and in January and September 2023, by Brad Jeffers and Lauren Eade. Andrew Dawson and Brad Jeffers also undertook an additional survey in January and February 2024 (respectively) to collect additional potential Finger Panic Grass (*Digitaria porrecta*) specimens that were verified by the Herbarium.

The location of field traverses undertaken are shown on Figure 16. The vegetation was open so parallel transects of 10 m width were required in accordance with *Surveying Threatened Plants and Their Habitats: NSW Survey Guide for the Biodiversity Assessment Method* (DPIE, 2020c). However, some tracks were less than required (around 5 m width) which more than required coverage. In addition to the standard survey transects, opportunistic searches for threatened plants were also undertaken.

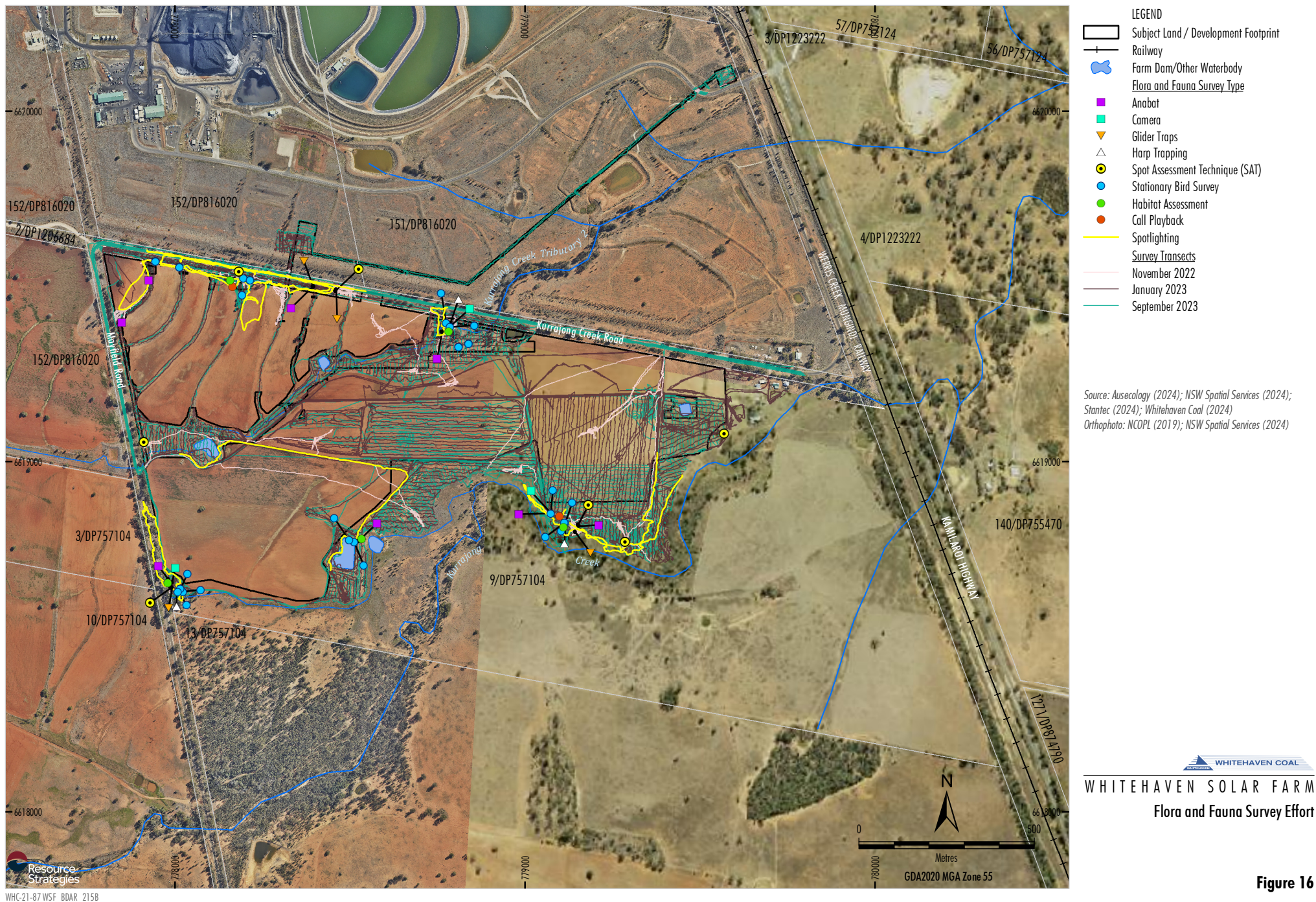


Table 11
Candidate Species Credit Species – Survey Timing

Scientific Name	Common Name	Biodiversity Credit Class ¹	January	February	March	April	May	June	July	August	September	October	November	December
Flora														
<i>Cyperus conicus</i>	-	Species	Yes	Yes	Yes	Yes	Yes	-	-	-	-	-	-	-
<i>Dichanthium setosum</i>	Bluegrass	Species	Yes	Yes	Yes	Yes	Yes	-	-	-	-	-	Yes	Yes
<i>Digitaria porrecta</i>	Finger Panic Grass	Species	Yes	Yes (Recorded)	-	-	-	-	-	-	-	-	-	-
<i>Diuris tricolor</i>	Pine Donkey Orchid	Species	-	-	-	-	-	-	-	-	Yes (Recorded)	Yes	-	-
<i>Lepidium aschersonii</i>	Spiny Peppergrass	Species	Yes	Yes	Yes	Yes	-	-	-	-	-	-	Yes	Yes
<i>Lepidium monoplocoides</i>	Winged Peppergrass	Species	-	-	-	-	-	-	-	-	Yes	Yes	Yes	Yes
<i>Polygala linariifolia</i>	Native Milkwort	Species	Yes	Yes	-	-	-	-	-	-	-	Yes	Yes	Yes
<i>Swainsona murrayana</i>	Slender Darling Pea	Species	-	-	-	-	-	-	-	-	Yes	-	-	-
<i>Thesium australe</i>	Austral Toadflax	Species	Yes	Yes	-	-	-	-	-	-	-	-	Yes	Yes
<i>Tylophora linearis</i>	-	Species	Yes	Yes	Yes	Yes	Yes	-	-	-	-	Yes	Yes	Yes
Birds														
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Species/Ecosystem	-	-	-	-	-	-	Yes	Yes	Yes	Yes	Yes	Yes
<i>Ardeotis australis</i>	Australian Bustard	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Burhinus grallarius</i>	Bush Stone-curlew	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mammals														
<i>Phascogale cinerea</i>	Koala	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	Species	Yes	Yes	Yes	-	-	-	-	-	-	Yes	Yes	Yes
<i>Petaurus norfolcensis</i>	Squirrel Glider	Species	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Months in which surveys for the species are to be conducted in accordance with the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b) are denoted with "Yes". The shaded months are the months in which targeted surveys were undertaken by Ausecology (2024) (Attachment B) for the relevant species.

¹ Biodiversity credit class under the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b) (current as at October 2024).

* The Subject land is not within a mapped important habitat area for this species (NSW DCCEEW, 2024f) so no survey is required. The species is assessed for species credits via the Important Habitat Map in BOAMS.

The searches were undertaken over a larger study area encompassing the Subject land. The larger study area contained potential habitat for threatened flora which was less disturbed compared to the potential habitat in the Subject land (e.g. near Kurrajong Creek). Further details are provided in the *Whitehaven Solar Farm Project - Flora and Fauna Baseline Report* (Ausecology, 2024) (Attachment B).

Threatened Birds

White-bellied Sea Eagle

The White-bellied Sea Eagle (*Haliaeetus leucogaster*) can be associated with any PCT in the Subject land according to the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b). Ausecology (2024) (Attachment B) undertook avifauna surveys in 2022 targeting White-bellied Sea Eagle in accordance with the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft* (Department of Environment and Conservation [DEC], 2004). A total of 480 person minutes of survey were undertaken.

Australian Bustard

The Australian Bustard (*Ardeotis australis*) can be associated with PCT 55 and PCT 56 according to the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b). Ausecology (2024) (Attachment B) undertook avifauna surveys in 2022 targeting Australian Bustard in accordance with DEC (2004). A total of 480 person minutes of survey were undertaken. This species can be detected year-round and is easily identified so any survey activities at other times of year may be detected this species if it were present.

Bush Stone-curlew

The Bush Stone-curlew (*Burhinus grallarius*) can be associated with PCT 88 and PCT 101 according to the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b). Ausecology (2024) (Attachment B) undertook avifauna surveys in 2022 targeting Bush Stone-curlew in accordance with DEC (2004). A total of 480 person minutes of survey were undertaken. This species can be detected year-round and is easily identified so any survey activities at other times of year may be detected this species if it were present.

Threatened Mammals

Koala

The Koala can be associated with any PCT according to the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b). Ausecology (2024) (Attachment B) undertook surveys in accordance with the *Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide* (DPE, 2022a). SAT surveys were undertaken at seven locations (Figure 16). Spotlighting was undertaken by two ecologists over eight nights across three survey periods.

Eastern Pygmy-possum and Squirrel Glider

The Eastern Pygmy-possum can be associated with PCT 88 and PCT 101 according to the *BioNet Threatened Biodiversity Data Collection* (NSW DCCEEW, 2024b). The Squirrel Glider (*Petaurus norfolcensis*) can be associated with PCT 88 (NSW DCCEEW, 2024b). Four arboreal camera traps were set for 5 nights each (20 trap nights) (Ausecology, 2024) (Attachment B). Spotlighting was undertaken by two ecologists over eight nights across three survey periods.

4.2.5 Step 5: Determine the Area or Count, and Location of Suitable Habitat for a Species Credit Species

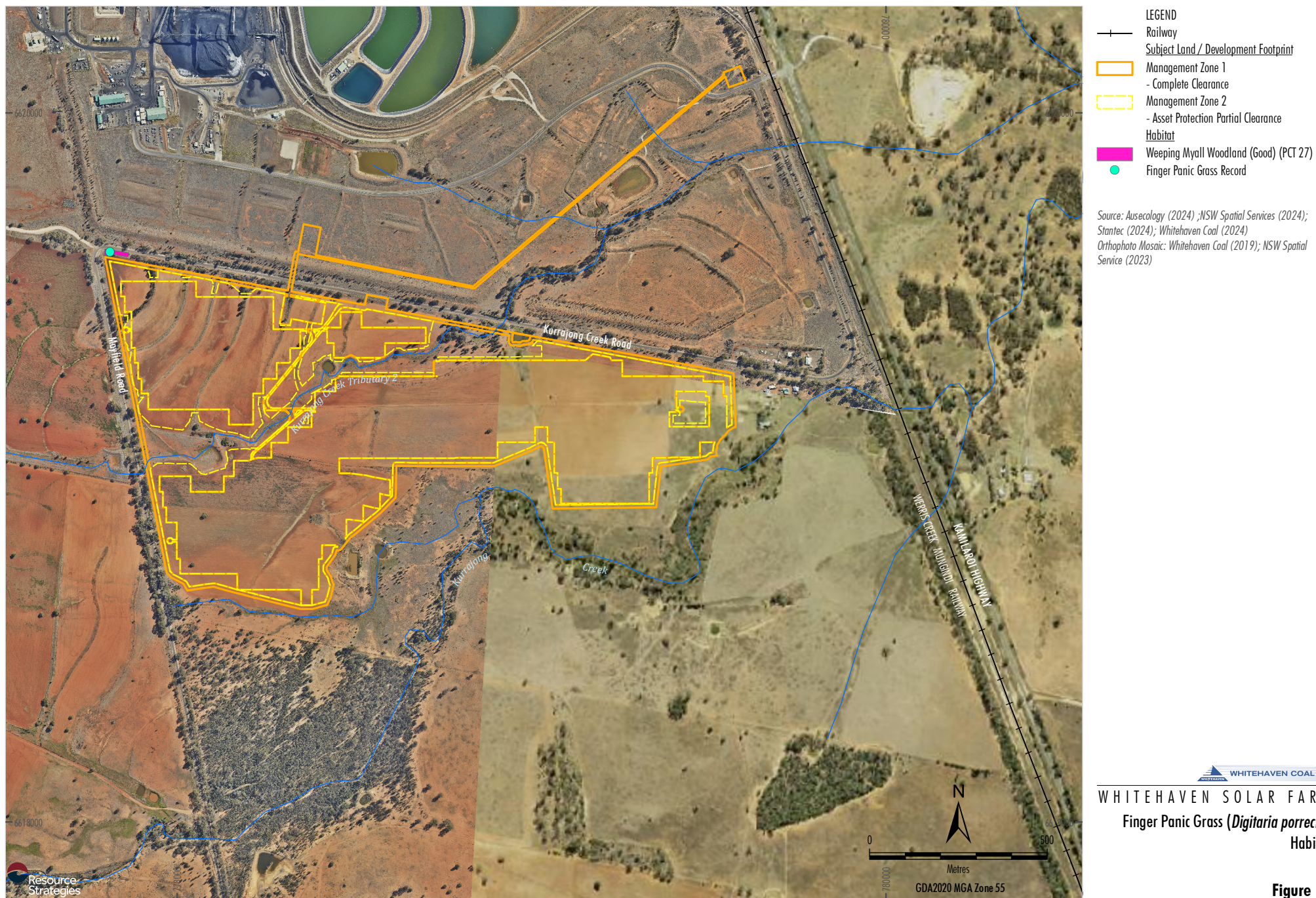
There are two threatened flora species listed under the BC Act that were recorded by Ausecology (2024) (Attachment B) during targeted flora surveys. The Finger Panic Grass (*Digitaria porrecta*) was recorded just outside the north-western boundary of the Development Footprint in the road reserve (Plate 8; Figure 17). No species polygon is required for this species.

The Pine Donkey Orchid (*Diuris tricolor*) was recorded to the south of the Project near Kurrajong Creek (Figure 18). The Development Footprint was revised to avoid impacts to the Pine Donkey Orchid (*Diuris tricolor*) (Figure 4). A portion of suitable habitat associated with the Pine Donkey Orchid (*Diuris tricolor*) record would be impacted by the Development Footprint and therefore species credits would be required (even though the species may not be present in the suitable habitat). The species polygon for Pine Donkey Orchid (*Diuris tricolor*) includes PCT 101 although this is not a PCT that is associated with the species (NSW DCCEEW, 2024b), because the species was recorded by Ausecology (2024) (Attachment B) within PCT 101. Also, Poplar Box (*Eucalyptus populnea*) (the main tree in PCT 101) is known to be an associated species (NSW DCCEEW, 2024a).

The species polygon for the Pine Donkey Orchid (*Diuris tricolor*) is shown on Figure 18. The Pine Donkey Orchid (*Diuris tricolor*) is an 'Area' species and the relevant vegetation zones are quantified in Table 12. The Biodiversity Risk Weighting for Pine Donkey Orchid (*Diuris tricolor*) is '1.5' (NSW DCCEEW, 2024b).

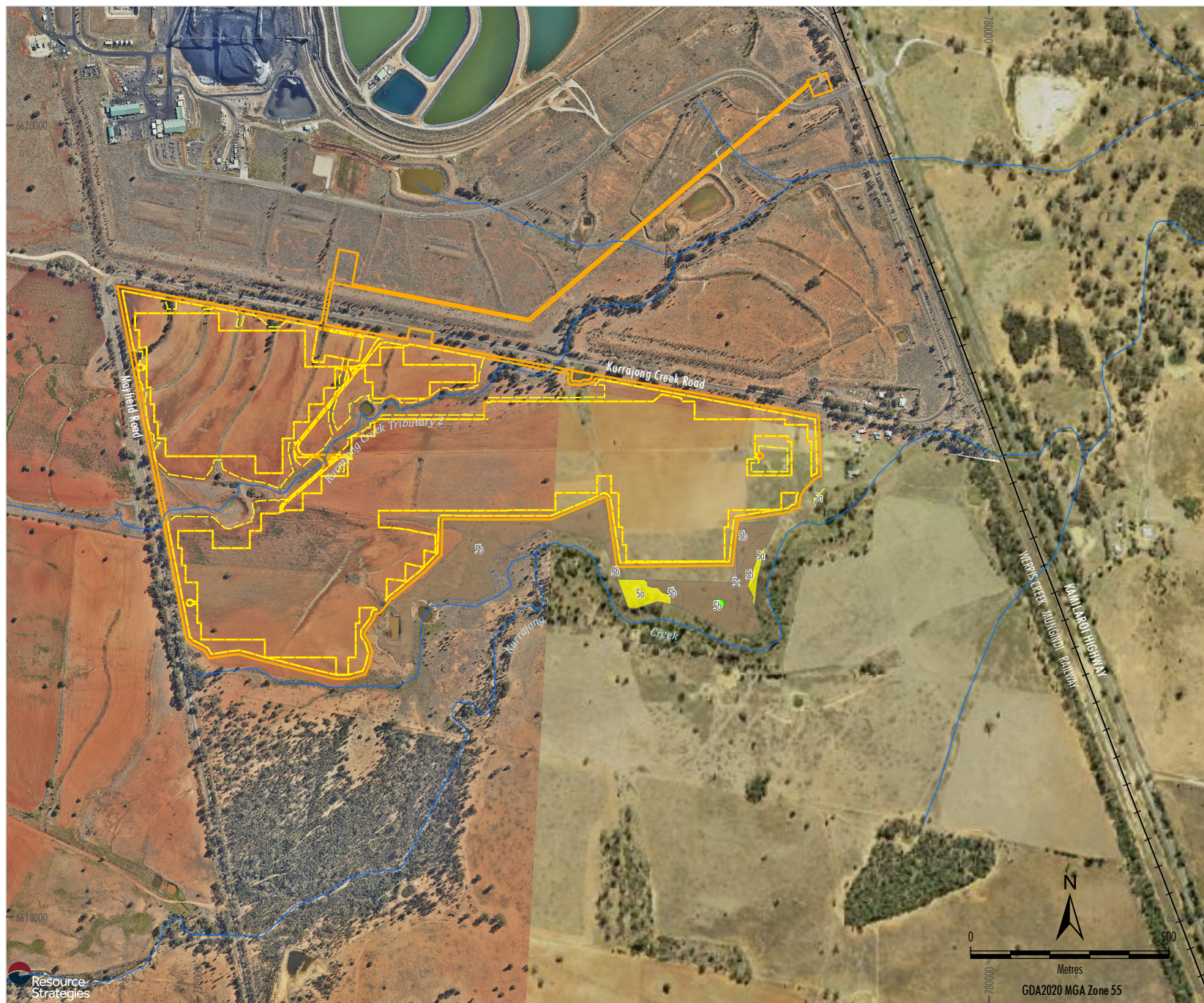
Table 12
Pine Donkey Orchid (*Diuris tricolor*) Species Polygon

Vegetation Community (Ausecology, 2024) (Attachment B)		PCT ID	Management Zone 1 - Complete Clearance (ha)	Management Zone 2 - Partial Clearance (Ongoing Maintenance) (ha)	Total Area (ha)
5b	Poplar Box Grassy Woodland (Semi-Cleared) (PCT 101)	PCT 101 Poplar Box Grassy Woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	0.03	0.12	0.15
Total			0.03	0.12	0.15



WHITEHAVEN COAL
 WHITEHAVEN SOLAR FARM
 Finger Panic Grass (*Digitaria praeceps*)
 Habitat

Figure 17



- LEGEND**
- Railway
 - Subject Land / Development Footprint
 - Management Zone 1
- Complete Clearance
 - Management Zone 2
- Asset Protection Partial Clearance
 - Species Polygon**
 - 5a Poplar Box - Yellow Box - Western Grey Box Grassy Woodland (Good) (PCT 101)
 - 5b Poplar Box - Yellow Box - Western Grey Box Grassy Woodland (Semi-Cleared) (PCT 101)
 - 5c Derived Grassland (Poor) (PCT 101)
 - Pine Donkey Orchid Record

Source: Aus ecology (2024); NSW Spatial Services (2024); Stantec (2024); Whitehaven Coal (2024) Orthophoto Mosaic: Whitehaven Coal (2019); NSW Spatial Service (2023)

WHITEHAVEN COAL
WHITEHAVEN SOLAR FARM
Pine Donkey Orchid (*Diuris tricolor*)
Species Polygon

Figure 18



Plate 8 – Location of the Finger Panic Grass (*Digitaria praeceps*) in the Road Reserve with Weeping Myall (*Acacia pendula*) in the Background

4.3 PRESCRIBED ADDITIONAL BIODIVERSITY IMPACT ENTITIES

Prescribed additional biodiversity impacts (prescribed impacts) must be assessed as part of the NSW Biodiversity Offsets Scheme, as per clause 6.1 of the BC Regulation. The BC Regulation states:

(1) The impacts on biodiversity values of the following actions are prescribed (subject to subclause (2) as biodiversity impacts to be assessed under the biodiversity offsets scheme—

(a) the impacts of development on the following habitat of threatened species or ecological communities—

- (i) karst, caves, crevices, cliffs and other geological features of significance,*
- (ii) rocks,*
- (iii) human made structures,*
- (iv) non-native vegetation,*

(b) the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range,

(c) the impacts of development on movement of threatened species that maintains their lifecycle,

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

(e) the impacts of wind turbine strikes on protected animals,

(f) the impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.

The relevance of prescribed biodiversity impacts to the Project is discussed below.

4.3.1 Karst, Caves, Crevices, Cliffs and Other Geological Features of Significance

No karst, caves, crevices, cliffs and other geological features of significance associated with threatened species occur in the Subject land. This prescribed biodiversity impact is not relevant to the Project.

4.3.2 Human Made Structures and Non-native Vegetation

It is noted that clearing of native vegetation on land that meets the definition of Category 1 – Exempt Land does not require assessment or offsetting, however any relevant prescribed impacts are still considered. The Category 1 – Exempt Land is not suitable habitat for any threatened flora or fauna species.

No human-made structures or areas of non-native vegetation that provide habitat for threatened species (e.g. bats) occur in the Subject land. The non-native vegetation does not provide habitat for threatened species. This prescribed biodiversity impact is not relevant to the Project.

4.3.3 Habitat Connectivity

As described in Section 2.4, the scattered and clumped trees provide minimal habitat connectivity for threatened species. The aerial photo from 1988 shows less woodland vegetation in the past. Where the Development Footprint crosses the road reserve the vegetation is regrowth/revegetation (Plate 5) with no old growth Eucalypt trees.

The Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*), Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*) and Large Bent-winged Bat (*Miniopterus orianae oceanensis*) were the only threatened fauna species recorded by Ausecology (2024) (Attachment B). Due to the mobility of these species, none are likely to be impacted by the minor impacts on connectivity.

As native vegetation with some connectivity is present, this prescribed matter is assessed further in Section 6.3.1.

4.3.4 Movement of Threatened Species that Maintains their Lifecycle

The native vegetation in the Subject land is not part of a movement corridor for threatened species across their range. As described above, where the Development Footprint crosses the road reserve the vegetation is regrowth/revegetation (Plate 5) with no old growth Eucalypt trees. The Project would not impact on the movement of threatened species that maintains their lifecycle.

It is recognised that powerlines can result in bird strike and this prescribed matter is assessed further in Section 6.3.2.

4.3.5 Water Bodies, Water Quality and Hydrological Processes

There is an unnamed 1st order drainage line to Kurrajong Creek which occurs in the Subject land, with no defined banks (Plates 2 and 3; Figure 2). As there are waterbodies present, this prescribed matter is assessed in Section 6.3.3.

4.3.6 Fauna Vehicle Strike

The Project would involve use of vehicles for construction and operation. A speed limit of 40 km per hour would be applied on-site. There is a low likelihood of vehicle strike to any threatened birds flying in the area (Figure 15). Fauna vehicle strike is assessed further in Section 6.3.4.

5 AVOID AND MINIMISE IMPACTS

This section describes the measures that have been evaluated and adopted to avoid or minimise impacts on biodiversity values. Impacts are avoided when adverse impacts on biodiversity values, or certain areas of biodiversity are completely prevented. Impacts are minimised when impacts on biodiversity values are reduced.

This section has been prepared in consideration of the BAM (DPIE, 2020a) and *Biodiversity Assessment Method 2020 Operational Manual Stage 2* (DPE, 2023e) in regard to the Development Footprint.

The Project would provide lower cost renewable energy to the Narrabri Mine and hence would facilitate electricity production resulting in minimal greenhouse gas emissions.

5.1 LOCATION OF THE DEVELOPMENT TO AVOID OR MINIMISE DIRECT AND INDIRECT IMPACTS ON BIODIVERSITY VALUES

The BAM (DPIE, 2020a) states:

When selecting a proposal's location, all of the following should be analysed. Justification for the decisions in determining the final location must be based on consideration of:

- a. alternative modes or technologies that would avoid or minimise impacts on biodiversity values*
- b. alternative routes that would avoid or minimise impacts on biodiversity values*
- c. alternative locations that would avoid or minimise impacts on biodiversity value*
- d. alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values.*

5.1.1 Alternative Locations that would Avoid or Minimise Impacts on Biodiversity Values

The Project is to supply renewable energy to the Narrabri Mine. Therefore, the location and extent of the Project is driven by the location and energy needs of the Narrabri Mine. The Project has been designed to approximately match the average electricity demand of the Narrabri Mine in 2024, during a winter scenario during solar hours.

The Project is largely located on previously cultivated land (Section 1.4) as close as possible to the Narrabri Mine, with consideration to proximity to existing infrastructure, to minimise the length of the ETL (and associated clearance). Locating the Project to the north, west or east of the Narrabri Mine would not further avoid or minimise impacts on biodiversity values, as can be seen on the site map (Figure 9). There are also land use constraints to the west (Narrabri Mine existing and approved longwall mining) and east (Kamilaroi Highway and Werris Creek Mungindi Railway).

5.1.2 Alternative Sites within a Property on which the Proposal is Located that would Avoid or Minimise Impacts on Biodiversity Values

All native vegetation in the *NSW State Vegetation Type Map* (DPE, 2023c) has been avoided (Figure 11). The Project is largely located on the portion of the property with the least native vegetation and north of the Kurrajong Creek (avoiding the need to disturb/cross Kurrajong Creek). There are no alternative sites within the property that would avoid or minimise impacts on biodiversity values.

5.1.3 Alternative Modes or Technologies that would Avoid or Minimise Impacts on Biodiversity Values

There are alternative sources of energy. If the Project were not to proceed, the impacts on biodiversity values would be avoided but the energy would be produced by others off-site.

5.1.4 Alternative Routes that would Avoid or Minimise Impacts on Biodiversity Values

Consideration of alternative routes is applicable to the proposed ETL, access/internal road and perimeter security fence.

The Project involves the construction of an approximately 1,500 m ETL to connect the solar to the existing 66 kV ETL located north of Kurrajong Creek Road. This existing 66 kV ETL connects to the existing 66 kV Narrabri Mine switchyard and provides power supply to the mine. The proposed ETL mostly traverses cleared land. Some clearance of woodland along Kurrajong Creek Road is unavoidable as the proposed ETL needs to connect from the solar panels to the mine. No alternative route of the proposed ETL would avoid or minimise impacts on biodiversity values.

The access/internal road is a logical alignment from Kurrajong Creek Road through the Project layout. The site access road was moved to avoid old growth Eucalypt trees (PCT 88 Good).

The perimeter security fence would be constructed around the outside of the development and the clearance width is required for asset protection.

5.2 DESIGN OF THE DEVELOPMENT TO AVOID OR MINIMISE DIRECT AND INDIRECT IMPACTS ON BIODIVERSITY VALUES

The BAM (DPIE, 2020a) states the BDAR must *'document the reasonable measures taken by the proponent to avoid or minimise clearing of native vegetation and threatened species habitat during proposal design, including placement of temporary and permanent ancillary construction and maintenance facilities'*.

The initial Development Footprint design is shown on Figure 4 compared to the final Development Footprint assessed in this BDAR. The design of the Project is constrained by the location of unnamed 1st order drainage line to Kurrajong Creek which occurs in the Subject land as well as the existing woodland vegetation. Access to the site is required from Kurrajong Creek Road.

Key impact avoidance measures are:

- avoidance of clearance of any TECs (Myall Woodland EEC under the BC Act and EPBC Act, as well as the Poplar Box Grassy Woodland EEC under the EPBC Act [Plate 9]); and
- avoidance of water ways (except for unavoidable crossings).



Plate 9 – Poplar Box Grassy Woodland EEC under the EPBC Act which would be Avoided

Key impact minimisation measures are:

- locating the proposed Project largely within areas previously cleared for agricultural use;
- minimising the clearance of native vegetation (woodland and derived native grassland) by re-arranging and moving solar arrays;
- adoption of a partial clearing management zone where only trees and shrubs would be removed leaving understory and ground cover;
- designing the proposed ETL for minimal clearance required for safety.
- designing the proposed ETL to follow the existing ETL in the Narrabri Mine mining lease; and
- designing the proposed access road to avoid a group of mature trees in the road reserve.

All native vegetation in the *NSW State Vegetation Type Map* (DPE, 2023c) has been avoided (Figure 11). There are some thin patches of native vegetation between the paddocks of cultivated land - these would be unavoidable due to placement of the solar arrays.

It is usual for firebreaks of 10 m or more to be maintained around the perimeter of Solar farm facilities, electrical compounds and substations (Community Power Agency, 2024). The asset protection zone includes a 10 m partial clearance zone around solar panels. A 10 m complete clearance width has been included for the perimeter security fence which includes part of the asset protection zone.

Clearance of the recorded threatened plants (Finger Panic Grass [*Digitaria porrecta*] and Pine Donkey Orchid [*Diuris tricolor*]) would be avoided, however clearance of the wider more conservative species polygon (based on potential habitat) is not avoidable and that is why a Pine Donkey Orchid species credit requirement has been calculated. In practice, this threatened species may not be impacted, if not present.

To accommodate further detailed design, some flexibility in the Development Footprint is needed. Any such changes are expected to be minor and, therefore, would not have an increased impact on the biodiversity values identified in the BDAR. Subject to relevant approvals, Whitehaven Energy would track actual native vegetation/habitat clearance against the Development Footprint and the allowance included in the calculation of biodiversity credits for each phase. Any proposed native vegetation/habitat clearance outside of the Development Footprint or beyond the allowance for the phase, should it be required, would trigger a review of the proposed activities, the relevant Project approval documentation and the impact on biodiversity values. To facilitate this review, Vegetation Zones (PCTs in broad condition states) and habitat for species credit species (i.e. those species for which a species polygon is required to be determined by the area of habitat) have been mapped within and surrounding the Development Footprint.

5.3 CONSTRUCTION AND OPERATION

As described in Section 1.2, the Development Footprint is comprised of two management zones:

- Management Zone 1 – Complete clearing for construction and operation.
- Management Zone 2 – Partial clearing for asset protection/removal of shading issues. This would involve removal of trees/shrubs by chain-saw rather than heavy machinery, and no ground disturbance.

A management plan would be prepared to document the measures to mitigate and manage impacts and facilitate management at the site.

5.4 PRESCRIBED IMPACTS

5.4.1 Habitat Connectivity/Movement of Threatened Species that Maintains their Lifecycle

Key impact minimisation measures are:

- locating the proposed Project largely within areas previously cleared for agricultural use;
- minimising the clearance of native vegetation (woodland and derived native grassland) by re-arranging and moving solar arrays;
- designing the proposed ETL for minimal clearance required for safety;
- designing the proposed ETL to follow the existing ETL in the Narrabri Mine mining lease;
- designing the proposed access road to avoid a group of mature trees in the road reserve; and
- raising the perimeter security fence slightly off ground level near riparian zones for the passing of terrestrial animals such as lizards.

5.4.2 Water Bodies, Water Quality and Hydrological Processes

The solar panels would be located outside of the unnamed 1st order drainage line to Kurrajong Creek which occurs in the Subject land (Plates 2 and 3; Figure 2). Farm dams would also be avoided.

5.4.3 Fauna Vehicle Strike

The on-site speed limit that would be applied to internal roads (40 km per hour) may help to minimise the risk of fauna vehicle strike (this is also Biodiversity Measure 16 in Section 7).

5.5 SUMMARY

Table 13 provides a summary of the avoidance and minimisation measures.

Table 13
Avoidance and Minimisation Measures for Direct, Indirect and Prescribed Impacts

Biodiversity Value	Action/ Timing/Outcome
Native Vegetation/Habitat	- Avoidance of clearance of any TECs (Myall Woodland EEC under the BC Act and EPBC Act, as well as the Poplar Box Grassy Woodland EEC under the EPBC Act). - Avoidance of water ways (except for unavoidable crossings). - Locating the proposed Project largely within areas previously cleared for agricultural use. - Minimising the clearance of native vegetation (woodland and derived native grassland) by re-arranging and moving solar arrays. - Designing the proposed ETL for minimal clearance required for safety. - Designing the proposed ETL to follow the existing ETL in the Narrabri Mine mining lease. - Designing the proposed access road to avoid a group of mature trees in the road reserve. - Raising the perimeter security fence slightly off ground level near riparian zones for the passing of terrestrial animals such as lizards).
Habitat Connectivity/Movement of Threatened Species that Maintains their Lifecycle	- Locating the proposed Project largely within areas previously cleared for agricultural use. - Minimising the clearance of native vegetation (woodland and derived native grassland) by re-arranging and moving solar arrays. - Designing the proposed ETL for minimal clearance required for safety. - Designing the proposed ETL to follow the existing ETL in the Narrabri Mine mining lease. - Designing the proposed access road to avoid a group of mature trees in the road reserve. - Raising the perimeter security fence slightly off ground level near riparian zones for the passing of terrestrial animals such as lizards).
Water Bodies, Water Quality and Hydrological Processes	Avoidance of water ways (except for unavoidable crossings).
Fauna Vehicle Strike	The on-site speed limit that would be applied to internal roads may help to minimise the risk of fauna vehicle strike (this is also Biodiversity Measure 16 in Section 7).

6 ASSESSMENT OF POTENTIAL IMPACTS

Impacts on vegetation and habitat adjacent to the Development Footprint are assessed below, including those listed in the BAM (DPIE, 2020a), and *Biodiversity Assessment Method 2020 Operational Manual Stage 2* (DPE, 2023e). Relevant key threatening processes listed under the BC Act have been assessed.

6.1 DIRECT IMPACTS ON NATIVE VEGETATION AND HABITAT

6.1.1 Clearing of Native Vegetation and Habitat

All native vegetation in the *NSW State Vegetation Type Map* (DPE, 2023c) has been avoided (Figure 11). Approximately 97.2 % (86.08 ha) of the total Development Footprint is located in areas previously cleared for agricultural use (containing either non-vegetation or secondary grassland). The Project would require complete clearance of 19.52 ha of native vegetation and partial clearance (removal of trees/shrubs) of 2.87 ha of native vegetation, as outlined in Table 14 and shown on Figure 12. This native vegetation is more widespread in the area, and no TECs under the BC Act or EPBC Act would be cleared.

Table 14
Native Vegetation Clearance within the Development Footprint

Vegetation Community (Ausecology, 2024) (Attachment B)		Management Zone 1 - Complete Clearance (ha)	Management Zone 2 - Partial Clearance (Ongoing Maintenance) (ha)	Total Area (ha)
2a	Belah Woodland (Good) (PCT 55)	0.66	0.13	0.79
2b	Belah Woodland (Semi-Cleared) (PCT 55)	0.69	0.15	0.84
2c	Derived Grassland (Poor) (PCT 55)	3.84	0.64	4.48
3	Poplar Box - Belah Woodland (Good) (PCT 56)	0.25	0.03	0.28
4b	Pilliga Box - Buloke Woodland (Semi-Cleared) (PCT 88)	0.08	0	0.08
4c	Pilliga Box - Buloke Woodland (Revegetation) (PCT 88)	0.03	0	0.03
5b	Poplar Box Grassy Woodland (Semi-Cleared) (PCT 101)	0.27	0.12	0.39
5c	Derived Grassland (Poor) (PCT 101)	13.7	1.8	15.5
Total Woodland		1.98	0.43	2.41
Total Derived Native Grassland		17.54	2.44	19.98
Overall Total Native Vegetation		19.52	2.87	22.39
Cleared Land/Non-Native Vegetation		52	14.1	66.1
Overall Total Subject Land/Development Footprint		71.52	16.97	88.49

The Project is primarily located on an agricultural property with generally flat topography. The paddocks were cleared of native vegetation historically for farming, and presently the land use is a mix of livestock grazing and dry land cropping (oats, barley and/or wheat). The cultivated land meets the definition of Category 1 – Exempt Land as it lacks biodiversity values. Some paddocks contain secondary native grasslands that have regrown since the last crop. The trees present are a mixed age. Most of the trees in the road reserve are regrowth or revegetation (no trees with hollows).

Table 15 shows the change in the VI Score, before and after the Project. Within the Management Area 2 (Partial Clearance [Ongoing Maintenance]), it is assumed that trees, shrubs and regeneration would be removed for construction and maintenance as such trees and shrubs were manually removed from the future VI score calculation in the BAM Credit Calculator.

There is limited potential habitat for threatened fauna species listed under the BC Act. The Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*), Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*) and Large Bent-winged Bat (*Miniopterus orianae oceanensis*)¹⁰ were the only threatened fauna species recorded during surveys of the habitats in and surrounding the Development Footprint. These species have a wide distribution in NSW. No relevant fauna species credit species were recorded in the Subject land.

Dead wood and dead trees are present in the Development Footprint and surrounds. Stags (dead trees) can provide habitat for hollow-dwelling fauna (including some threatened birds and bats). Logs on the ground can provide habitat for fauna such as lizards and snakes), however, no threatened fauna that use logs were recorded.

Fauna present in the areas proposed to be cleared would be at risk of injury or fatality during clearance activities. The risk to fauna would be determined by the method of clearance, type of fauna present, amount of clearance, the presence of surrounding suitable habitat with the ability to accommodate displaced fauna, and the attendance during the clearance by a fauna handler to cater for injured fauna.

The habitat in the Subject land is typical of the surrounding landscape and loss of the habitat in the Development Footprint is unlikely to significantly impact any local fauna populations.

The Pine Donkey Orchid (*Diuris tricolor*) is a small, deciduous, ground orchid with a wide distribution from southern NSW to Queensland. There are many records of the species in the Pilliga East State Forest (NSW DCCEEW, 2024c). The Pine Donkey Orchid is often recorded from disturbed habitats (NSW DCCEEW, 2024a). As shown on Figure 18, this species was recorded outside the Development Footprint, and may not be impacted, although clearance of potential habitat would be offset.

The following mitigation and management measures described in Section 7 would minimise the impacts from vegetation clearance and habitat loss:

- Biodiversity Measure 1 – Site Induction/Access.
- Biodiversity Measure 2 – Clearing Limits.
- Biodiversity Measure 3 – Temporary Fencing/Signage on Sensitive Areas.
- Biodiversity Measure 4 – Pre-clearance Surveys.
- Biodiversity Measure 5 - Salvage and Relocation of Habitat Resources.
- Biodiversity Measure 6 – Tree Planting along the unnamed drainage line of Kurrajong Creek (Figure 3).

¹⁰ The Large Bent-winged Bat (*Miniopterus orianae oceanensis*) is a species credit species but no breeding habitat is present within 2 km of the Subject land so it is not a relevant species to generate species credits.

Table 15
Impacts to Vegetation Integrity

#	Vegetation Zone	Management Zone	Area	Before Development				After Development				Change in VI Score
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	
2a	Belah Woodland (Good) (PCT 55)	MZ1	0.66	77.6	56	66.3	66	0	0	0	0	-66
		MZ2	0.13					50	19.6	1.3	10.8	-55.2
2b	Belah Woodland (Semi-Cleared) (PCT 55)	MZ1	0.69	74.3	64.7	43.4	59.3	0	0	0	0	-59.3
		MZ2	0.15					50	42.2	12.7	29.9	-29.4
2c	Derived Grassland (Poor) (PCT 55)	MZ1	3.84	74.4	39.9	14.5	35.1	0	0	0	0	-35.1
		MZ2	0.64					50	39.8	5.7	22.4	-12.7
3	Poplar Box - Belah Woodland (Good) (PCT 56)	MZ1	0.25	98.8	92.9	29.3	64.5	0	0	0	0	-64.5
		MZ2	0.03					66.7	49.4	0.5	11.9	-52.6
4b	Pilliga Box - Buloke Woodland (Semi-Cleared) (PCT 88)	MZ1	0.08	91.2	66.5	30.2	56.8	0	0	0	0	-56.8
4c	Pilliga Box - Buloke Woodland (Revegetation) (PCT 88)	MZ1	0.03	79.9	41.2	22.1	41.7	0	0	0	0	-41.7
5b	Poplar Box Grassy Woodland (Semi-Cleared) (PCT 101)	MZ1	0.27	67.6	48.4	26	44	0	0	0	0	-44
		MZ2	0.12					58	46.4	2.2	18	-26
5c	Derived Grassland (Poor) (PCT 101)	MZ1	13.7	49.2	59.3	17.2	36.9	0	0	0	0	-36.9
		MZ2	1.8					44	52.7	4.5	21.9	-15

6.1.2 Cumulative Impacts

The *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPE, 2022b) describes that *'cumulative impacts are a result of incremental, sustained and combined effects of human action and natural variations over time and can be both positive and negative. They can be caused by the compounding effects of a single project or multiple projects in an area, and by the accumulation of effects from past, current and future activities as they arise.'*

The Project is proposed adjacent to the existing Narrabri Mine and would provide electricity supply to the Narrabri Mine. The Narrabri Mine commenced in 2008 and the approved clearance footprint for the Narrabri Mine is 750 ha in size and includes the clearance of a total of approximately 210.5 ha of native vegetation. In addition to this, the surface development for the Narrabri Extension Project (SSD 10269) would involve progressive clearance (over a 23-year period) of approximately 546.7 ha of native vegetation. In addition to potential cumulative adverse impacts, the approved and proposed activities at the Narrabri Mine also have potential cumulative benefits in the form of offset areas.

Key proposed or approved projects that may potentially interact with, or have potential cumulative impacts with, the Project include:

- Narrabri Gas Project (approximately 988.8 ha of proposed native vegetation clearance) (ELA, 2016d);
- Narrabri South Solar Farm (indeterminant);
- Silverleaf Solar Farm (approximately 183 ha of proposed native vegetation clearance) (GHD Pty Ltd [GHD], 2019);
- Inland Rail (Narromine to Narrabri Section) (indeterminant);
- Inland Rail (Narrabri to North Star Section) (approximately 411 ha of proposed native vegetation clearance) (GHD, 2017); and
- other coal mining operations.

The Project would require complete clearance of 19.52 ha of native vegetation and partial clearance (removal of trees/shrubs) of 2.87 ha of native vegetation as outlined in Table 14 and shown on Figure 12. The Project's contribution to cumulative impacts on biodiversity values is low.

6.2 INDIRECT IMPACTS ON NATIVE VEGETATION AND HABITAT

This section assesses the potential for indirect impacts on vegetation and habitat adjacent to the Development Footprint, during construction and operation. Vegetation adjacent to the Development Footprint is shown on Figure 12. Threatened flora and fauna records adjacent to the Development Footprint are shown on Figure 15.

6.2.1 Inadvertent Impacts on Adjacent Habitat or Vegetation

Inadvertent impacts on habitat or vegetation adjacent to the Development Footprint has the potential to occur through human error. The following mitigation and management measures described in Section 7 would minimise the risk of trampling flora outside of the Development Footprint:

- Biodiversity Measure 1 - Site Induction/Access.
- Biodiversity Measure 2 – Clearing Limits.
- Biodiversity Measure 3 – Temporary Fencing/Signage on Sensitive Areas.

6.2.2 Trampling of Threatened Flora Species

There are also two threatened flora species listed under the BC Act that are outside of the Development Footprint (Finger Panic Grass [*Digitaria porrecta*] in the road reserve and Pine Donkey Orchid [*Diuris tricolor*] south of the Project near Kurrajong Creek). A portion of the larger area of suitable habitat associated with the records would be impacted and therefore species credits would be required (even though the species may not be present in the suitable habitat).

Threatened flora species known to occur adjacent to the Development Footprint are unlikely to be at risk of trampling during construction or operation, as the activities would be confined to the management zones (Figure 3). The following mitigation and management measures described in Section 7 would minimise the risk of trampling flora outside of the Development Footprint.

- Biodiversity Measure 1 - Site Induction/Access.
- Biodiversity Measure 2 – Clearing Limits.
- Biodiversity Measure 3 – Temporary Fencing/Signage on Sensitive Areas.

6.2.3 Reduced Viability of Adjacent Habitat Due to Edge Effects

Edge effects can occur from a change in physical and/or biological conditions at edges of habitat. As described in Section 6.2.3, the derived native grassland is in poor condition due to the past clearance and long-term use of the paddocks for grazing livestock, and the patches of woodland provide minimal habitat. The Project is unlikely to notably reduce viability of adjacent habitat due to edge effects.

The potential impact of noise, dust or light spill is discussed further below in Section 6.2.4. The potential impact of weeds is discussed in Section 6.2.5.

6.2.4 Reduced Viability of Adjacent Habitat Due to Noise, Dust or Light Spill

The land adjacent to the Development Footprint comprises limited habitat as described in Section 6.2.1. Any incremental increase in noise, dust and light spill on the adjacent habitat as a result of the Project is unlikely to significantly impact any local fauna populations, noting that the vegetation adjacent to the Development Footprint is mostly open derived native grassland.

6.2.5 Transport of Weeds and Pathogens from the Site to Adjacent Vegetation

Activities that could spread weeds during construction and operation include soil disturbance, vehicle movements and movement of soil. Disturbed areas provide a substrate in which weed species may grow.

The Subject land has been cleared historically and is mostly cultivated/grazing land. A third of all plant species recorded by Ausecology (2024) (Attachment B) were weeds and 10 High Threat Exotic species were recorded (Black-jack [*Bidens pilosa*], Noogoora burr [*Xanthium occidentale*], Great brome [*Bromus diandrus*] Rhodes grass [*Chloris gayana*], African lovegrass [*Eragrostis curvula*], Guinea grass [*Megathyrsus maximus*], Dallis grass [*Paspalum dilatatum*], Unknown sp., African boxthorn [*Lycium ferocissimum*] and Common Prickly Pear [*Opuntia stricta*]).

The *Biosecurity Act 2015* and regulations provide specific legal requirements for state level priority weeds and high-risk activities. Regionally determined priority weed species are listed in the *North West Regional Strategic Weed Management Plan 2023-2027* (North West Local Land Services, 2022) along with regional strategic responses. African Boxthorn (*Lycium ferocissimum*) and Common Prickly Pear (*Opuntia stricta*) are priority species recorded by Ausecology (2024) (Attachment B).

Weeds are to be controlled in accordance with the *Biosecurity Act 2015* (NSW) and the *North West Regional Strategic Weed Management Plan 2023-2027* (North West Local Land Services, 2022). Local council would be consulted on an ongoing basis in the development and delivery of weed management programs.

The Project is unlikely to increase the risk of weeds transporting from the site to adjacent vegetation. The following mitigation and management measures described in Section 7 would minimise the risk of trampling flora outside of the Development Footprint.

- Biodiversity Measure 8 - Weed Hygiene Protocol
- Biodiversity Measure 9 - Weed Control

The Project does not involve activities that are likely to spread plant pathogens, and pathogens such as Myrtle Rust (*Austropuccinia psidii*) and *Phytophthora cinnamomi* are more likely to occur in wetter coastal areas.

6.2.6 Increase in Pest Animal or Predatory Species Populations

Pest species recorded by Ausecology (2024) (Attachment B) in the wider area include; Cat (*Felis catus*), European hare (*Lepus europaeus*), Rabbit (*Oryctolagus cuniculus*), Black Rat (*Rattus rattus*), Rat (*Rattus sp.*), Pig (*Sus scrofa*) and Fox (*Vulpes vulpes*).

The Project is unlikely to result in an increase in pest animal populations or increase the populations of predatory species given pest animals would be managed through maintenance of the security perimeter fence (Biodiversity Measure 11 in Section 7). Feral pest management programs are implemented at Narrabri Mine (ELA, 2017c) and Whitehaven Coal-managed properties (e.g. biodiversity offsets).

6.2.7 Increased Risk of Fauna Starvation, Exposure and Loss of Shade or Shelter

Only a small portion of the woodland in the locality would be cleared for the Project, so it is unlikely that the Project would materially increase risk of fauna starvation, exposure and loss of shade or shelter. Tree planting is proposed along the unnamed drainage line of Kurrajong Creek (Figure 3) (Biodiversity Measure 6 in Section 7) which would help balance the loss of habitat in the short-term with a gain in habitat in the medium to long-term.

6.2.8 Other Indirect Impacts

The Project would not involve:

- indirect impacts that may inhibit nitrogen fixation or increase soil salinity to vegetation in the surrounds;
- potential fertiliser drift to habitat adjacent to the Development Footprint because fertiliser would be used in select areas for revegetation purposes directly applied and not via aerial means;
- rubbish dumping or related indirect impacts;
- the collection of wood from the surrounding native vegetation outside of the Development Footprint;

- the collection of bush rocks from the surrounding native vegetation outside of the Development Footprint;
- indirect impacts to specialist breeding and foraging habitat;
- adverse changes to hydrology that would impact threatened species;
- changes to the existing fire regime; and
- indirect loss of breeding habitat outside of the Development Footprint.

6.3 PRESCRIBED BIODIVERSITY IMPACTS

6.3.1 Habitat Connectivity

Nature

Native woodland would be removed for the Project, which connects to native woodland that would be retained. All threatened species and communities known to occur in the Subject land are likely to benefit from the current level of connectivity.

Extent

The extent of native woodland that would be removed for the Project is shown on Figure 12. As described in Section 2.4, the scattered and clumped trees provide minimal habitat connectivity. The aerial photo from 1988 shows less woodland vegetation in the past. Where the Development Footprint crosses the road reserve, the vegetation is regrowth/revegetation.

Duration, Frequency and Timing

The impacts would occur during the life of the Project.

Consequences

The impacts on habitat connectivity would have little consequence because the vegetation is regrowth. Sufficient connectivity would remain surrounding the Development Footprint such that no threatened species are likely to become isolated as a result of the Project. All the threatened fauna species recorded on the Subject site are sufficiently mobile to cross the gaps in native vegetation. Tree planting is proposed along the unnamed drainage line of Kurrajong Creek (Figure 3) (Biodiversity Measure 6 in Section 7) which would help balance the loss of habitat in the short-term with a gain in habitat in the medium to long-term.

6.3.2 Movement of Threatened Species that Maintains their Lifecycle

Nature

Native woodland would be removed for the Project, which connects to native woodland that would be retained. Movement patterns key to the life cycle of threatened species could include seasonal movements between foraging and breeding habitats.

Extent

The extent of native woodland that would be removed for the Project is shown on Figure 12. The Project is not likely to impact a well-defined movement pattern for any particular threatened species.

Bird strike is a higher risk when powerlines pass through vegetation (adjacent to canopy) or when powerlines are constructed adjacent to waterbodies.

Duration, Frequency and Timing

The impacts would occur during the life of the Project.

Consequences

The native vegetation in the Subject land is not part of a movement corridor for threatened species across their range. The aerial photo from 1988 shows less woodland vegetation in the past. Where the Development Footprint crosses the road reserve, the vegetation is regrowth/revegetation. The Project would not materially impact the movement of threatened species that maintains their lifecycle.

6.3.3 Water Bodies, Water Quality and Hydrological Processes

Nature

The solar panels would be located outside of the unnamed 1st order drainage line to Kurrajong Creek which occurs in the Subject land. The Project would involve construction of a crossing of an unnamed 1st order drainage line to Kurrajong Creek (Plates 2 and 3, Figure 2). The drainage line has no defined banks and the crossing would be near an existing crossing used by the existing lessee.

The Project also would involve benefits. Tree planting is proposed along the unnamed drainage line of Kurrajong Creek (Figure 3) (Biodiversity Measure 6 in Section 7) which would help balance the loss of habitat in the short-term with a gain in habitat in the medium to long-term.

Extent

Impacts would be limited to a discrete section of the unnamed 1st order drainage line to Kurrajong Creek.

Duration, Frequency and Timing

The impacts to the discrete section would occur during the life of the Project.

Consequences

No threatened species would likely to be adversely impacted by potential impacts to waterbodies.

6.3.4 Fauna Vehicle Strike

Nature

The Project would involve the use of vehicles for construction and operation.

Extent

Due to the minimal amount of native woodland/habitat in and around the Subject land, the risk of fauna vehicle strike is low. The strip of vegetation along the road reserve may provide a narrow movement corridor for fauna, but the vehicles would slow down when turning into the site, so again the chance of fauna vehicle strike is low.

Duration, Frequency and Timing

The site access road would be used for personnel and visitor access and deliveries. During operations, a speed limit of 40 km per hour would be applied to roadways required as part of the Project.

Consequences

Vehicle strike of animals is possible; however, it is not expected to be of a magnitude that would result in the loss of any threatened species from the local area. The consequences of the impacts from vehicle strike are predicted to be negligible as the threatened fauna species are more widespread in adjacent connected habitat.

6.4 STATE ENVIRONMENTAL PLANNING POLICY (BIODIVERSITY AND CONSERVATION)

The *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (Biodiversity and Conservation SEPP) began on 1 March 2022 and consolidates, transfers and repeals provisions of various State Environmental Planning Policies (SEPPs) in NSW including the Koala Habitat Protection SEPP (2020 and 2021). The provisions within the repealed SEPPs have been transferred to the new Biodiversity and Conservation SEPP.

The land associated with the Subject land is zoned RU1 Rural. Chapter 3 of the Biodiversity and Conservation SEPP (Koala Habitat Protection 2020) applies for all RU1, RU2 and RU3 zoned land outside of the Sydney Metropolitan Area and some LGAs of the Central Coast.

Under the Biodiversity and Conservation SEPP (Koala Habitat Protection 2020), potential Koala habitat is defined as:

...areas of native vegetation where trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

Under the Biodiversity and Conservation SEPP (Koala Habitat Protection 2020), core Koala habitat is defined as:

...an area of land with a resident population of koalas, evidenced by attributes such as breeding females, being females with young, and recent sightings of and historical records of a population.

There is limited potential habitat for the Koala in the Development Footprint (Ausecology, 2024) (Attachment B) and the area has been heavily cleared. The Development Footprint contains potential Koala foraging and shelter habitat in PCTs 27, 55, 56, 88 and 101. PCTs 56, 88 and 101 comprise foraging and shelter habitat including White Box (*Eucalyptus albens*), Poplar Box (*Eucalyptus populnea*), and Forest Red Gum (*Eucalyptus tereticornis*), and PCTs 27 and 55 comprising shelter habitat (use trees) comprising White Cypress Pine (*Callitris glaucophylla*), Belah/Muurrugu (*Casuarina cristata*), White Box (*Eucalyptus albens*), and Narrow-leaved Grey Box (*Eucalyptus pilligaensis*) (Attachment B).

Target Koala SAT surveys did not detect evidence of Koalas in the Development Footprint, most likely due to the fragmented nature of the potential habitat. No core Koala habitat occurs in the Development Footprint as the Koala has not been recorded in the Development Footprint, despite targeted surveys.

Development controls within the Koala Habitat Protection SEPP 2020 do not apply to Part 4 development applications (such as the Project) which are determined by a consent authority other than a local council. However, even if they were to apply, the Project is not likely to impact Koalas given the potential habitat is degraded and there are no recent records of the Koala.

7 MEASURES TO MITIGATE AND MANAGE IMPACTS

This section describes how the Project has been designed to mitigate and manage impacts on biodiversity values. Direct, indirect and prescribed impacts that remain after avoiding and minimising impacts (Section 5) must be mitigated (aimed at preventing, or reducing the extent/severity of, an impact) and managed (to reduce the severity of an impact that has occurred, or prevent future impacts of the same nature from occurring).

The duration of the construction period is expected to be in the order of six to nine months. It is anticipated the Project activities would commence as soon as practicable after all necessary consents, approvals and licenses have been obtained. The design operational life of the Project is approximately 50 years, at which point the Project would be reconditioned with updated technology or decommissioned.

The BAM (DPIE, 2020a) sets a standard of no net loss of biodiversity values. To achieve this, reasonable measures to mitigate and manage impacts are required to be implemented. Table 16 provides measures to mitigate and manage impacts on biodiversity values from the Project. A management plan would be prepared to document the measures to mitigate and manage impacts and facilitate management at the site.

The measures to mitigate and manage impacts have been prepared in consideration of:

- BAM (DPIE, 2020a);
- *Biodiversity Assessment Method 2020 Operational Manual Stage 2* (DPE, 2023e);
- review of relevant industry best practice and standards, including:
 - *Building Better Biodiversity on Solar Farms Guide* (Community Power Agency, 2024).
 - *Australian Guide to Agrisolar for Large-Scale Solar for Proponents and Farmers* (Clean Energy Council, 2021).
 - *Mitigating Biodiversity Impacts Associated with Solar and Wind Energy Development. Guidelines for Project Developers* (Bennun et al., 2021).
- compatibility with the integration of solar energy and sheep grazing (agrisolar);
- whether the measure is reasonable;
- the residual risk to biodiversity values; and
- the risk of the measure failing.

After the measures to mitigate and manage impacts, there would be a negligible risk to biodiversity with a low consequence. This considers that residual direct impacts on biodiversity values from clearing and habitat loss would be offset.

All measures to mitigate and manage impacts in Table 16 have a low risk of failure (i.e. risk the measure fails to have the intended outcome), because there are no constraints to implementation, the Project has been designed to avoid most biodiversity values, and all of the measures have been implemented elsewhere in NSW. As such, adaptive management strategies as described in the BAM (DPIE, 2020a) are not proposed.

In addition to the measures in Table 16, the EIS provides measures to mitigate and manage other potential environmental impacts from the Project, such as commonly applied measures to manage dust, noise and lighting. No material dust, noise and lighting impacts are likely to occur on biodiversity from the Project. As described in Table 16, local native riparian trees are proposed to be planted along the unnamed 1st order ephemeral drainage line to Kurrajong Creek running through the property (Plate 10; Figure 3). The revegetation area in Figure 3 is 1.8 ha in size.



Plate 10 – Location of the Proposed Revegetation Works

Table 16
Mitigation and Management Measures

Mitigation Measure	Method/Technique	Timing	Frequency	Responsibility	Likely Efficacy (including risk of failure)
General					
Biodiversity Measure 1 - Site Induction/Access	A site induction for everyone entering the site would provide necessary occupational health and safety information (e.g. contacts in a bushfire emergency). Access to active operational/construction areas would only be allowed for authorised personnel and machinery thereby minimising impacts associated with human access.	During construction and operation	Ongoing	Site manager	Moderate – high (low risk of failure)
Clearing of Native Vegetation and Fauna Habitat (including Displacement of Fauna)					
Biodiversity Measure 2 – Clearing Limits	Staff and personnel involved in vegetation clearance works would be made aware of clearing (disturbance) limits in the relevant Project approval documentation and of restricted access areas to prevent inadvertent damage. Staff and personnel involved in vegetation clearance works would be made aware of the difference between complete clearing and partial clearing management zones (i.e. removal of trees/shrubs by chain-saw rather than heavy machinery in partial clearing management zones, no ground disturbance). Construction materials must not be stockpiled in partial clearing management zones.	Pre-construction	Ongoing during construction	Site manager	Moderate – high (low risk of failure)
Biodiversity Measure 3 – Temporary Fencing/Signage on Sensitive Areas	Clear delineation of the areas to be cleared on the ground prior to clearing activities (e.g. paint, flagging tape and posts) and restriction of clearing to within these areas (signposts to alert personnel not to enter vegetation outside of the disturbance areas). Focus on sensitive areas include riparian zones, native vegetation to be retained, TECs and species polygons for threatened flora species outside of the Development Footprint.	Pre-construction	Ongoing during construction	Site manager	Moderate – high (low risk of failure)

Table 16 (Continued)
Mitigation and Management Measures

Mitigation Measure	Method/Technique	Timing	Frequency	Responsibility	Likely Efficacy (including risk of failure)
Biodiversity Measure 4 – Pre-clearance Surveys	Pre-clearance fauna surveys would be undertaken by a suitably trained and qualified ecologist or wildlife handler to identify trees with suspected active nests and tree hollows. Options to minimise harm to fauna by modifying the clearance method would be evaluated by the suitably trained and qualified ecologist or wildlife handler (e.g. timing of clearance to avoid breeding, non-habitat trees/understorey vegetation would be cleared initially to give fauna an opportunity to relocate. Shaking or nudging tree trunks to evacuate mobile fauna, retaining trees with suspected active nests until the nest is disused or lowering trees with suspected tree hollows being used by fauna with the hollow facing upwards to enable fauna to exit). A suitably trained and qualified ecologist or wildlife handler would be present during the clearing of habitat to manage animals that may be encountered during land clearing. Management of fauna may include allowing the animal to relocate by itself, relocating the individual to adjacent habitat or treating injuries (the nearest veterinary clinic, wildlife carer and/or appropriately trained ecologist contact information would be on hand in case any fauna are injured).	Construction	Ongoing during construction	Site manager/ suitably trained and qualified ecologist or wildlife handler	Moderate – high (low risk of failure)
Biodiversity Measure 5 - Salvage and Relocation of Habitat Resources	Key habitat features (hollow logs) would be salvaged during vegetation clearance activities and used in habitat enhancement along the unnamed drainage line of Kurrajong Creek for ground-dwelling fauna.	Construction	Ongoing during construction	Site manager	Moderate – high (low risk of failure)
Biodiversity Measure 6 – Tree Planting Along the Unnamed Drainage Line of Kurrajong Creek	The unnamed drainage line of Kurrajong Creek (1 st order creek) running through the property would be planted with local native riparian trees during construction of the Project, or next suitable planting season if the time of year is unsuitable for planting (Figure 3). The plantings would be outside the asset protection zone where they will not shade solar panels. Weed control would be undertaken in this area. This measure has the potential for the Project to result in a net gain in biodiversity values over time.	Construction	Ongoing	Site manager	Moderate – high (low risk of failure)
Biodiversity Measure 7 – Groundcover Species	The site may be operated as an agrisolar operation with continued sheep grazing under the solar panels. Ground cover species would include local endemic native flora species suitable for fodder.	Construction	Ongoing	Site manager	Moderate – high (low risk of failure)

Table 16 (Continued)
Mitigation and Management Measures

Mitigation Measure	Method/Technique	Timing	Frequency	Responsibility	Likely Efficacy (including risk of failure)
Weeds					
Biodiversity Measure 8 - Weed Hygiene Protocol	A visual inspection of all vehicles/ machinery entering site would be undertaken. A washdown location would be provided and vehicles/ machinery cleaned prior to entering site to prevent weed seed transportation into the site.	During construction and operation	Ongoing	Site manager	Moderate – high (low risk of failure)
Biodiversity Measure 9 - Weed Control	All plants are regulated under the <i>Biosecurity Act 2015</i> with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant has a duty to prevent, eliminate or minimise the risk, so far as is reasonably practicable. Qualified and experienced weed management personnel would map the locations of weeds requiring control, identifying species, cover and extent. Mechanical removal of identified weeds and/or the application of approved herbicides. Follow-up site inspections to determine the effectiveness of the eradication programmes.	During construction and operation	Quarterly – for 2 years post-construction Annually – for remaining life of the Project	Site manager	Moderate – high (low risk of failure)
Biodiversity Measure 10 – Grazing Management	The site may be operated as an agrisolar operation with continued sheep grazing under the solar panels. In this case, grazing would be managed such that ground cover is retained beneath panels (with best practice forage height), to resist erosion and weeds. This may involve rotational grazing management or adjusting stocking rate. There are existing fences, however, additional stock fence and gates would be installed to manage grazing sheep as necessary (e.g. to protect Tree Planting along the unnamed drainage line of Kurrajong Creek [Figure 3]). Plain wire instead of barbed used on top of the stock fencing, potentially with electrified fence. Existing dams would be used but water troughs would be provided where necessary.	Operation	Ongoing	Site manager	Moderate – high (low risk of failure)

Table 16 (Continued)
Mitigation and Management Measures

Mitigation Measure	Method/Technique	Timing	Frequency	Responsibility	Likely Efficacy (including risk of failure)
Pest Animal					
Biodiversity Measure 11 – Pest Animal Management	Pest animals are regulated under the <i>Biosecurity Act 2015</i> with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Pest animals would be managed through maintenance of the security perimeter fence.	During construction and operation	Ongoing	Site manager	Moderate – high (low risk of failure)
Bushfire Risk					
Biodiversity Measure 12 - Bushfire Prevention and Control Measures	Sheep grazing would continue on the property associated with the Project. The site would be a non-smoking site. Clear access would be maintained around all infrastructure. The Narrabri Mine maintains appropriate firefighting equipment.	During construction and operation	Ongoing	Site manager	Moderate – high (low risk of failure)
Habitat Connectivity					
Biodiversity Measure 13 - Bird Flight Diverters	Bird flight diverters would be installed on the ETL at the crossing of Kurrajong Creek Road to minimise the risk of bird collisions.	During construction and operation	Ongoing	Site manager	Moderate – high (low risk of failure)
Waterbodies					
Biodiversity Measure 14 - Sediment and Erosion Controls	The potential for localised Project-related channel erosion on Kurrajong Creek and other ephemeral creek lines would be managed using appropriate sediment and erosion controls (e.g. silt fencing). Revegetation of native or sterile exotic cover crop would commence as soon as possible during construction to minimise erosion.	Construction	Ongoing during construction	Site manager	Moderate – high (low risk of failure)

Table 16 (Continued)
Mitigation and Management Measures

Mitigation Measure	Method/Technique	Timing	Frequency	Responsibility	Likely Efficacy (including risk of failure)
Waterbodies (Continued)					
Biodiversity Measure 15 - Construction of Drainage Line Crossings	Construction of drainage line crossings would be undertaken in accordance with the policy and guideline document of DPI-Fisheries NSW <i>Why do fish need to cross the road?</i> (Fairfull and Witheridge, 2003) as required by the Fisheries NSW <i>Policy and guidelines for fish habitat conservation and management Update 2013</i> (NSW Department of Primary Industries, 2013). The waterways traversed by the Development Footprint are Class 3 (Minimal fish habitat ¹) and Class 4 (Unlikely fish habitat ²) (Fairfull and Witheridge, 2003). Crossings would involve installation of fords or culverts. Plain wire instead of barbed used on top of the security perimeter fence.	Construction	Ongoing during construction	Site manager	Moderate – high (low risk of failure)
Vehicle Strike					
Biodiversity Measure 16 – Vehicle Strike	The 40 km per hour on-site speed limit that would be applied to internal roads may help to minimise the risk of fauna vehicle strike.	During construction and operation	Ongoing	Site manager	Moderate – high (low risk of failure)

¹ Named or unnamed waterway with intermittent flow and potential refuge, breeding or feeding areas for some aquatic fauna (e.g. fish, yabbies). Semi-permanent pools form within the waterway after a rain event.

² Named or unnamed waterway with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free-standing water or pools after rain events (e.g. dry gullies or shallow floodplain depressions with no permanent aquatic flora present).

8 IMPACT SUMMARY

8.1 SERIOUS AND IRREVERSIBLE IMPACTS

Under the BC Act, there is a small list of threatened species and communities that are considered by the NSW Government to be at risk of a Serious and Irreversible Impact (SAIL). These species/ecological communities are named SAIL entities.

The Large Bent-winged Bat (*Miniopterus orianae oceanensis*) (breeding habitat) is an SAIL species (NSW DCCEEW, 2024a). However, there is no breeding habitat for this species within 100 m of the Development Footprint and therefore this species is not likely to be at risk of an SAIL from the Project.

No other threatened species or communities recorded by Ausecology (2024) (Attachment B) in the Subject land are 'potential SAIL entities'.

8.2 RESIDUAL IMPACTS ON NATIVE VEGETATION (ECOSYSTEM CREDITS)

Figure 19 shows areas requiring offset and Figure 20 shows areas not requiring assessment or offset. Table 17 provides the ecosystem credit requirements from the credit report (Attachment D). The like-for-like credits are required to be in the Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga, Pilliga Outwash or any IBRA subregion that is within 100 km of the outer edge of the impacted site (Attachment E). The variation report is provided in Attachment F. Whitehaven Energy may choose to use the variation rules in accordance with the BC Act.

Table 17
Ecosystem Credit Requirement

Vegetation Community (Ausecology, 2024) (Attachment B)		Credit Requirements (Attachment D)					
		PCT ID	Biodiversity Risk Weighting	Like-for-like PCTs	Trading Group	Hollow- bearing Trees	Ecosystem Credit Requirement
2a	Belah Woodland (Good) (PCT 55)	PCT 55 Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions	2	PCT 55	North-west Floodplain Woodlands >=70% and <90%	No	25
2b	Belah Woodland (Semi-Cleared) (PCT 55)						23
2c	Derived Grassland (Poor) (PCT 55)						71
3	Poplar Box - Belah Woodland (Good) (PCT 56)	PCT56 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	2.5	PCTs: 56, 74, 76, 80, 81, 82, 101, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	No	9

Table 17 (Continued)
Ecosystem Credit Requirement

Vegetation Community (Ausecology, 2024) (Attachment B)		Credit Requirements (Attachment D)					
		PCT ID	Biodiversity Risk Weighting	Like-for-like PCTs	Trading Group	Hollow- bearing Trees	Ecosystem Credit Requirement
4a	Pilliga Box - Buloke Woodland (Good) (PCT 88)	PCT 88 Pilliga Box - White Cypress Pine - Buloke shrubby woodland in the Brigalow Belt South Bioregion	2.5	PCTs: 88, 141, 148, 397, 411, 702, 1090, 1384	Pilliga Outwash Dry Sclerophyll Forests <50%	No	0
4b	Pilliga Box - Buloke Woodland (Semi-Cleared) (PCT 88)						2
4c	Pilliga Box - Buloke Woodland (Revegetation) (PCT 88)						1
5a	Poplar Box Grassy Woodland (Good) (PCT 101)	PCT 101 Poplar Box Grassy Woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	2.5	PCTs: 56, 74, 76, 80, 81, 82, 101, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	No	0
5b	Poplar Box Grassy Woodland (Semi-Cleared) (PCT 101)						7
5c	Derived Grassland (Poor) (PCT 101)						266
Total							404

8.3 RESIDUAL IMPACTS ON THREATENED SPECIES (SPECIES CREDITS)

Table 18 provides the species credit requirements from the credit report (Attachment D).

Table 18
Species Credit Requirement

Credit Type	Biodiversity Risk Weighting	Development Footprint Area (ha)	Total Development Footprint Credits
Pine Donkey Orchid (<i>Diuris tricolor</i>)	1.5	0.15	2

8.4 BIODIVERSITY OFFSET STRATEGY

According to the BAM Credit Calculator, all of the vegetation zones require an offset.

The credit requirements in Tables 17 and 18 could be retired in accordance with the like-for-like rules or the variation rules, subject to meeting the requirements under the BC Act. This is because, as described in Section 1.3, Whitehaven Energy will separately consider the requirements under the EPBC Act as the Project is not being assessed bilaterally.

A payment to the Biodiversity Conservation Fund is permissible under the BC Act. There is no proposal to fund a biodiversity conservation action instead of retiring biodiversity credits. There is also no proposal to use mine site rehabilitation as a measure to offset the residual impacts (it would be undertaken anyway).



- LEGEND**
- +— Railway
 - Subject Land / Development Footprint
 - Management Zone 1
- Complete Clearance
 - Management Zone 2
- Asset Protection Partial Clearance
 - North-west Floodplain Woodlands
 - 2a Belah Woodland (Good) (PCT 55)
 - 2b Belah Woodland (Semi-Cleared) (PCT 55)
 - 2c Derived Grassland (Poor) (PCT 55)
 - Floodplain Transition Woodlands
 - 3 Poplar Box - Belah Woodland (Good) (PCT 56)
 - Pilliga Outwash Dry Sclerophyll Forests
 - 4b Pilliga Box - Buloke Woodland (Semi-Cleared) (PCT 88)
 - 4c Pilliga Box - Buloke Woodland (Revegetation) (PCT 88)
 - Brigalow Clay Plain Woodlands
 - 5b Poplar Box - Yellow Box - Western Grey Box
Grassy Woodland (Semi-Cleared) (PCT 101)
 - 5c Derived Grassland (Poor) (PCT 101)

Source: Aus ecology (2024); NSW Spatial Services (2024);
Stantec (2024); Whitehaven Coal (2024)
Orthophoto Mosaic: Whitehaven Coal (2019); NSW Spatial
Service (2023)



WHITEHAVEN SOLAR FARM Areas Requiring Offsets

Figure 19



- LEGEND**
- Railway
 - Subject Land / Development Footprint
 - Management Zone 1
- Complete Clearance
 - Management Zone 2
- Asset Protection Partial Clearance
 - Other**
 - Exotic
 - Farm Dam
 - Infrastructure

Source: Aus ecology (2024) ;NSW Spatial Services (2024);
 Stantec (2024); Whitehaven Coal (2024)
 Orthophoto Mosaic: Whitehaven Coal (2019); NSW Spatial
 Service (2023)

WHITEHAVEN COAL
WHITEHAVEN SOLAR FARM
 Areas Not Requiring
 Assessment or Offsets

Figure 20

9 CONCLUSION

This Project aims to provide a renewable electricity supply to the Narrabri Mine, whilst continuing agriculture on the farming property. The Project is suitably located near to where the energy is needed (the mine) on land that has been historically cleared.

The Project has been refined to avoid and minimise impacts on biodiversity values, and a range of mitigation and management measures have been provided. In particular, local native riparian trees are proposed to be planted along the unnamed drainage line of Kurrajong Creek (1st order creek) running through the property.

Ecosystem credits have been calculated for the clearance of native vegetation/habitat. Species credits are required for the Pine Donkey Orchid (*Diuris tricolor*) based on suitable habitat (although the species were detected outside of the Development Footprint).

Residual impacts that are not mitigated would be offset via the NSW Biodiversity Offset Scheme. Whitehaven Coal already hold some of the biodiversity credits that would be required for the Project, through established land-based offset areas (Biodiversity Stewardship Sites).

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ATTACHMENT A
ASSESSMENT OF COMPLIANCE WITH BDAR MINIMUM INFORMATION REQUIREMENTS

Table A-1 Assessment of Compliance with BDAR Minimum Information Requirements

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
Introduction	Chapters 2 and 3	Information	
		Introduction to the biodiversity assessment including:	-
		☑ brief description of the proposal	Section 1.1
		☑ identification of subject land boundary, including:	Section 1.2
		☑ operational footprint	
		☑ construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure	
		☑ general description of the subject land	Section 1.2
		☑ sources of information used in the assessment, including reports and spatial data	Section 1.5
		☑ identification and justification for entering the BOS	Section 1.3
		Maps and tables	
		☑ Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure	Figure 3
Landscape	Sections 3.1 and 3.2, Appendix E	Information	
		Identification of site context components and landscape features, including:	-
		☑ general description of subject land topographic and hydrological setting, geology and soils	Section 2.2
		☑ per cent native vegetation cover in the assessment area (as described in BAM Section 3.2)	Section 2.9
		☑ IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	Section 2.1
		☑ rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	Section 2.3
		☑ wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	Section 2.3
		☑ connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	Section 2.4
		☑ karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.))	Section 2.5
		☑ areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.))	Section 2.6
		☑ any additional landscape features identified in any SEARs for the proposal	Section 2.8
		☑ NSW (Mitchell) landscape on which the subject land occurs	Section 2.7
		☑ details of field reconnaissance undertaken to confirm the extent and condition of landscape features and native vegetation cover (as described in Operational Manual Stage 1 Section 2.4)	Section 2
		Maps and tables	

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ Site Map ☒ Property boundary ☒ Boundary of subject land ☒ Cadastre of subject land (including labelling of Lot and DP or section plan if relevant) ☒ Landscape features identified in BAM Subsection 3.1.3	Figure 9
		☒ Location Map ☒ Digital aerial photography at 1:1,000 scale or finer ☒ Boundary of subject land ☒ Assessment area (i.e. the subject land and either 1500 m buffer area or 500 m buffer for linear development) ☒ Landscape features identified in BAM Subsection 3.1.3 ☒ Additional detail (e.g. local government area boundaries) relevant at this scale	Figure 10
		Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location Map include:	-
		☒ IBRA bioregions and subregions ☒ rivers, streams and estuaries <i>N/A</i> wetlands and important wetlands ☒ connectivity of different areas of habitat <i>N/A</i> karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features <i>N/A</i> areas of outstanding biodiversity value occurring on the subject land and assessment area <i>N/A</i> any additional landscape features identified in any SEARs for the proposal ☒ NSW (Mitchell) landscape on which the subject land occurs	Figures 9 and 10
		Data	
		☒ All report maps as separate jpeg files	Provided to BOAMS
		Individual digital shape files of:	
		☒ subject land boundary	Provided to BOAMS
		☒ assessment area (i.e. subject land and 1500 m buffer area) boundary	Provided to BOAMS
		☒ cadastral boundary of subject land	Provided to BOAMS
		☒ areas of native vegetation cover	Provided to BOAMS
		☒ landscape features	Provided to BOAMS
Native vegetation	Chapter 4, Appendix	Information	

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
	A and Appendix H		
		☒ Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	Section 3.1
		☒ Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	Section 1.4 and 3.3
		☒ Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	Section 3.2
		☒ Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	Section 3.3
		N/A Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	N/A
		For each PCT within the subject land, describe:	-
		☒ PCT name and ID	Section 3.4
		☒ vegetation class	Section 3.4
		☒ extent (ha) within subject land	Section 3.4
		☒ evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.))	Section 3.4
		☒ plant species relied upon for identification of the PCT and relative abundance of each species	Table 4
		☒ if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.))	Section 3.5
		☒ estimate of per cent cleared value of PCT (BAM Subsection 4.2.1(5.))	Section 3.4
		Describe the vegetation integrity assessment of the subject land, including:	-
		☒ identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	Section 3.4
		☒ description of vegetation zones within the subject land (as described in Operational Manual Stage 1 Table 3 and Subsection 3.3.2)	Section 3.4
		☒ area (ha) of each vegetation zone	Table 3
		☒ assessment of patch size (as described in BAM Subsection 4.3.2)	Section 3.6
		☒ survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.)	Section 3.6
		☒ use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	Section 3.6
		Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A):	-
		N/A identify the PCT or vegetation class for which local benchmark data will be applied	N/A
		N/A identify published sources of local benchmark data (if benchmarks obtained from published sources)	

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		N/A describe methods of local benchmark data collection (if reference plots used to determine local benchmark data)	
		N/A provide justification for use of local data rather than BioNet Vegetation Classification benchmark values	N/A
		N/A provide written confirmation from the decision-maker that they support the use of local benchmark data	N/A
		Maps and tables	
		☒ Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of all areas of native vegetation including areas that are ground cover only, cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	Figure 12
		☒ Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figure 12
		☒ Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1)	Figure 12
		☒ Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries	Figure 14
		☒ Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	Figure 13
		☒ Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	Figures 12 and 9
		Table of current vegetation integrity scores for each vegetation zone within the site and including:	
		☒ composition condition score	Table 5
		☒ structure condition score	
		☒ function condition score	
		☒ presence of hollow bearing trees	
		Data	
		☒ All report maps as separate jpeg files	Provided to BOAMS
		☒ Plot field data (MS Excel format)	Provided to BOAMS
		☒ Plot field datasheets	Provided to BOAMS
		Digital shape files of:	
		☒ PCT boundaries within subject land	Provided to BOAMS
		☒ TEC boundaries within subject land	Provided to BOAMS
		☒ vegetation zone boundaries within subject land	Provided to BOAMS
		☒ floristic vegetation survey and vegetation integrity plot locations	Provided to BOAMS
Threatened species	Chapter 5	Information	
		Identify ecosystem credit species likely to occur on the subject land, including:	-
		☒ list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.))	Section 4.1.1

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	Section 4.1.2
		☒ justification for addition of any ecosystem credit species to the list	Section 4.1.1
		Identify species credit species likely to occur on the subject land, including:	
		☒ list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1)	Section 4.2.1
		☒ justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	Section 4.2.2
		☒ justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2)	Section 4.2.3
		☒ justification for addition of any species credit species to the list	Section 4.2.1
		From the list of candidate species credit species, identify:	Section 4.2.4.2
		☒ species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.))	Section 4.2.4.2
	N/A	species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.))	Section 4.2.4.2 Section 4.2.4.4
		☒ species for which targeted surveys are to be completed to determine species presence (BAM Subsection 5.2.4(2.b.))	Section 4.2.4.3
	N/A	species for which an expert report is to be used to determine species presence (BAM Subsection 5.2.4(2.c.))	
		Present the outcomes of species credit species assessments from:	
		☒ threatened species survey (as described in BAM Section 5.2.4)	Section 4.2.4.4
	N/A	expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Subsection 5.2.4, Section 5.3, Box 3)	N/A
		Where survey has been undertaken include detailed information on:	
		☒ survey method and effort (as described in BAM Section 5.3)	Section 4.2.4.4
		☒ justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the department's taxa-specific survey guides or where no relevant guideline has been published	Section 4.2.4.4
		☒ timing of survey in relation to requirements in the TBDC or the department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys	Table 11
		☒ survey personnel and relevant experience	Section 4.2.4.4
		☒ describe any limitations to surveys and how these were addressed/overcome	Attachment B
		Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include:	N/A
	N/A	justification of the use of an expert report	

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		N/A identify the expert, provide evidence of their expert credentials and departmental approval of expert status	
		N/A all requirements of Box 3 have been addressed in the expert report	
		Where use of local data is proposed (BAM Subsection 1.4.2):	N/A
		N/A identify relevant species	
		N/A identify data to be amended	
		N/A identify source of information for local data, e.g. published literature, additional survey data, etc.	
		N/A justify use of local data in preference to VIS Classification or TBDC data	
		☒ provide written confirmation from the decision-maker that they support the use of local data	
		Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that:	Section 4.2.5
		☒ the unit of measure for each species is documented	Section 4.2.5
		for species assessed by area:	Section 4.2.5
		☒ the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5)	Section 4.2.5
		☒ a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied	Section 4.2.5
		for species assessed by counts of individuals:	N/A
		N/A the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.))	
		N/A the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken	
		N/A the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land	
		☒ Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	Section 4.2.5
		Maps and tables	
		☒ Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and identifying:	Table 6
		N/A the ecosystem credit species removed from the list	N/A
		☒ the sensitivity to gain class of each species	Table 6
		☒ Table detailing species credit species in accordance with BAM Section 5.2 and identifying:	Table 7
		☒ the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the	Section 4.2.3.1

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		habitat or microhabitat features are not present	
		☒ the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	Table 11
		☒ Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	Tables 13 and 14; Section 4.2.5
		☒ Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM Subsection 5.2.5)	Figures 15, 17 and 18
		Data	
		☒ Digital shape files of suitable habitat identified for survey for each candidate species credit species	BOAMS
		☒ Survey locations including GPS coordinates of any plots, transects, grids	BOAMS
		☒ Digital shape files of each species polygon including GPS coordinates of located individuals	BOAMS
		☒ Species polygon map in jpeg format	BOAMS
		N/A Expert reports and any supporting data used to support conclusions of the expert report	N/A
		☒ Field datasheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	Attachment B
Prescribed impacts	Chapter 6	Information	
		Identify potential prescribed biodiversity impacts on threatened entities, including:	
		N/A karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1)	Section 5.4
		☒ occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2)	
		☒ corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3)	
		☒ waterbodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4)	
		N/A protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5)	N/A
		☒ where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)	Section 5.4
		☒ Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	Section 5.4
		☒ Describe the importance of habitat features to the species including, where relevant, impacts on life cycle or movement patterns (e.g. Subsection 6.1.3)	Section 5.4
		Where the proposed development is for a wind farm:	N/A
		N/A identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident	

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5)	
		N/A provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.)	N/A
		N/A predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	N/A
		Where the proposal may result in vehicle strike:	
		☒ identify a list of threatened fauna or protected fauna species that are part of a TEC and at risk of vehicle strike due to the proposal	Section 5.4
		Maps and tables	
		☒ Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	Figures 9 and 10
		☒ Map showing location of potential vehicle strike locations	Figure 12
		N/A Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	N/A
		Data	
		☒ Digital shape files of prescribed impact feature locations	BOAMS
		☒ Prescribed impact features map in jpeg format	BOAMS
Avoid and minimise impacts	Chapter 7		
		Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative:	Section 5
		☒ modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology	Section 5.1.3
		☒ routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route	Section 5.1.4
		☒ alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	Section 5.1.1
		☒ alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	Section 5.1.2
		☒ Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2)	Section 5.2
		☒ Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.))	Section 5.2
		☒ Detail measures or options considered but not implemented because they are not feasible and/or practical (e.g. due to site constraints)	Section 5.2

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Maps and tables	
		☒ Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	Table 13
		☒ Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	Figure 4
		N/A Maps demonstrating indirect impact zones where applicable	N/A
		Data	
		Digital shape files of:	BOAMS
		☒ alternative and final proposal footprint	BOAMS
		☒ direct and indirect impact zones	BOAMS
		☒ Maps in jpeg format	BOAMS
Assessment of impacts	Chapter 8, Sections 8.1 and 8.2	Information	
		☒ Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	Section 6.1
		Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2):	Section 6.2
		☒ description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal	Section 6.2
		☒ documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications	Section 6.2
		☒ reporting any limitations or assumptions, etc. made during the assessment	Section 6.2
		☒ identification of the threatened entities and their habitat likely to be affected	Section 6.2
		Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including:	
		assessment of the nature, extent frequency, duration and timing of impacts on the habitat of threatened species or ecological communities associated with:	Section 6.3
		N/A karst, caves, crevices, cliffs, rocks and other features of geological significance	N/A
		N/A human-made structures	N/A
		N/A non-native vegetation	N/A
		☒ connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Section 6.3
		☒ movement of threatened species that maintains their life cycle	Section 6.3
		☒ water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities	Section 6.3

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ assessment of the impacts of wind turbine strikes on protected animals	N/A
		☒ assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	Section 6.3.4
		☒ evaluate the consequences of prescribed impacts	Section 6.3.4
		☒ describe impacts that are uncertain	Section 6.3.4
		☒ document limitations to data, assumptions and predictions	Section 6.3.4
		Maps and tables	
		☒ Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Table 15
		Data	
		N/A	
Mitigation and management of impacts	Chapter 8, Sections 8.4 and 8.5	Information	
		Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5 including:	Section 7
		☒ techniques, timing, frequency and responsibility	Table 16
		☒ identify measures for which there is risk of failure	
		☒ evaluate the risk and consequence of any residual impacts	
		N/A document any adaptive management strategy proposed	N/A
		Identification of measures for mitigating impacts related to:	
		☒ displacement of resident fauna (as described in BAM Subsection 8.4.1(2.))	Table 16
		☒ indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.))	
		☒ mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	
		N/A Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	N/A
		Maps and tables	
		☒ Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Table 16
		Data	
		N/A	
Impact summary	Chapter 9	Information	
		Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance	Section 8.1

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		with BAM Section 9.1) including:	
		N/A addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAI present on the subject land	N/A
		N/A for each TEC, report the extent of the TEC in NSW	N/A
		N/A addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAI present on the subject land	N/A
		N/A for each threatened species, report the population size in NSW	N/A
		N/A documenting assumptions made and/or limitations to information	N/A
		N/A documenting all sources of data, information, references used or consulted	
		N/A clearly justifying why any criteria could not be addressed	
		☒ Identification of impacts requiring offset in accordance with BAM Section 9.2	Section 8.2
		☒ Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	Sections 8.2 and 8.3
		☒ Identification of areas not requiring assessment in accordance with BAM Section 9.3	Figure 20 and Section 8.2
		Maps and tables	
		N/A Map showing the extent of TECs at risk of an SAI within the subject land	N/A
		N/A Map showing location of threatened species at risk of an SAI within the subject land	N/A
		Map showing location of:	
		☒ impacts requiring offset	Figure 19
		☒ impacts not requiring offset	Figure 20
		☒ areas not requiring assessment	Figure 20
		Data	
		Digital shape files of:	
		N/A extent of TECs at risk of an SAI within the subject land	N/A
		N/A location of threatened species at risk of an SAI within the subject land	N/A
		☒ boundary of impacts requiring offset	BOAMS
		☒ boundary of impacts not requiring offset	BOAMS
		☒ boundary of areas not requiring assessment	BOAMS
		☒ Maps in jpeg format	BOAMS
Impact summary	Chapter 10	Information	
		Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including:	
			Table 15

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H)	
		☒ change in vegetation integrity score (BAM Subsection 8.1.1)	
		☒ number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 10.1.2)	
		☒ biodiversity risk weighting for each	Tables 17 and 18
		☒ number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3)	Table 18
		Maps and tables	
		☒ Table of PCTs requiring offset and the number of ecosystem credits required	Table 17
		☒ Table of threatened species requiring offset and the number of species credits required	Table 18
		Data	
		☒ Submitted proposal in the BAM Calculator	BOAMS
Biodiversity credit report	Chapter 10	Information	
		N/A Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	N/A
		☒ BAM credit report in pdf format	BOAMS
		Maps and tables	
		☒ Table of credit class and matching credit profile	Tables 17 and 18
		Data	
		☒ BAM credit report in pdf format	BOAMS

ATTACHMENT B
WHITEHAVEN SOLAR FARM PROJECT – FLORA AND FAUNA BASELINE REPORT



Whitehaven Solar Farm Project - Flora and Fauna Baseline Report

Prepared for:
Whitehaven Energy Pty Ltd

Report issued:
August 2024

This document has been prepared and is certified by:

AUSECOLOGY PTY LTD

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Glossary of Terms

Acronym	Description
BAM	Biodiversity Assessment Method
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BOM	Bureau of Meteorology
cm	centimetre
DC	direct current
DPE	Department of Planning and Environment
DPIE	Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act, 1999 (Cth)</i>
ETL	Electricity Transmission Line
GDA	Geocentric Datum of Australia
GPS	Global Positioning System
ha	hectare
km	kilometres
kV	kilovolt
LEP	Local Environmental Policy
LGA	Local Government Area
m	metre
mm	millimetre
MGA	Map Grid of Australia
MW	megawatt
NSW	New South Wales
PCT	Plant Community Type
PMST	Protected Matters Search Tool
QLD	Queensland
SAT	Spot Assessment Techniques
sp.	species
subsp.	sub species
TEC	Threatened Ecological Community
Whitehaven	Whitehaven Coal Limited

Executive Summary

The Whitehaven Solar Farm Project (the Project) is located approximately 25 kilometres (km) south-east of Narrabri and approximately 60 km north-west of Gunnedah, within the Narrabri Shire Council Local Government Area, in the New England North West region of New South Wales (NSW).

The Project would be located adjacent to the existing Narrabri Mine on Whitehaven Coal Limited (Whitehaven)-managed land and would include approximately 26 megawatts (MW) direct current (DC) of solar electricity generation to supply the neighbouring Narrabri Mine. Whitehaven Energy Pty Ltd (Whitehaven Energy) is the proponent of the Project and is seeking approval for the Project as a State Significant Development under Section 4.36 of the *Environmental Planning and Assessment Act 1979*.

Ausecology Pty Ltd was engaged by Whitehaven to undertake ecological surveys and provide a Flora and Fauna Baseline Report, which is to be an attachment to a Biodiversity Development Assessment Report (BDAR) for the Project. The Study Area, which includes the Project general arrangement area is approximately 110 hectares (ha).

The content of this report includes:

- a description of the existing environment (terrestrial flora and fauna);
- a desktop review of existing information;
- a systematic field-based floristic vegetation survey;
- systematic field-based fauna surveys;
- descriptions of the Plant Community Types, vegetation zones, vegetation integrity assessments, and habitat values;
- land categorisation assessment;
- targeted surveys for threatened flora and fauna under the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- determination of the species polygons for species credit species; and
- a review of vegetation present against *State Environmental Planning Policy (Biodiversity Conservation) 2021*.

Field survey work was carried out in November 2022, January 2023, August 2023, September 2023, January 2024 and February 2024 over eight site survey visits, by a team of six Ausecology ecologists. The field survey methodologies and effort including 22 BAM plot assessments, 20 interim groundcover assessments, threatened flora searches and targeted fauna surveys, are detailed in Section 2.

Five PCTs were determined to be present in the Study Area, including:

- **PCT 27** – Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion.
- **PCT 55** – Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.
- **PCT 56** – Poplar Box – Belah woodland on clay-loam soils on alluvial plains of north-central NSW.
- **PCT 88** – Pilliga Box – White Cypress Pine – Buloke shrubby woodland in the Brigalow Belt South Bioregion.

- **PCT 101** – Poplar Box – Yellow Box – Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion.

Field observations demonstrated the presence of one Threatened Ecological Communities (TEC) listed under the BC Act and two TECs listed under the EPBC Act:

- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions – BC Act Endangered Ecological Community (EEC).
- Poplar Box Grassy Woodland on Alluvial Plains – EPBC Act EEC.
- Weeping Myall Woodlands – EPBC Act EEC.

Native vegetation occurring in the Study Area was stratified into broad condition states and assigned vegetation zones. Ten vegetation zones are recognised as occurring within the Study Area, comprising five PCTs in different condition states, as described in Section 3.3.

A total area of 90.47 ha of the Study Area is classified as Category 1 – Exempt Land characterised by exotic dominated pasture, cultivation and cropping. These areas were actively being used for cattle grazing and crop production during the survey period.

Two species of threatened flora listed under the BC Act, Finger Panic Grass (*Digitaria porrecta*) and Pine Donkey Orchid (*Diuris tricolor*) were detected within the Study Area during the targeted flora searches. No other threatened flora were detected during the surveys.

Targeted threatened fauna searches in the Study Area resulted in detection of three threatened fauna species listed under the BC Act. One ecosystem credit species, Grey-crowned Babbler (eastern subspecies), listed as Vulnerable under the BC Act, was recorded on numerous occasions at several localities during the surveys. Two threatened species of microbat *Miniopterus orianae oceanensis* (Large Bent-winged Bat) and *Saccolaimus flaviventris* (Yellow-bellied Sheath-tail-bat), were positively confirmed by echolocation call recording identification.

No flora or fauna species listed as threatened or migratory under the EPBC Act were recorded.

1 Introduction

1.1 Project Background

The Whitehaven Solar Farm Project (the Project) is located approximately 25 kilometres (km) south-east of Narrabri and approximately 60 km north-west of Gunnedah, within the Narrabri Shire Council Local Government Area (LGA), in the New England North West region of New South Wales (NSW) (Figure 1-1).

The Project would be located adjacent to the existing Narrabri Mine on Whitehaven Coal Limited (Whitehaven)-managed land and would include approximately 26 megawatts (MW) direct current (DC) of solar electricity generation, with a 10MWH Battery Energy Storage System (BESS) and incorporating an agri-solar design for sheep grazing. The Project would provide behind-the-meter electricity supply to the Narrabri Mine via the existing 66 kilovolt (kV) electricity transmission line (ETL).

Whitehaven Energy Pty Ltd (Whitehaven Energy) is the proponent of the Project and is seeking approval for the Project as a State Significant Development under Section 4.36 of the *Environmental Planning and Assessment Act 1979*.

The Project would include the following primary components and activities (Figure1-2):

- construction and operation of approximately 50,000 solar photovoltaic (PV) panels to provide electricity supply for the Narrabri Mine;
- construction of a substation that facilitates connection to the existing 66 kV overhead ETL;
- construction of an overhead ETL to connect the proposed substation to the existing 66 kV overhead ETL, north of Kurrajong Creek Road;
- construction and operation of ancillary infrastructure including access roads, inverter stations, temporary staging areas, perimeter fencing and operations and maintenance buildings;
- construction and operation of a BESS;
- ongoing maintenance activities; and
- decommissioning and rehabilitation of the site.

Table 1-1 provides a summary of the key attributes of the Project.

Table 1-1 Summary of key Project attributes

Project Component	Summary Description
Size and Purpose	26 MW DC, 20 MW alternative current for behind-the-meter electricity supply to the Narrabri Mine.
Project Area	Development site footprint of approximately 100 hectares (ha).
Solar Configuration	▪ 50,000 PV panels in a north to south alignment. ▪ East to west tracking system (single axis).
Access Route	The proposed access route is via the Kamilaroi Highway and Kurrajong Creek Road.
Power Infrastructure	▪ Substation and switchyard. ▪ 66 kV connector to the existing 66 kV ETL.

Project Component	Summary Description
	▪ Battery Energy Storage System.
Site Entry	Site entry would be via a constructed access point on Kurrajong Creek Road.
Construction	▪ Construction period of approximately 9 months. ▪ Employment of approximately 30 personnel on average during its construction, with peak construction requiring approximately 65 personnel. ▪ Construction undertaken during daylight hours.
Operational Life	The design operational life is approximately 50 years.
Decommissioning and Rehabilitation	Decommissioning at the end of the Project life, involving the removal of all infrastructure.
Capital Investment	Approximately \$54 million.
Hours of Operation	24 hours per day with scheduled maintenance activities undertaken during daytime hours.

1.2 Project Scope

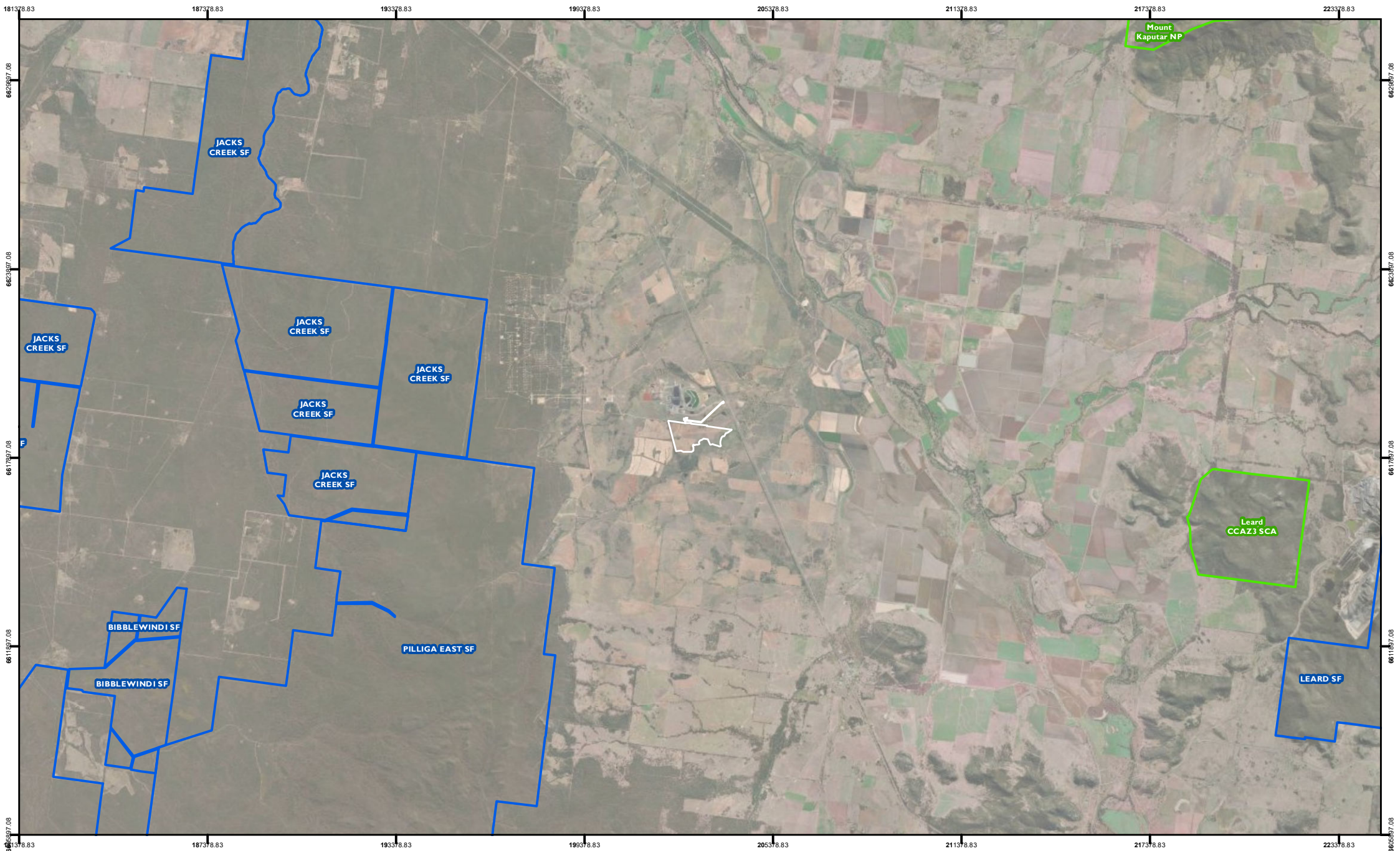
Ausecology Pty Ltd (Ausecology) was engaged by Whitehaven Energy to provide a Flora and Fauna Baseline Report, which is to be an attachment to a Biodiversity Development Assessment Report (BDAR) for the Project on behalf of Whitehaven.

The Study Area is shown in Figure 1-3, and covers 117.4 ha.

This flora and fauna baseline report was prepared in consideration of the Biodiversity Assessment Method (BAM) (NSW Department of Planning, Industry and Environment [DPIE], 2020a) and includes:

- a description of the existing environment relevant to flora and fauna;
- a desktop review of existing information on native vegetation and threatened species;
- a systematic field-based floristic vegetation survey;
- systematic field-based fauna surveys, documenting the presence of all native and introduced fauna species;
- a description of the following for each Plant Community Type (PCT) and vegetation zones;
 - justification of evidence used to identify a PCT;
 - plant species relied upon for identification of the PCT and relative abundance of each species;
 - threatened status under the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); and
 - justification of the assignment of PCTs to Threatened Ecological Communities (TEC);
- a land categorisation assessment;

-
- a description of the vegetation integrity assessment of the Study Area, including:
 - collection of vegetation integrity plots; and
 - identification and mapping of vegetation zones;
 - a description of the habitat assessment of the Study Area;
 - targeted surveys for threatened flora and fauna under the BC Act and EPBC Act;
 - determination of the species polygons for species credit species identified within the Study Area; and
 - a review of vegetation present against *State Environmental Planning Policy (SEPP) (Biodiversity Conservation) 2021*.

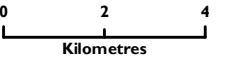


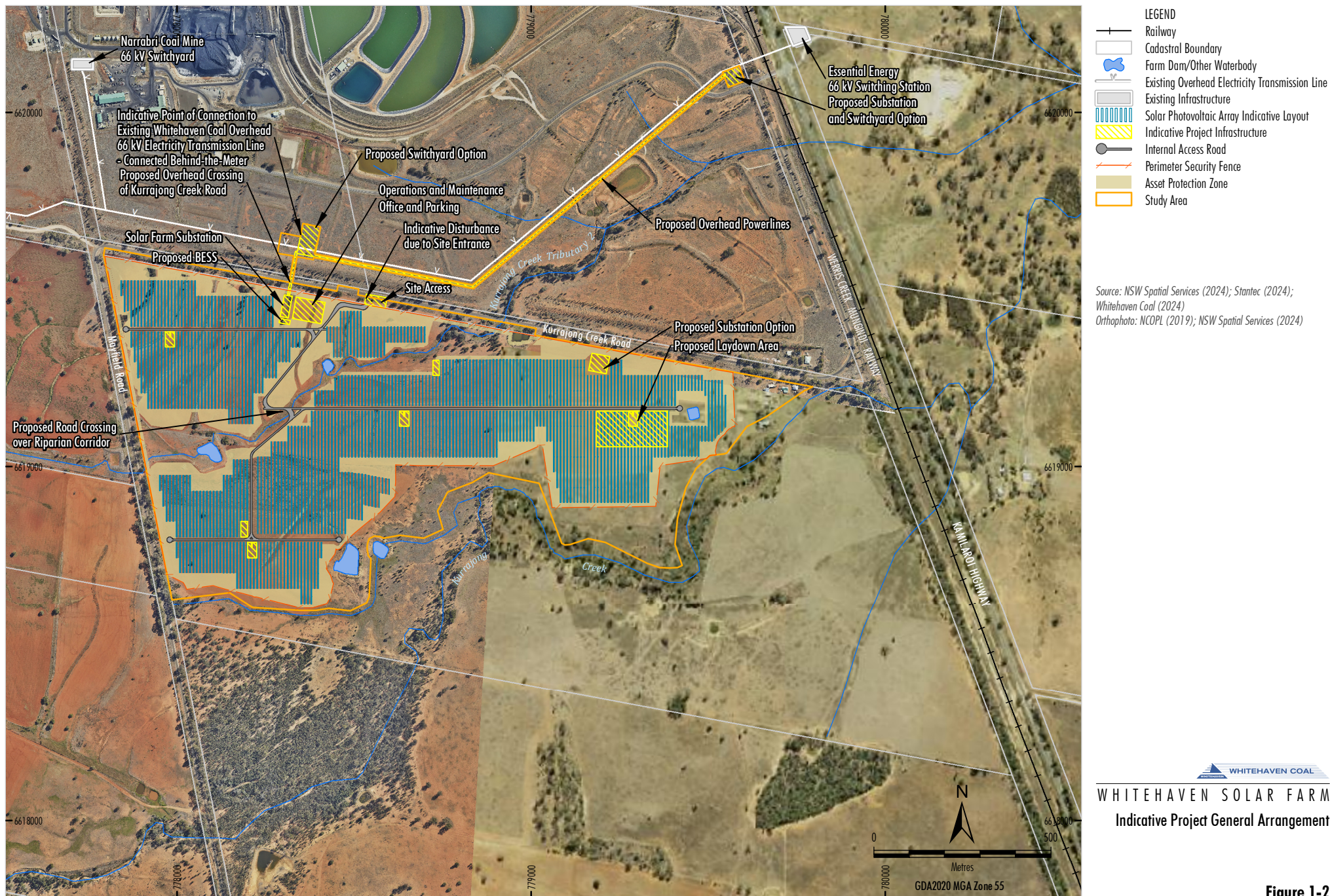
-  Study Area
-  NSW Dedicated State Forests
-  NSW National Parks and Wildlife Service (NPWS) Estate

Figure I-1:
Regional Context
Whitehaven Solar Farm Project

REVISION	AUTHOR	REVIEWER	DATE
I	NC	ML	01/05/2024

COORDINATE SYSTEM: GDA 1994 MGA Zone 56
SCALE: 1:150,000





WHC-21-87 BSFF_201A

WHITEHAVEN COAL
WHITEHAVEN SOLAR FARM
Indicative Project General Arrangement

Figure 1-2





Figure I-3:
Study Area
Whitehaven Solar Farm Project

 Study Area

REVISION	AUTHOR	REVIEWER	DATE
I	NC	ML	01/05/2024

COORDINATE SYSTEM: GDA 1994 MGA Zone 56
SCALE: 1:10,000



0 100 200
Metres

2 Methodology

2.1 Personnel

Ausecology has the appropriate permits in place to undertake flora and fauna surveys as per below:

- NSW Animal Care and Ethics Permit for Ecological Fauna Surveys throughout NSW.
- NSW Scientific Licence SL 101654.

Key details of personnel are provided in Table 2-1.

Table 2-1 Summary of personnel qualifications

Name	Position	Qualifications
Andrew Dawson	Principal Ecologist	▪ Master of Wildlife Conservation ▪ Bachelor of Science (Biodiversity and Conservation)
Braden Macdonald	Ecologist	▪ Bachelor of Environmental Science (Honours)
Bradley Jeffers	Principal Ecologist	▪ Bachelor Applied Science
Brendan Schembri	Fauna Specialist	▪ Bachelor of Environmental Science
Dr Emma Gray	Senior Ecologist	▪ Accredited BAM assessor – Accreditation #BAAS19069 ▪ Doctor of Philosophy ▪ Bachelor of Applied Science (Ecology)
Lachlan Beil	Ecologist	▪ Bachelor of Science (Zoology & Ecology Major)
Lauren Eade	Senior Ecologist	▪ Bachelor of Science (Ecology)

2.2 Desktop Review

Desktop searches of existing information for the Study Area were undertaken to identify the presence of potential threatened species listed under the BC Act and EPBC Act, habitat and PCTs. The desktop assessments were used to guide the field survey methodology and effort, and provided an overview of matters to be targeted during field surveys. The desktop assessment involved a review of environmental databases, maps, and literature, as well as previous ecological reports prepared for Whitehaven. Table 2-2 provides a full list of searches undertaken as part of the desktop assessment.

Table 2-2 Summary of desktop searches conducted

Search	Source	Details
Matters of National Environment Significance		
EPBC Act listed threatened species, migratory species and TECs	Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth DCCEEW) – EPBC Act Protected Matters Search Tool (PMST) (Cth DCCEEW, 2024a)	Identified matters prescribed under the EPBC Act that are predicted to occur in proximity to the Study Area.

Search	Source	Details
Matters of State Environment Significance		
Atlas of Living Australia Spatial Analysis	Atlas of Living Australia – Spatial Portal (2023)	Locality search around the Study Area.
BioNet Threatened Biodiversity Data Collection	NSW DCCEEW (2024a)	Threatened species information
BioNet Atlas Search	NSW DCCEEW (2024b)	Database of biodiversity records throughout NSW.
BioNet Vegetation Classification	NSW DCCEEW (2024c)	Descriptions of PCTs occurring in NSW.
Important Habitat Maps for Threatened Species	NSW DCCEEW (2024d)	Land mapped as important habitat map for select species.
Survey records as reported in the Narrabri Stage 3 Project BDAR	“Narrabri Underground Mine Stage 3 Extension Project BDAR” (Resource Strategies, 2021)	Assessment results for a project in proximity to the Study Area.
NSW Government Web Map Service layers for NSW Imagery	NSW Spatial Collaboration Portal (NSW Government, 2022)	Aerial imagery.
State Vegetation Type Mapping	NSW DCCEEW (2024e)	Mapped occurrence and distribution of PCTs, Vegetation Classes, and Vegetation Formations.
Declared Areas of Outstanding Biodiversity Value	NSW DCCEEW (2024f)	Identified Areas of Outstanding Biodiversity Value.
PlantNET Spatial Search	Plant information Network System (PlantNET), The Royal Botanic Gardens and Domain Trust (2024)	Identified plant species occurring within proximity to the Study Area.

2.3 Field Survey

Field surveys were undertaken in accordance with the following:

- Biodiversity Assessment Method 2020 (DPIE, 2020a);
- Biodiversity Assessment Method 2020 Operational Manual Stage 1 (DPE, 2022a);
- Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities Working Draft (Department of Environment and Conservation, 2004);
- Koala (*Phascolarctos cinereus*) Biodiversity Assessment Method Survey Guide (DPE, 2022b);
- State Environmental Planning Policy (Biodiversity and Conservation) 2021;
- Surveying Threatened Plants and their Habitats: NSW Survey Guide for the Biodiversity Assessment Method (DPIE, 2020b);

- NSW Survey Guide for Threatened Frogs – A Guide for the Survey of Threatened Frogs and their Habitats for the Biodiversity Assessment Method (DPIE, 2020c);
- NSW Survey Guide for ‘Species Credit’ Threatened Bats and their Habitats: NSW Survey Guide for the Biodiversity Assessment Method (DPIE, 2021);
- Survey Guidelines for Australia’s Threatened Frogs (Department of the Environment, Water, Heritage and the Arts [DEWHA], 2010a);
- Survey Guidelines for Australia’s Threatened Birds (DEWHA, 2010b);
- Survey Guidelines for Australia’s Threatened Mammals (Department of Sustainability, Environment, Water, Population and Communities [DSEWPC], 2011a);
- Survey Guidelines for Australia’s Threatened Reptiles (DSEWPC, 2011b);
- BioNet Threatened Species Profile Database (Cth DCCEEW, 2024g);
- Commonwealth Species Profile and Threats Database (Cth DCCEEW, 2024b); and
- Threatened Reptiles – Biodiversity Assessment Method Survey Guide (DPE, 2022c).

2.3.1 Survey Timing and Conditions

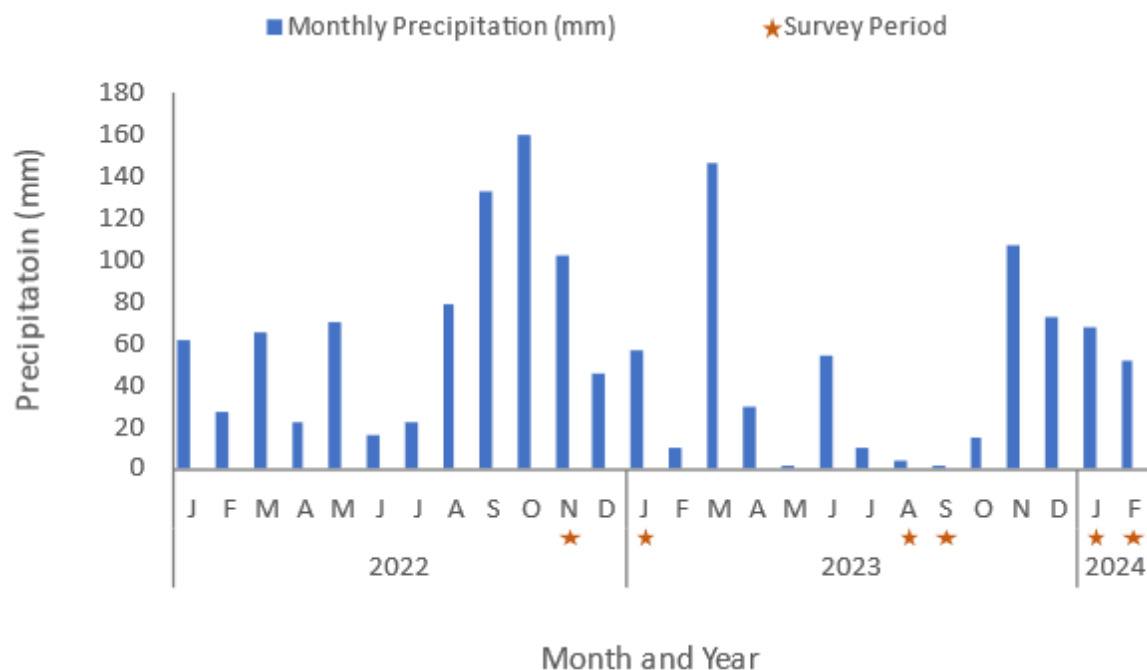
Field survey work was carried out in November 2022, January 2023, August 2023, September 2023, January 2024 and February 2024 over eight survey visits as summarised in Table 2-3.

Table 2-3 Survey periods

Survey Period	Assessors	Surveys Completed
1 st – 3 rd November 2022	Dr Emma Gray and Brad Jeffers	PCT identification and mapping, vegetation integrity assessments, and scattered tree assessments.
7 th November 2022	Andrew Dawson and Brendan Schembri	Targeted flora surveys, scattered tree assessments and targeted bird surveys.
15 th - 17 th November 2022	Lachlan Beil and Brendan Schembri	Anabat detectors deployment, bird surveys, nocturnal spotlighting and herpetofauna searches, active diurnal herpetofauna searches, harp trapping, and scattered tree assessments.
17 th -19 th January 2023	Lauren Eade and Brad Jeffers	Targeted flora surveys, additional PCT identification and vegetation integrity assessments, koala Spot Assessment Technique (SAT) surveys, and deployment of Anabat detectors and arboreal camera traps.
28 th – 31 st August 2023	Lauren Eade and Braden Macdonald	Targeted surveys for Glossy-black Cockatoo and masked owl potential breeding places.
18 th – 21 st September 2023	Lauren Eade and Brad Jeffers	Targeted flora surveys, Additional PCT identification and vegetation integrity

Survey Period	Assessors	Surveys Completed
		assessments, and targeted surveys for Glossy-black cockatoo and masked owl potential breeding places.
13 th January 2024	Andrew Dawson	<i>Digitaria porrecta</i> herbarium sample collection.
26 th February 2024	Brad Jeffers	<i>Digitaria porrecta</i> herbarium sample collection.

Climatic conditions preceding the November 2022 and January 2023 surveys were characterised by heavy rainfall, as was evident during the field surveys with saturated muddy soils and areas of the Study Area inundated with runoff. Rainfall records at a nearby Bureau of Meteorology (BOM) weather station, Narrabri Airport AWS (Station ID: 54038), recorded a total of 101.8 millimetres (mm) recorded between the 1st and 16th November 2022 (during the first three survey periods) and 6.6 mm recorded between the 17th and 29th January 2023 (during the fourth survey period) (BOM, 2024). Prior to the August and September 2023 surveys there had been 54.4mm recorded at Narrabri airport in July, 10.2mm in August, and 2.2mm in September 2023, and conditions on site were dry (Figure 2-1) (BOM, 2024). Weather preceding the January and February 2024 site visits was characterised by high rainfall.



Source: (BOM, 2023)

Figure 2-1 Monthly Rainfall Data from January 2022 – February 2024 as sourced from the nearest weather station, Narrabri Airport AWS (Station ID: 54038)

2.3.2 Plant Community Type Identification

Vegetation communities are identified in accordance with the online BioNet Vegetation Classification (NSW DCCEEW, 2024c), which is the current state-wide vegetation classification system for PCTs. In this study, PCTs were identified on the basis of the following inputs:

- Regional Scale State Vegetation Map which provides predictive mapping of PCTs in and around the Study Area. This mapping is indicative only. It is not necessarily accurate at a fine scale for the purposes of the current study.
- Professional ecological knowledge about locally occurring vegetation types and landscape, soil and topographic patterns, including transitions from one community to another and potential for intergrades between plant communities.
- Field survey results to confirm the flora species present, vegetation structure, landscape position and soil type at the Study Area and the extent and condition of native vegetation.
- The BioNet Vegetation Classification database to identify the candidate vegetation communities likely to be present based on the site conditions (e.g. flora species present, vegetation structure, bioregion, landscape position and soil type) and the relevant published PCT descriptions (NSW DCCEEW, 2024c).

Twenty-two¹ BAM vegetation plots were surveyed according to the BAM (DPIE, 2020a) as follows:

- The survey plots consisted of nested 20 metres (m) x 50 m and 20 m x 20 m plots.
- Species composition and structure (species and percent cover) data collected from within 20 m x 20 m plot.
- Vegetation function data (size and number of trees, presence of hollow-bearing trees and woody debris) collected from within 20 m x 50 m plot.
- Percent of litter cover data collected within five 1 m x 1 m squares positioned at 5 m, 15 m, 25 m, 35 m and 45 m points of 50 m transect.
- The plots were positioned within the Study Area and their Global Positioning System (GPS) locations were recorded (GDA 94 / MGA Zone 55).
- The plot locations were randomly selected whilst ensuring adequate survey effort within each vegetation zone.

Plant identification followed nomenclature in the Royal Botanic Gardens PlantNet online database (Royal Botanic Gardens and Domain Trust, 2024).

2.3.3 Threatened Ecological Community Identification

The potential presence of TECs listed under the BC Act and/or EPBC Act was considered before and after the PCT identification mapping survey was completed. If any of the PCTs were identified as having potential to be part of a TEC, the relevant listing advice and identification criteria were consulted to determine the status of the vegetation community present. Any potentially occurring TECs identified in the PMST report (Cth DCCEEW, 2024a) were considered.

According to the BioNet Vegetation Classification (NSW DCCEEW, 2024c) the PCTs mapped within the Study Area can be partly associated with the following BC Act and/or EPBC Act TECs:

- Artesian Springs Ecological Community in the Great Artesian Basin – BC Act Critically Endangered.

¹ Three plots (P3, P5, P14) after being assessed in November 2022, were found to be cultivated in January and September 2023 when revisited for threatened flora searches.

- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions – BC Act Critically Endangered.
- Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions – BC Act Endangered.
- Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions – BC Act Endangered.
- Native Vegetation on Cracking Clay Soils of the Liverpool Plains – BC Act Endangered.
- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions – BC Act Endangered.
- Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions – BC Act Endangered.
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions – BC Act Endangered.
- White Box-Yellow Box-Blakelys Red Gum Grassy Woodland and Derived Native Grassland- BC Act Critically Endangered.
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia – EPBC Act Endangered.
- Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions – EPBC Act Endangered.
- Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland – EPBC Act Critically Endangered.
- Poplar Box Grassy Woodland on Alluvial Plains – EPBC Act Endangered.
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – EPBC Act Critically Endangered.
- Weeping Myall Woodlands – EPBC Act Endangered.

2.3.4 Vegetation Integrity Survey

In order to assess native vegetation and its condition within different vegetation zones, vegetation integrity plots were undertaken in the Study Area. As described above, a total of 22 vegetation plots were surveyed as per the BAM (DPIE, 2020a). Data collected to measure the condition of the vegetation included attributes relating to composition, structure, and function. The location of each vegetation plot is depicted in Figure 2-2.

2.3.5 Interim Grasslands and other Groundcover Assessment

Field surveys were undertaken as per the *Interim Grasslands and other Groundcover Assessment Method* (IGGAM) (OEH, 2017) in vegetation zones that were identified as cropping, grazing paddock and grasslands, in order to inform if these areas meet the definitions of Category 1 – Exempt Land. Assessment of potential derived grasslands and vegetated land was undertaken under the BAM (DPIE, 2020a). A total of 20 IGGAM assessments were undertaken in the Study Area, as depicted in Figure 2-2. Where cultivation or active cropping was in progress, the assessment data in the form of a representative photo was captured from a vantage point at the edge of the cultivation so as not to damage the crops.

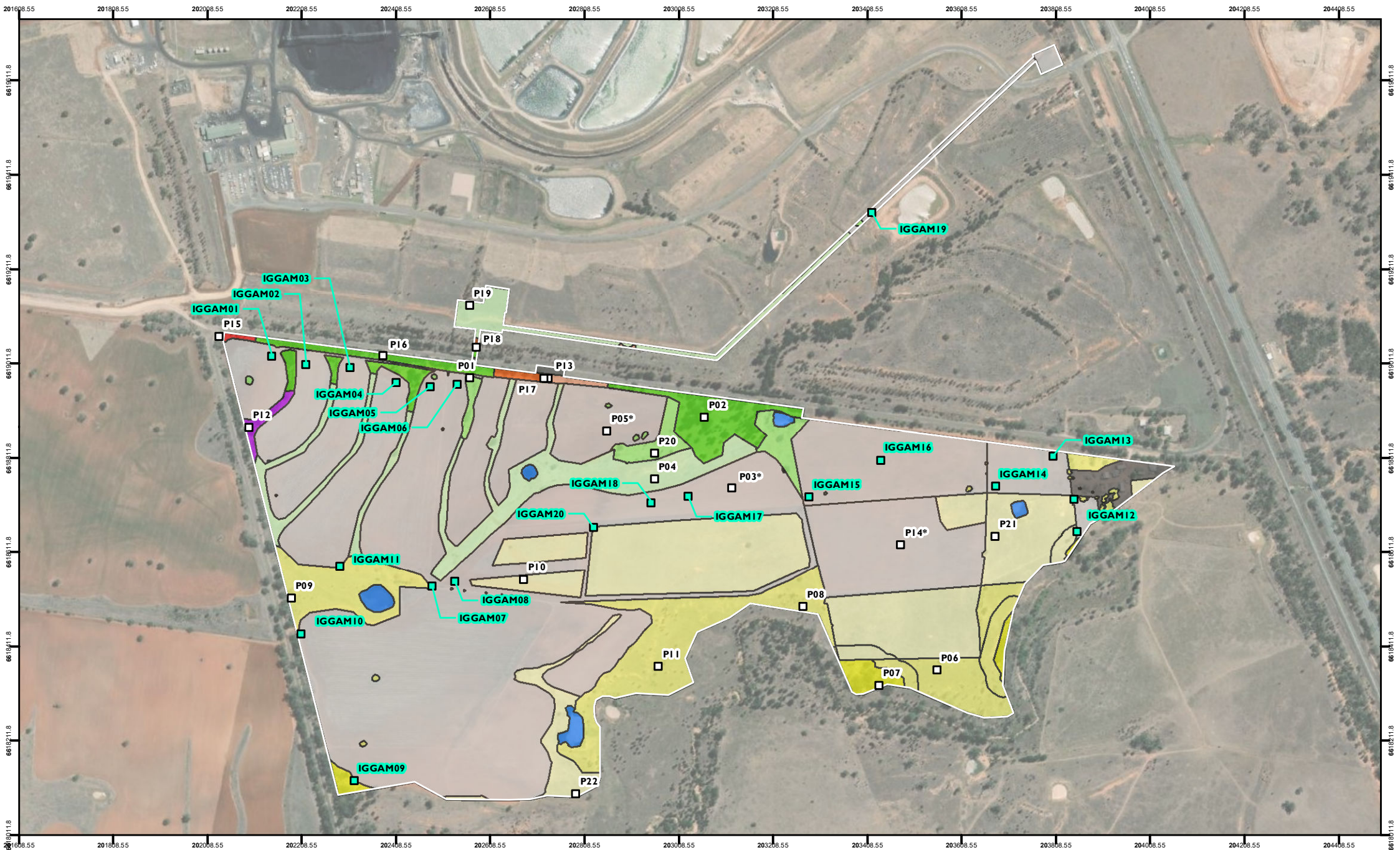


Figure 2-2:
Plant Community Types and
Vegetation Surveys
Whitehaven Solar Farm Project

- Study Area
- Survey Type
- Interim Grassland Assessment
 - Vegetation Integrity Point (BAM)

- Dry Sclerophyll Forests (Shrub/Grass Sub-formation)**
- Piliga Box - Buloke Woodland (Good) (PCT 88)
 - Piliga Box - Buloke Woodland (Semi-Cleared) (PCT 88)
 - Piliga Box - Buloke Woodland (Revegetation) (PCT 88)

- Grassy Woodlands**
- Poplar Box - Belah Woodland (Good) (PCT 55)
- Semi-arid Woodlands (Grassy Sub-formation)**
- Weeping Myall Woodland (Good) (PCT 27)
 - Belah Woodland (Good) (PCT 55)

- Belah Woodland (Semi-Cleared) (PCT 55)
- Derived Grassland (Poor) (PCT 55)
- Poplar Box - Yellow Box - Western Grey Box Grassy Woodland (Good) (PCT 101)
- Poplar Box - Yellow Box - Western Grey Box Grassy Woodland (Semi-Cleared) (PCT 101)
- Derived Grassland (Poor) (PCT 101)

- Exotic**
- Exotic
- Other**
- Farm Dam
 - Infrastructure

REVISION	AUTHOR	REVIEWER	DATE
2	NC	BJ	17/05/2024
3	NC	BJ	16/08/2024

COORDINATE SYSTEM: GDA 1994 MGA Zone 56
SCALE: 1:10,000

0 100 200
Metres

2.3.6 Threatened Flora Surveys

The areas requiring targeted threatened flora surveys were defined following completion of PCT identification and vegetation zone mapping. A list of potential threatened plant species was determined by analysis of the BioNet Atlas (NSW DCCEEW, 2024b) records occurring within 10 km of the Study Area. These records were then refined to those species with associated PCTs occurring in the Study Area. Further target species were identified in the BAM Candidate Species.

Targeted searches for threatened flora in potential habitat were undertaken in accordance with *Surveying Threatened Plants and Their Habitats: NSW Survey Guide for the Biodiversity Assessment Method* (DPIE, 2020b). Opportunistic searches for threatened plants were also undertaken during all vegetation plot surveys and while traversing the site. For all targeted species, the timing of the targeted surveys coincided with their optimum survey time (NSW DCCEEW, 2024a). The searches were undertaken in November 2022 by Andrew Dawson and Brendan Schembri, and in January and September 2023, by Brad Jeffers, and Lauren Eade. Andrew Dawson and Brad Jeffers also undertook additional surveys in January and February 2024 (respectively) to collect additional potential Finger Panic Grass (*Digitaria porrecta*) specimens for verification. The search traverses covered are shown in Figure 2-3.

Table 2-4 Summary of targeted flora survey methods and effort

Survey Type	Survey Effort		
	Survey Period	People (ppl)	Hours (hrs)
Threatened flora searches	1 -3 rd November 2022	2	32.5
	17 -20 th January 2023	2	91
	18 - 21 st September 2023	2	54.5
	13 th January 2024	1	1
	26 th February 2024	1	2

Details of the targeted threatened flora surveys completed are described in Table 2-5. The vegetation was open and so parallel transects of 10 m width were required in accordance with *Surveying Threatened Plants and Their Habitats: NSW Survey Guide for the Biodiversity Assessment Method* (DPIE, 2020b). However, some tracks were 5 m width.

Specimens of suspected Finger Panic Grass (*Digitaria porrecta*) were verified by the NSW Herbarium.

Table 2-5 Targeted threatened flora

Scientific Name	Common Name	Conservation Status		Associated PCTs	Survey Details
		BC Act*	EPBC Act†		
<i>Cyperus conicus</i>	-	E1	-	55, 56, 88, 101	Survey period: January - May, after rain, using flowers to identify (NSW DCCEEW, 2024a). Parallel transects (5-10 m width) were undertaken in PCTs 27, 55, 56, 88, and 101 in January 2023.
<i>Dichanthium setosum</i>	Bluegrass	V	V	27, 55, 56, 101	Survey period: November - May, 3 to 4 weeks after effective rainfall. Use seed-head to identify (NSW DCCEEW, 2024a). Parallel transects (5-10 m width) were undertaken in PCT 55 in November and PCTs 27, 55, 56, 88 and 101 in January 2023.
<i>Digitaria porrecta</i>	Finger Panic Grass	E1	-	27, 55, 56, 101	Survey period: mid-January - late February, using flowers to identify. Seeds mature and fall from the plant soon after flowering (NSW DCCEEW, 2024a). Parallel transects (5-10 m width) were undertaken in PCTs 27, 55, 56, 88 and 101 in January 2023.
<i>Diuris tricolor</i>	Pine Donkey Orchid	V	-	56, 88, 101 ²	Survey period: September Habitat Constraints: nil Parallel transects (5-10 m width) were undertaken in PCTs 27, 55, 56, 88 and 101 in September 2023.

² Whilst PCT 101 is not currently included as an associated PCT in BioNET, it is included because *Diuris tricolor* was found in this PCT during surveys.

Scientific Name	Common Name	Conservation Status		Associated PCTs	Survey Details
		BC Act*	EPBC Act†		
<i>Lepidium aschersonii</i>	Spiny Peppercross	V	V	55, 56, 88	Survey period: November - April. Use fruits to identify, usually during warmer months (NSW DCCEEW, 2024a). Parallel transects (5-10 m width) were undertaken in PCT 88 (semi-cleared) in November, and in PCTs 27, 55, 56, 88 and 101 in January 2023.
<i>Lepidium monoplacoides</i>	Winged Peppercross	E	E	56, 88	Survey period September to December. Parallel transects (5-10 m width) were undertaken in PCT 88 (semi-cleared) in November 2023, and in all PCTs 56 and 88 in September 2023.
<i>Polygala linariifolia</i>	Native Milkwort	E1	-	88	Survey period: October - February, using flowers to identify (NSW DCCEEW, 2024a). Parallel transects (5-10 m width) were undertaken in PCT 88 (semi-cleared) in November, and PCT 88 (good and semi-cleared) in January 2023.
<i>Swainsona murrayana</i>	Slender Darling Pea	V	V	27, 55, 56, 101	Survey period: September (NSW DCCEEW, 2024a). Parallel transects (5-10 m width) were undertaken in PCTs 27, 55, 56, 88 and 101 in September 2023.
<i>Thesium australe</i>	Austral Toadflax	V	V	101	Survey period: November - February. Species can be easily overlooked when understorey height exceeds 30 centimetres (cm). When this is the case, use close inspection surveys (searching between grass tussocks) to conclusively determine absence of this species (NSW DCCEEW, 2024a).

Scientific Name	Common Name	Conservation Status		Associated PCTs	Survey Details
		BC Act*	EPBC Act†		
					Parallel transects (5-10 m width) were undertaken in PCT 101 (good, semi-cleared, and poor) in January 2023.
<i>Tylophora linearis</i>	Tylophora linearis	V	E	88	Survey period: October - May. Use flowers and fruit to locate and identify. Easily confused with other climbers when not in flower or fruit (NSW DCCEEW, 2024a). Parallel transects (5-10 m width) were completed in PCT 88 (semi-cleared) in November and PCT 88 (good and semi-cleared) in January 2023.

* V – Vulnerable, E – Endangered.

† V – Vulnerable, E – Endangered.

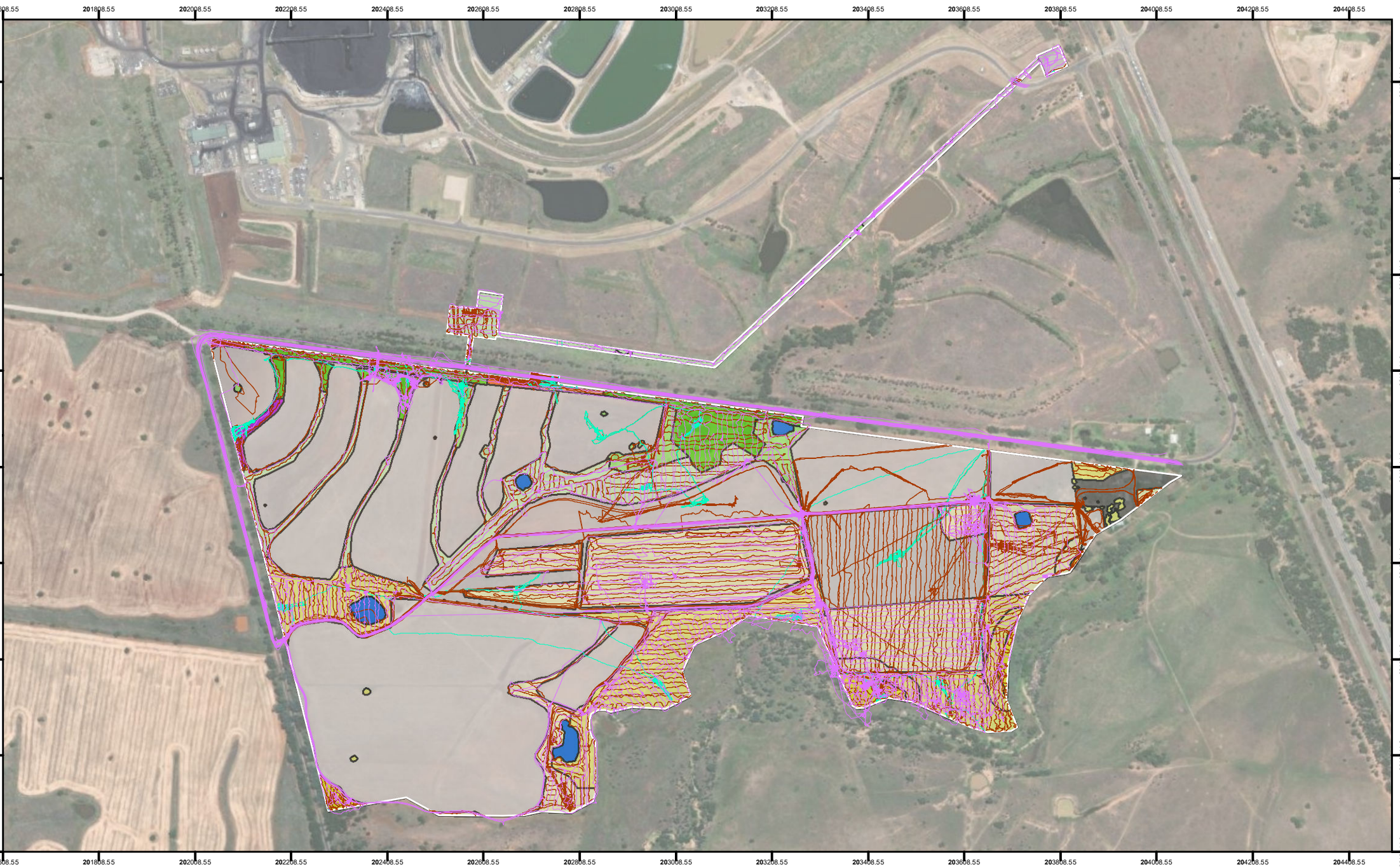
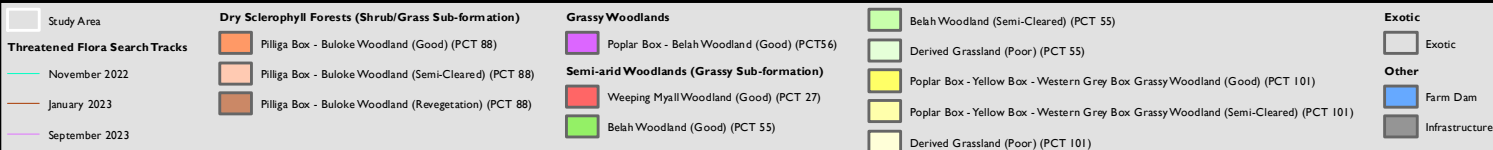


Figure 2-3:
Threatened Flora Search Traverses
Whitehaven Solar Farm Project



REVISION	AUTHOR	REVIEWER	DATE
2	NC	BJ	17/05/2024
3	NC	BJ	17/05/2024

COORDINATE SYSTEM: GDA 1994 MGA Zone 56
SCALE: 1:10,000

0 100 200
Metres

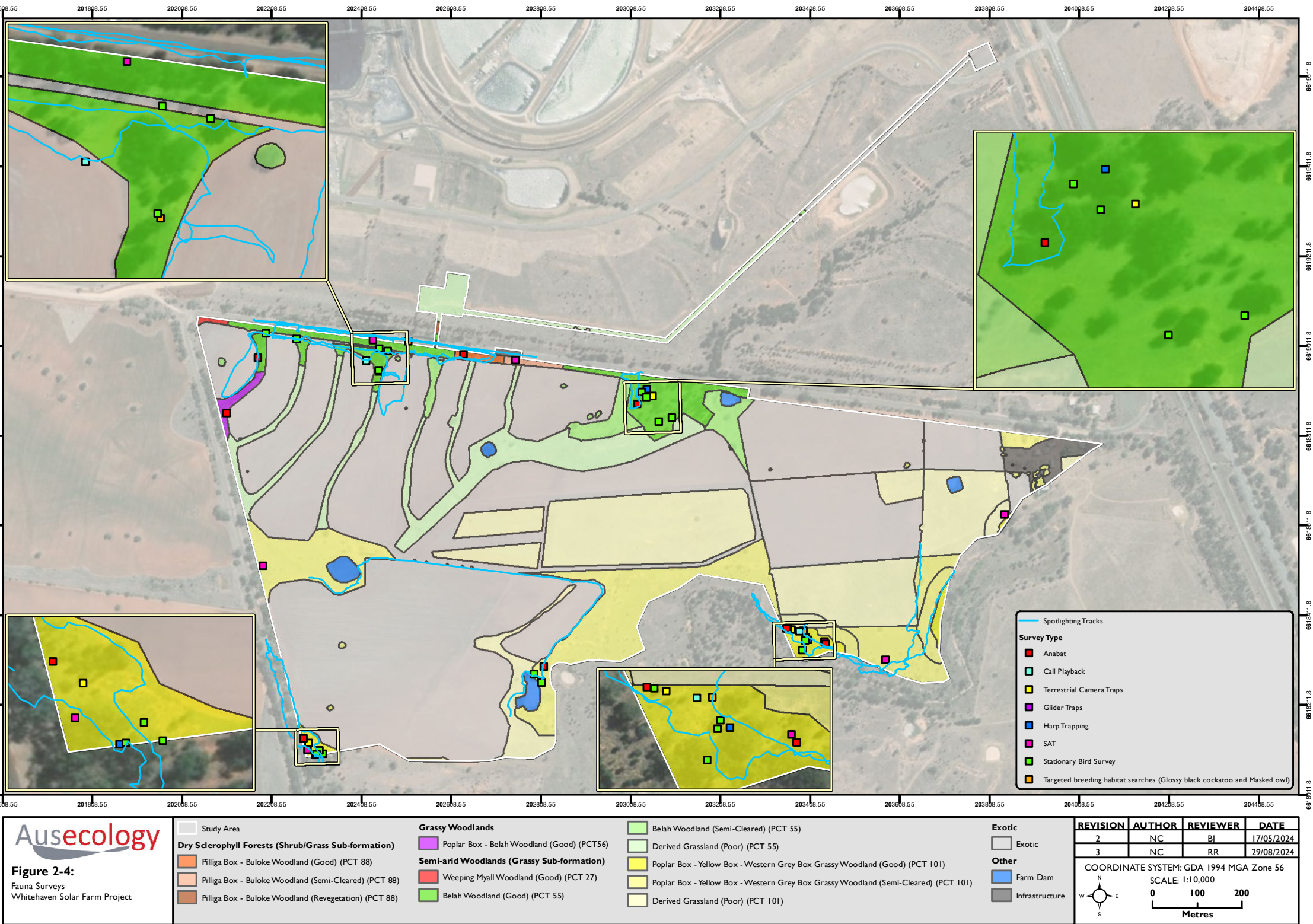
2.3.7 Threatened Fauna Surveys

Targeted surveys were carried out to confirm the presence/absence of a number of threatened fauna species credit species. Target species were identified through a desktop review of Bionet Atlas (NSW DCCEEW, 2024b) records within 10 km of the Study Area, associated PCTs occurring on-site, and the BAM Candidate Species Report. A full list of threatened fauna which may potentially occur in the Study Area (including ecosystem credit species) is provided in Section 3.8.

A summary of the field survey effort is presented in Table 2-6 and shown on the maps in Figure 2-4 and Figure 2-5. Details of the targeted threatened fauna surveys completed are described in Table 2-7.

Table 2-6 Summary of targeted fauna survey methods and effort

Survey Type	Survey Effort		
Anabat bat echolocation recorders	23 nights		
Baited glider camera traps	3 camera traps for 2 nights each		
	4 arboreal camera traps for 5 nights each		
Bird surveys	480 person minutes		
Habitat assessments	5 sites		
Harp traps	3 harp traps for 2 nights each		
Koala SAT surveys	7 survey locations		
Masked owl call playback	Two sites, three nights each, with 55mins per site per night. Surveys were conducted on the 28 th , 29 th and 30 th of August 2023.		
Spotlighting	Survey Period	People	Time
	15 - 16 th November 2022	2	6pm - 11:30pm
	28 - 30 th August 2023	2	6:45pm - 9pm
	18 - 20 th September 2023	2	6pm - 7pm



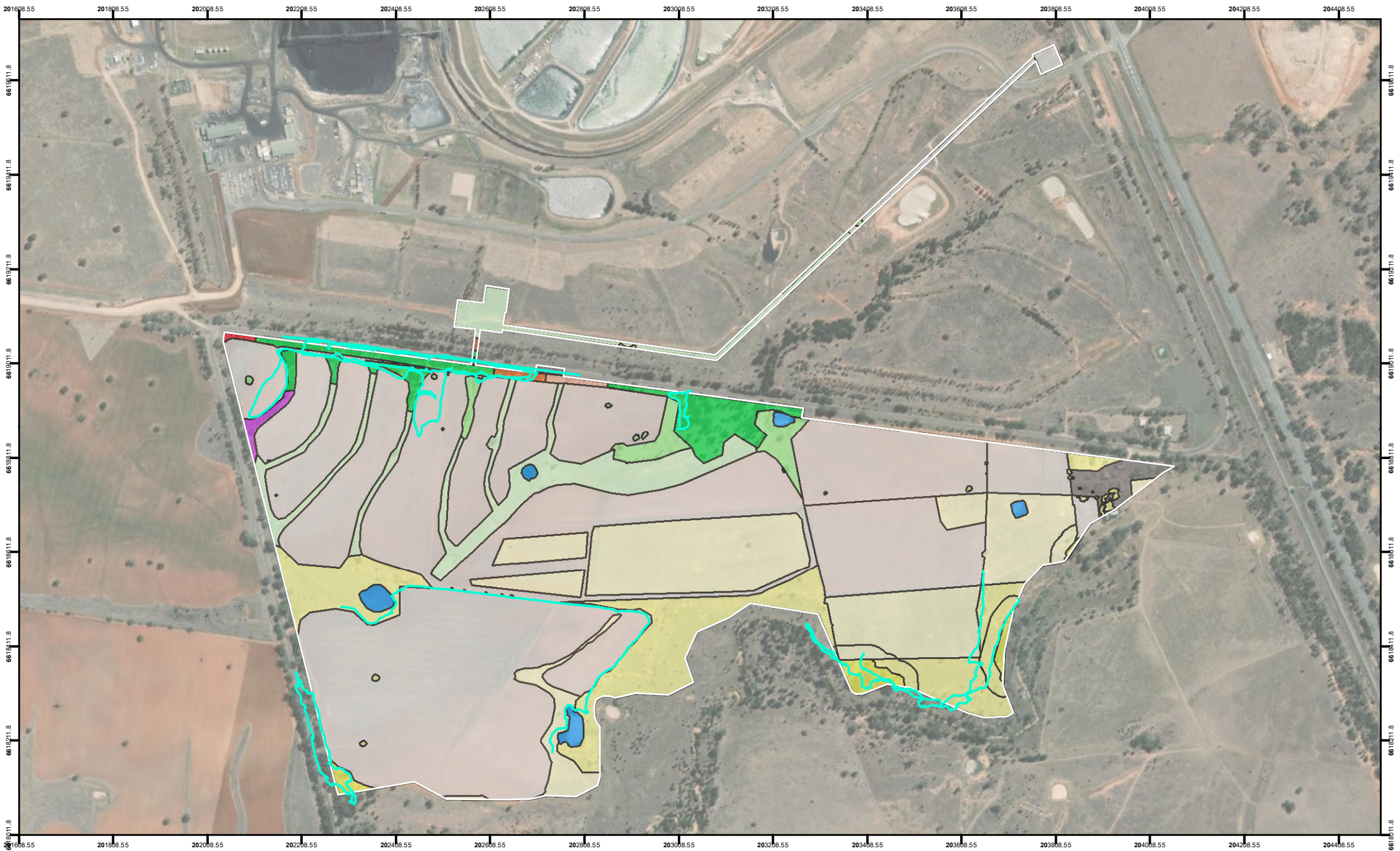


Figure 2-5:
Arboreal Spotlighting and
Nocturnal Herpetofauna Searches
Whitehaven Solar Farm Project

- Arboreal Spotlighting and Nocturnal Herpetofauna Searches
- Study Area
- Dry Sclerophyll Forests (Shrub/Grass Sub-formation)**
- Pilliga Box - Buloke Woodland (Good) (PCT 88)
- Pilliga Box - Buloke Woodland (Semi-Cleared) (PCT 88)
- Pilliga Box - Buloke Woodland (Revegetation) (PCT 88)

- Grassy Woodlands**
- Poplar Box - Belah Woodland (Good) (PCT 56)
- Semi-arid Woodlands (Grassy Sub-formation)**
- Weeping Myall Woodland (Good) (PCT 27)
- Belah Woodland (Good) (PCT 55)
- Belah Woodland (Semi-Cleared) (PCT 55)

- Derived Grassland (Poor) (PCT 55)
- Poplar Box - Yellow Box - Western Grey Box Grassy Woodland (Good) (PCT 101)
- Poplar Box - Yellow Box - Western Grey Box Grassy Woodland (Semi-Cleared) (PCT 101)
- Derived Grassland (Poor) (PCT 101)
- Exotic**
- Exotic

- Other**
- Farm Dam
- Infrastructure

REVISION	AUTHOR	REVIEWER	DATE
3	NC	BJ	17/05/2024
4	NC	BJ	27/08/2024

COORDINATE SYSTEM: GDA 1994 MGA Zone 56

SCALE: 1:10,000

0 100 200

Metres

Table 2-7 Fauna species survey details

Scientific Name	Common name	Conservation Status		Associated PCTs	Survey Details
		BC Act*	EPBC Act†		
<u>Reptiles</u>					
<i>Uvidicolus sphyrurus</i>	Border Thick-tailed Gecko	V	V	88	Spotlighting and active searches for reptiles following the <i>Threatened Reptiles – Biodiversity Assessment Method Survey Guide</i> (DPE, 2022c). No suitable habitat in the Development Footprint (Figure 1-2).
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V	-	56, 27, 88, 101	Survey not required – no suitable habitat present in Development Footprint. Associated PCTs in the Development Footprint are either cleared or are impacted by cattle grazing, fragmentation and loss of hollow-bearing trees which are known threats (NSW DCCEEW, 2024g; Shelton et al, 2020). The Development Footprint has been subject to ongoing historical livestock grazing. No hollow bearing trees were present in the wooded PCT 56 patch. Spotlighting and active searches was undertaken as a precautionary measure and is considered most effective for detecting the species.
<u>Birds</u>					
<i>Ardeotis australis</i>	Australian Bustard	E	-	55, 56, 27	Bird surveys done in all woodland areas. Diurnal bird surveys were undertaken from 15 - 18th November 2022.
<i>Ninox connivens</i>	Barking Owl	V	-	55, 56, 101, 27, 88	Bird surveys done in all woodland areas. No hollow-bearing trees are located in the Development Footprint (Figure 1-2). Spotlighting, targeting potential breeding hollows at two locations in Study Area, were undertaken on 15th -- 16th November 2022, 28th -30th August 2023, and 19th -21st September 2023. Diurnal bird surveys were undertaken from 15th – 18th November 2022.
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	V	-	55, 56, 101, 88	Bird surveys done in all woodland areas. Diurnal bird surveys were undertaken from 15th - 18th November 2022.
<i>Burhinus grallarius</i>	Bush Stone-curlew	E	-	101, 27, 88	Bird surveys done in all woodland areas. Diurnal bird surveys were undertaken from 15th - 18th November 2022.
<i>Calyptorhynchus lathami</i>	South-eastern Glossy Black-cockatoo	V	V	55, 56, 88	<i>C. lathami</i> is a dual credit species.

Scientific Name	Common name	Conservation Status		Associated PCTs	Survey Details
		BC Act*	EPBC Act†		
					Months of survey for species credit purposes are January to September. Identification of breeding habitat is also required. Surveys for signs of feeding and potential breeding places was undertaken in November 2022. Surveys of potential breeding places for breeding activity were undertaken in January, August and September 2023. Searches for animals included observation during all site surveys in November 2022, January 2023, and September 2023, as well as noting signs of orts indicating feeding. No hollow-bearing trees are located in the Development Footprint (Figure 1-2). Outside the Development Footprint, but within the Study Area were two two potential nest locations which were determined to be were very low quality and suitability. Searches for signs of breeding was undertaken on 28th, 29th and 30th August 2023 and 19th, 20th and 21st September 2023. These occurred in August from 3pm to 6pm, and again in September, from 4pm to 6:50pm at two potential nest locations, looking and listening for signs of foraging and breeding including: begging birds of any age or sex; males returning to feed females in nests, or an occupied nest. No evidence of individuals or breeding was found, and the potential nest hollows were absent in the Development Footprint, therefore species polygons were not defined.
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	55, 56, 101, 27, 88	Bird surveys done in all woodland areas. No nest trees identified.
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	55, 56, 101, 27, 88	Months for species credit surveys: May, June, July and August. Diurnal bird surveys were undertaken from 15th to 18th November 2022. Spotlighting, was undertaken from 15th to 16th November 2022, 28th to 30th August 2023 (during breeding season), and 19th to 21st September 2023. Targeted masked owl call playback was conducted by two ecologists on the 28th, 29th and 30th of August 2023. Masked Owl specific habitat for breeding, male roosts, feeding/grooming perches and fledgling requirements were not found. Evidence of

Scientific Name	Common name	Conservation Status		Associated PCTs	Survey Details
		BC Act*	EPBC Act†		
					individuals or breeding was not found, and the potential nest hollows were absent in the Development Footprint (Figure 1-2), therefore species polygons were not defined. Targeted surveys for breeding were undertaken on two occasions, being the 28 - 30th August 2023 (within season), and 19th - 21st September 2023 (not within season).
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	101	Survey not required – not Important Habitat Area. Nearest Important Habitat Area mapped approximately 75 km east of the Study Area.
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	55, 56, 101, 27, 88	Bird surveys done in all woodland areas. No nest trees identified.
<i>Polytelis swainsonii</i>	Superb Parrot	V	V	55, 56, 101, 27, 88	Survey not required – geographic constraint and no suitable tree species with hollows.
<i>Lathamus discolor</i>	Swift Parrot	E	CE	55, 56, 101, 88	Surveys not required – not Important Habitat Area. Nearest Important Habitat Area mapped greater than 90 km south-east of the Study Area.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	V	-	55, 56, 101, 27, 88	Bird surveys done in all woodland areas. Diurnal bird surveys were undertaken from 15 th to 18th November 2022.
<u>Mammals</u>					
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	56, 88	No suitable habitat present.
<i>Vespudelus troughtoni</i>	Eastern Cave Bat	V	-	56, 101, 88	Harp traps and Anabat recorders deployed. No suitable breeding habitat present.
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	101, 88	Arboreal camera traps and spotlight searches done in woodland areas.
<i>Pteropus poliocephalus</i>	Grey headed Flying-fox	V	V	55, 56, 101	Search for camps in Study Area.
<i>Phascolarctos cinereus</i>	Koala	E	E	55, 56, 101, 27, 88	SAT assessments and spotlighting in all suitable habitat.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	E	E	88	Harp traps and Anabat recorders deployed. No suitable breeding habitat present.
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	88	Arboreal camera traps deployed in suitable habitat areas, in addition to spotlighting.

* V – Vulnerable, E – Endangered, CE – Critically Endangered

† V – Vulnerable, E – Endangered, CE – Critically Endangered.

2.3.8 Incidental Records

Incidental flora and fauna sightings were recorded while undertaking the BAM plots and searching the Study Area for hollow-bearing trees and other potential habitat features. Birds were recorded as either present on the site, or as off-site, if using or flying over nearby land. Potential habitat such as rock outcrops, loose bark and coarse woody debris was recorded and examined for signs of cryptic species. Tracks and other areas of suitable substrate were searched for animal tracks. Other evidence of fauna presence on the Study Area, such as scats, feathers and skins were also recorded.

2.4 Limitations

Conditions at times of the survey periods were considered to be relatively suitable for the detection of threatened flora and fauna likely to occur within the survey area. Access to some cropping land within the Study Area was impeded by active cropping and cultivation activity but this had no impact on the assessment of biodiversity values.

3 Results

3.1 Plant Community Types

Five PCTs were determined to be present in the Study Area based on the existing mapping and the results of the fieldwork:

- **PCT 27** – Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion.
- **PCT 55** – Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.
- **PCT 56** – Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW.
- **PCT 88** – Pilliga Box - White Cypress Pine - Buloke shrubby woodland in the Brigalow Belt South Bioregion.
- **PCT 101** - Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion.

The justification for the identification of these PCTs is provided in Table 3-1 and their extent is mapped in Figure 2-2 above. Non-native vegetation was mapped within the Study Area where pasture and cropping activities are active. A section of revegetation area was identified in the northern section of the Study Area and map assigned to the most likely vegetation zone. Scattered trees were also assigned to a vegetation zone.

Table 3-1 PCTs identified within Study Area

PCT	PCT Name	Vegetation Formation	Justification of Identification
27	Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	Semi-arid Woodlands (Grassy sub-formation)	- Occurs in IBRA region Brigalow Belt South, sub-region Liverpool Plains. - Low woodland dominated by weeping myall (<i>Acacia pendula</i>). Shrub species include <i>Alectryon oleifolius</i> and ground layer dominated by grasses including <i>Austrostipa aristiglumis</i>. - Identified out of nine potential PCTs (i.e. 27, 35, 49, 55, 77, 145, 433, 511, 1766) as most suitable due to PCT 27 having the highest percentage of species present in the Upper Stratum (i.e. dominated by <i>Acacia pendula</i>) and Ground Stratum species lists. The vegetation formed a low woodland, characteristic of PCT 27, compared to tall woodland of other potential PCTs.
55	Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.	Semi-arid Woodlands (Grassy sub-formation)	- Occurs in IBRA region Brigalow Belt South, sub-region Liverpool Plains. - PCT 55 is mapped as occurring within the vicinity of the Study Area (NSW DCCEEW, 2024e; AMBS, 2020a). - Several species characteristic of PCT 55 were recorded in these patches including <i>Casuarina cristata</i>, <i>Acacia pendula</i>, <i>Geijera parviflora</i>, <i>Eremophila mitchellii</i>, <i>Dichanthium sericeum</i> sub species (subsp.) <i>sericeum</i>, <i>Alternanthera denticulata</i>, <i>Enteropogon acicularis</i>, <i>Sclerolaena muricata</i>, <i>Enchylaena tomentosa</i>, <i>Austrostipa scabra</i> subsp. <i>scabra</i>, <i>Chloris truncata</i>, and <i>Wahlenbergia gracilis</i>. - Identified as the most suitable PCT from seven (i.e. 27, 55, 56, 228, 244, 378, 1291) due to suitable species in the Upper Stratum, Mid Stratum and Ground Stratum Species lists. Two alternative PCTs were discounted due to incongruous vegetation formation and differing dominant upper stratum species.
56	Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Grassy Woodlands	- Occurs in IBRA region Brigalow Belt South, sub-region Liverpool Plains. - PCT 56 is mapped as occurring within the vicinity of the Study Area (NSW DCCEEW, 2024e). - Several species characteristic of PCT 56 were recorded in these patches including <i>Eucalyptus populnea</i>, <i>Casuarina cristata</i> and <i>Callitris glaucophylla</i>.

PCT	PCT Name	Vegetation Formation	Justification of Identification
			Identified out of four possible PCTs (i.e. 47, 56, 67, 200) by diagnostic features including being a tall to mid-high woodland occurring on red or red-brown loams or light clay, and a higher percentage of suitable species across all strata.
88	Pilliga Box - White Cypress Pine Buloke shrubby woodland in the Brigalow Belt South Bioregion	Dry Sclerophyll Forests (Shrub/grass sub-formation)	- Occurs in IBRA region Brigalow Belt South, sub-region Liverpool Plains. - PCT 88 is mapped as occurring within vicinity of Study Area (NSW DCCEEW, 2023e; AMBS, 2020a). - Several shrub and ground species characteristic of PCT 88 were recorded in these patches including <i>Geijera parviflora</i>, <i>Myoporum montanum</i>, <i>Enchylaena tomentosa</i>, <i>Austrostipa scabra</i>, and <i>Enteropogon acicularis</i>. - Pilliga Box (<i>Eucalyptus pilligaensis</i>) is the dominant canopy species. Other possible PCTs (i.e. 35, 145) were typically dominated by a different canopy species, none of which were present at the site.
101	Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	Semi-arid Woodlands (Grassy sub-formation)	- Occurs in IBRA region Brigalow Belt South, sub-region Liverpool Plains. - Area is mapped as PCT 101 (NSW DCCEEW, 2023e). - Several species characteristic of PCT 101 were recorded in these patches including <i>Eucalyptus populnea</i>, <i>Callitris glaucophylla</i>, <i>Maireana microphylla</i>, <i>Austrostipa scabra</i> subsp. <i>scabra</i>, <i>Chrysocephalum apiculatum</i>, <i>Einadia hastata</i>, <i>Geijera parviflora</i>, <i>Oxalis perennans</i>, <i>Carex inversa</i>, <i>Calotis lappulacea</i>, <i>Plantago debilis</i>, <i>Sclerolaena birchii</i>, <i>Chloris truncata</i>. - Identification of the PCT was defined from other potential PCTs (i.e. 244, 56, 397, 418, 435, 458, 594, 56, 101, 397, 27, 35, 49, 52, 56, 101, 145, 211, 397, 433, 484, 81, 88, 202, 397, 421, 599, 35, 49, 52, 56, 88, 101, 145, 397, 454, 511) by the soil, position in landscape, dense ground cover and highest percentage of suitable species present in the Upper Stratum, Mid Stratum and Ground Stratum Species lists.

3.2 Threatened Ecological Communities

Field observations demonstrated the presence of the following TECs:

- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions – BC Act EEC.
- Poplar Box Grassy Woodland on Alluvial Plains - EPBC Act EEC.
- Weeping Myall Woodlands - EPBC Act EEC.

The factors indicating the presence of TECs are described below:

Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions – BC Act EEC

This EEC is present in the Study Area based on field data captured at vegetation integrity plot P15 (Appendix A), desktop GIS analysis, and field observations, summarised as follows:

1. the presence of red-brown earth;
2. location within the Brigalow Belt South Bioregion;
3. structure of low open woodland; and
4. the presence at the site of characteristic species *Acacia pendula* (Weeping Myall).

There is a single patch of this EEC (0.08 ha in the Study Area) (Figure 3-1, Weeping Myall Woodland Good PCT 27). The patch extends along roadsides beyond the Study Area.

Poplar Box Grassy Woodland on Alluvial Plains - EPBC Act EEC

This EEC is present in the Study Area based on field data captured at vegetation integrity plot P07 (Appendix A), desktop GIS analysis, and field observations, summarised as follows:

1. occurs in the Brigalow Belt South IBRA bioregion;
2. associated with ancient and recent depositional alluvial plains with clay, clay-loam;
3. structure grassy woodland to grassy open woodland;
4. tree crown cover of 75 percent (%).
5. canopy tree species are capable of reaching 10 m or more in height;
6. *Eucalyptus populnea* (Poplar Box) is present in the canopy and is the dominant tree species;
7. mid layer (1 - 10 m) crown cover of shrubs to small trees is low, 4.3%;
8. the ground layer (less than 1 m) is mostly dominated by native grasses and herbs;
9. 98% of perennial vegetation cover in the ground layer is native (ref. BAM P07); and
10. Twenty-two diagnostic native plant species in the ground layer recorded in the P07 plot indicates a reasonable likelihood of there being greater than or equal to 30 diagnostic native plant species per patch at the site in suitable seasonal conditions.

The areas of the site considered to be the TEC cover a total of 1.5 ha across two patches Poplar Box Grassy Woodland (Good) (PCT 101) (1.17 ha) (Figure 3-1). The TEC extends beyond the Study Area following the creek.

Weeping Myall Woodlands - EPBC Act EEC

This TEC is present in the Study Area based on field data captured at vegetation integrity plot P15 (Appendix A), desktop GIS analysis, and field observations, summarised as follows:

1. occurs in the Brigalow Belt South IBRA bioregion;
2. weeping Myall (*Acacia pendula*) trees are the dominant overstorey species;
3. the overstorey has 40% tree canopy cover;
4. the area is approximately 3 ha in size;
5. the canopy ranges from 4 m to 8 m; and
6. and of the vegetative cover present, greater than 50% is comprised of native species.

There is a single patch of this EEC (0.08 ha in the Study Area) (Figure 3-1, Weeping Myall Woodland Good PCT 27). The patch extends along the roadside and extends into the Study Area in the far north west corner.

TECs Absent from the Study Area

The following TECs were determined to be absent from the Study Area:

- Artesian Springs Ecological Community in the Great Artesian Basin is absent because neither artesian spring mounds or emerging water, nor associated artesian spring vegetation (i.e. sedges) was detected.
- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions is absent because the key indicator species, *Acacia harpophylla*, was not detected.
- Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions is absent because the key indicator species, *Corymbia tessellaris*, is absent.
- Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penepine and Mulga Lands Bioregions is absent because neither of the key indicator species Coolibah (*Eucalyptus coolabah*) and Black Box (*E. largiflorens*) are absent.
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepine, Nandewar and Brigalow Belt South Bioregions is absent because the key indicator species, *Eucalyptus microcarpa* (Inland Grey Box), is absent.
- Native Vegetation on Cracking Clay Soils of the Liverpool Plains is absent because cracking clay soils are absent.
- Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions is absent because vine thicket was not present, and the key indicator species, such as Red Olive Plum (*Cassine australis* var. *angustifolia*), Wilga (*Geijera parvifolia*) Native Olive (*Notelaea microcarpa* var. *microcarpa*) and Peach Bush (*Ehretia membranifolia*) were not forming a dominant canopy.
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland is absent because only one of the key indicator species, White Box (*Eucalyptus albens*), was present, it was present as a single specimen, and was not found to be forming an open woodland community.

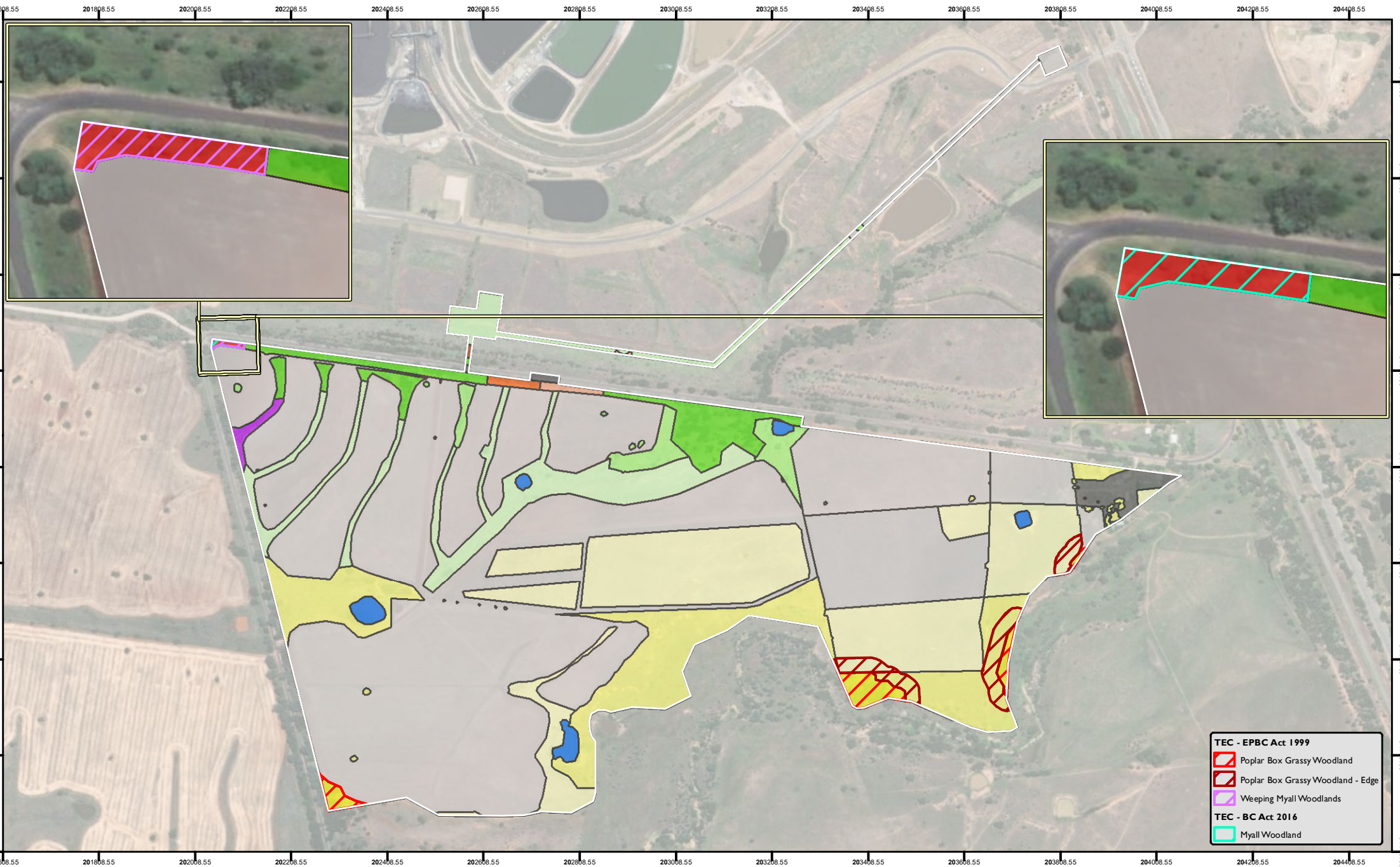
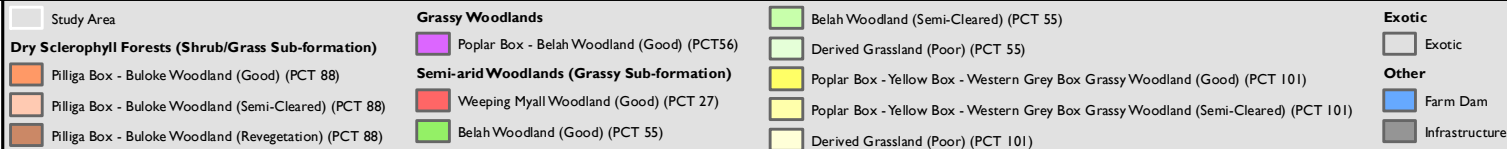


Figure 3-1:
Threatened Ecological
Communities (TEC)
Whitehaven Solar Farm Project



REVISION	AUTHOR	REVIEWER	DATE
2	NC	BJ	09/05/2024
3	NC	BJ	17/05/2024

COORDINATE SYSTEM: GDA 1994 MGA Zone 56
SCALE: 1:10,000

0 100 200
Metres

3.3 Vegetation Zones

In accordance with the BAM (DPIE, 2020a), PCTs occurring in the Study Area were further stratified into broad condition states and assigned a vegetation zone. Broad condition states have been determined by the presence or absence of key structural elements of the respective PCT, assessed by reviewing plot data and general observations made whilst conducting fieldwork.

Eleven vegetation zones are recognised as occurring within the Study Area, comprising five PCTs in different condition states (see Figure 3-2):

- Vegetation Zone 1 – Weeping Myall Woodland (Good) (PCT 27). Good cover of *Acacia pendula* with a sparse shrub layer. Grassy ground layer is dense and predominantly native species.
- Vegetation Zone 2a – Belah Woodland (Good) (PCT 55). There is a stand of Belah (*Casuarina cristata*) with a moderate density of native and non-native shrubs, and good diversity of ground species.
- Vegetation Zone 2b – Belah Woodland (Semi-cleared) (PCT 55). There is sparse shrub cover (predominantly *Sclerolaena* spp.), and ground species are mostly native species, with a moderate density of exotic species including *Taxodium orientalis* and *Soliva sessilis*.
- Vegetation Zone 2c – Derived Grassland (Poor) (PCT 55). Vegetation in this zone has been historically cleared, and no trees or shrubs were recorded in this zone. Groundcover is comprised of both native and non-native grasses and forbs.
- Vegetation Zone 3 – Poplar Box-Belah Woodland (Good) (PCT 56). There is regrowth *Callitris glaucophylla* and *Casuarina cristata* with scattered *Eucalyptus populnea*. A moderately dense shrub layer is dominated by *Enchylaena tomentosa*. Ground layer is predominately native, dominated by tussock grasses such as *Austrostipa scabra*.
- Vegetation Zone 4a – Pilliga Box-Buloke Woodland (Good) (PCT 88). There is remnant *Eucalyptus pilligaensis* with a shrub layer dominated by *Geijera parviflora* and sparse grassy ground layer. Vegetation is predominantly native.
- Vegetation Zone 4b – Pilliga Box-Buloke Woodland (Semi-cleared) (PCT 88). Vegetation in this zone was likely historically cleared, with remnant *Eucalyptus pilligaensis* open forest. A sparse shrub layer is dominated by native species, particularly *Geijera parviflora*. Groundcover is mostly native with some non-native forbs including *Glandularia aristigera* and *Bidens dissectifolia*.
- Vegetation Zone 4c – Pilliga Box-Buloke Woodland (Revegetation) (PCT 88). A revegetation area with planted native trees approximately 10 years old, with *Eucalyptus tereticornis* and *Casuarina cristata*.
- Vegetation Zone 5a – Grey Box Grassy Woodland (Good) (PCT 101). Vegetation in this zone is a grassy woodland dominated by *Eucalyptus populnea* and *Callitris glaucophylla*. Few shrub species were recorded, both native and non-native. This zone is connected to an area of mapped PCT 101 woodland to the south of the Study Area.
- Vegetation Zone 5b – Grey Box Grassy Woodland (Semi-cleared) (PCT 101). Vegetation in this zone is comprised of scattered trees and moderate shrub diversity, mostly native. Groundcover is dense and comprised of both native and non-native grasses and forbs.
- Vegetation Zone 5c – Derived Grassland (Poor) (PCT 101). Vegetation in this zone has been historically cleared, with no trees present and a sparse shrub layer. Groundcover is predominantly native, however several non-native species occur in moderate density including *Lolium* sp., *Lysimachia arvensis*, *Hypochaeris glabra* and *Euchiton japonicus*.

A total area of 70.97 ha of the Study Area is classified as exotic dominated, including areas of pasture, cultivation, farm infrastructure, revegetation, road, dams, and cropping. The land categorisation assessment results for these zones are presented in Section 3.4, Table 3-3.

Table 3-2 provides a summary of each vegetation zones that occurs within the Study Area. The vegetation integrity plot data and photographs area provided in Appendix A and B, respectively.

Table 3-2 Summary of vegetation zones

Vegetation Zone	PCT ID	Condition	PCT Name	Local name	Area (ha)
1	27	Good	Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	Weeping Myall Woodland (Good) (PCT 27)	0.08
2a	55	Good	Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions	Belah Woodland (Good) (PCT 55)	3.76
2b	55	Semi-cleared	Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions	Belah Woodland (Semi-cleared) (PCT 55)	1.99
2c	55	DNG	Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions	Derived Grassland (Poor) (PCT 55)	7.92
3	56	Good	Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Poplar Box-Belah Woodland (Good) (PCT 56)	0.33
4a	88	Good	Pilliga Box - White Cypress Pine - Buloke shrubby woodland in the Brigalow Belt South Bioregion	Pilliga Box-Buloke Woodland (Good) (PCT 88)	0.20
4b	88	Semi-cleared	Pilliga Box - White Cypress Pine - Buloke shrubby woodland in the Brigalow Belt South Bioregion	Pilliga Box-Buloke Woodland (Semi-cleared) (PCT 88)	0.20
4c	88	Revegetation	Pilliga Box - White Cypress Pine - Buloke shrubby woodland in the Brigalow Belt South Bioregion	Pilliga Box-Buloke Woodland	0.03

Vegetation Zone	PCT ID	Condition	PCT Name	Local name	Area (ha)
				(Revegetation) (PCT 88)	
5a	101	Good	Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	Poplar Box Grassy Woodland (Good) (PCT 101)	1.17
5b	101	Semi-cleared	Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	Poplar Box Grassy Woodland (Semi-cleared) (PCT 101)	11.94
5c	101	DNG	Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	Derived Grassland (Poor) (PCT 101)	18.77
Subtotal Native Vegetation					46.39
Cultivation, Cropping and Exotic					68.88
Dams					0.87
Existing Farm Infrastructure and Roads					1.22
Total area					117.36





Figure 3-2:
Plant Community Types and
Vegetation Zones
Whitehaven Solar Farm Project

Study Area

- Dry Sclerophyll Forests (Shrub/Grass Sub-formation)
- Pilliga Box - Buloke Woodland (Good) (PCT 88)
- Pilliga Box - Buloke Woodland (Semi-Cleared) (PCT 88)
- Pilliga Box - Buloke Woodland (Revegetation) (PCT 88)

Grassy Woodlands

- Poplar Box - Belah Woodland (Good) (PCT 56)
- Poplar Box - Yellow Box - Western Grey Box Grassy Woodland (Good) (PCT 101)
- Poplar Box - Yellow Box - Western Grey Box Grassy Woodland (Semi-Cleared) (PCT 101)
- Derived Grassland (Poor) (PCT 101)

Semi-arid Woodlands (Grassy Sub-formation)

- Weeping Myall Woodland (Good) (PCT 27)
- Belah Woodland (Good) (PCT 55)
- Belah Woodland (Semi-Cleared) (PCT 55)
- Derived Grassland (Poor) (PCT 55)

Exotic

- Exotic

Other

- Farm Dam
- Infrastructure

REVISION	AUTHOR	REVIEWER	DATE
1	NC	ML	01/05/2024
2	NC	BJ	17/05/2024

COORDINATE SYSTEM: GDA 1994 MGA Zone 56
SCALE: 1:10,000

0 100 200
Metres

N
W E
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3.4 Land Categorisation

The area mapped as exotic includes active cultivation and cropping, and is considered to be land designated as Category 1 – Exempt Land, as assessed generally in accordance with the *Determining Native Vegetation Land Categorisation for Application in the Biodiversity Offsets Scheme* (DPE, 2023a), due to the following factors:

- it is RU1 zoned land under the *Narrabri Local Environmental Plan* (LEP) Land Zones (DPE, 2023b) (Figure 3-3);
- aerial photography demonstrates that the land was cleared prior to 1 January 1990 (Figure 3-4);
- it is land that is not Category 2 – Vulnerable Regulated Lands or Category 2 – Sensitive Regulated Lands according to the draft Native Vegetation Regulatory Map (NSW DCCEEW, 2024h) (Figure 3-5);
- it is land that is mapped as ‘cropping’ according to the NSW Land Use mapping (DPE, 2020) (Figure 3-6).
- photo evidence indicates clearing or cropping activities have occurred (Plate 3-1 and Plate 3-2); and
- site inspection results of the presented in Table 3-3 below, confirm that the area is comprised of cultivation, crops, and exotic ground cover vegetation (i.e. low conservation value groundcover).

No threatened species or communities listed under the BC Act or EPBC Act occur within the area mapped as Exotic.

Table 3-3 IGGAM transect results

Transect	Native	Non-native	Non-vegetative	Determination
IGGAM1	0	Cropping/Cultivation		Exotic
IGGAM2	0	Cropping/Cultivation		Exotic
IGGAM3	0	Cropping/Cultivation		Exotic
IGGAM4	0	Cropping/Cultivation		Exotic
IGGAM5	0	Cropping/Cultivation		Exotic
IGGAM6	0	Cropping/Cultivation		Exotic
IGGAM7	0	Cropping/Cultivation		Exotic
IGGAM8	0	Cropping/Cultivation		Exotic
IGGAM9	0	Cropping/Cultivation		Exotic
IGGAM10	0	Cropping/Cultivation		Exotic
IGGAM11	0	Cropping/Cultivation		Exotic
IGGAM12	4	78	18	Exotic
IGGAM13	6	59	35	Exotic
IGGAM14	2	72	26	Exotic
IGGAM15	8	28	64	Exotic
IGGAM16	4	30	66	Exotic
IGGAM17	4	35	61	Exotic
IGGAM18	8	48	44	Exotic
IGGAM19	17	70	13	Exotic
IGGAM20	0	Cropping/Cultivation		Exotic



Figure 3-3:
LEP Land Zone Map
Whitehaven Solar Farm Project

-  System Code: RUI
-  Study Area

REVISION	AUTHOR	REVIEWER	DATE
I	NC	ML	01/05/2024
COORDINATE SYSTEM: GDA 1994 MGA Zone 56			
SCALE: 1:10,000			
 0 100 200 Metres			

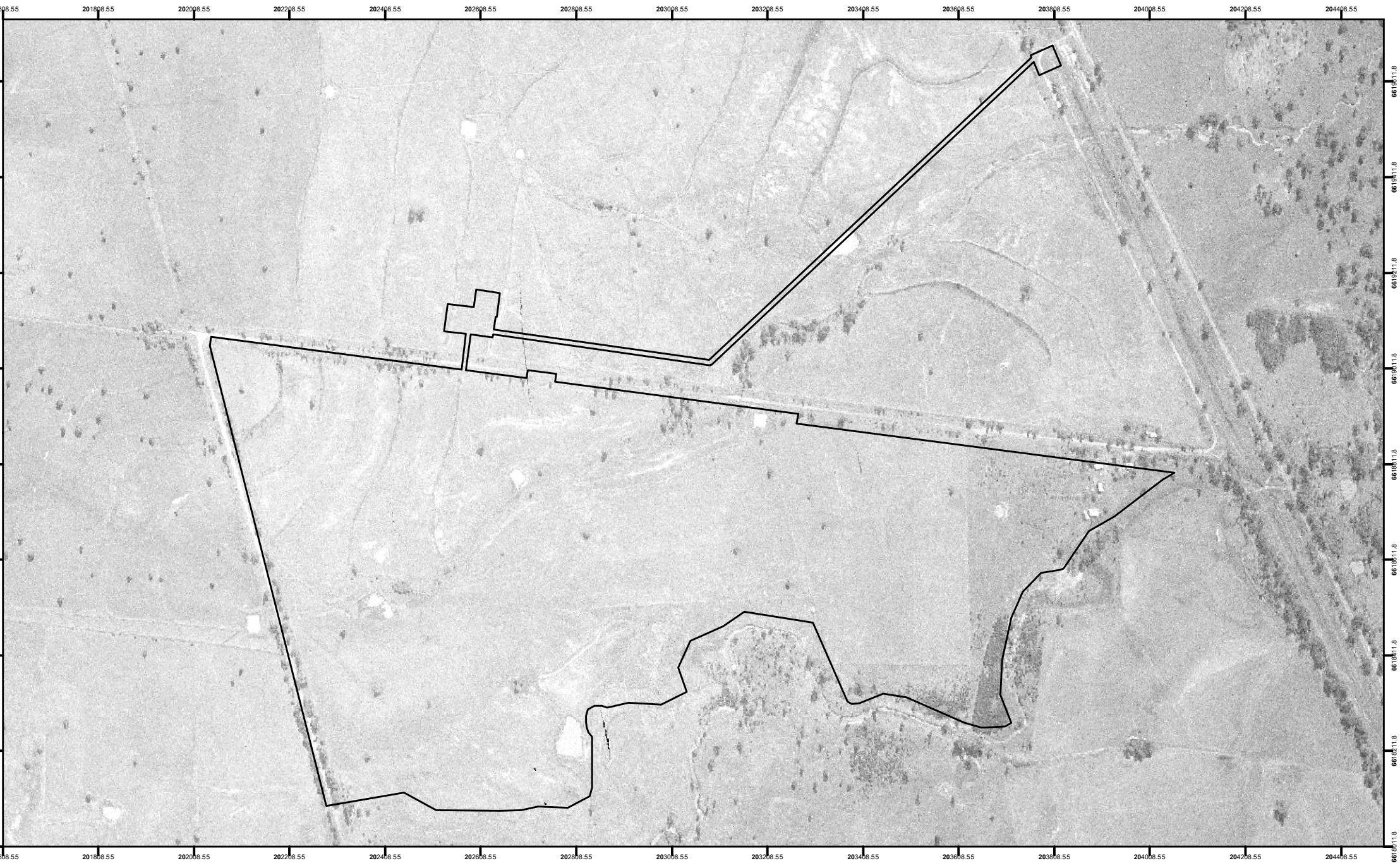


Figure 3-4:
Aerial Photography of
Study Area in 1988
Whitehaven Solar Farm Project

 Study Area

REVISION	AUTHOR	REVIEWER	DATE
I	NC	ML	01/05/2024
COORDINATE SYSTEM: GDA 1994 MGA Zone 56			
SCALE: 1:10,000			
 0 100 200 Metres			

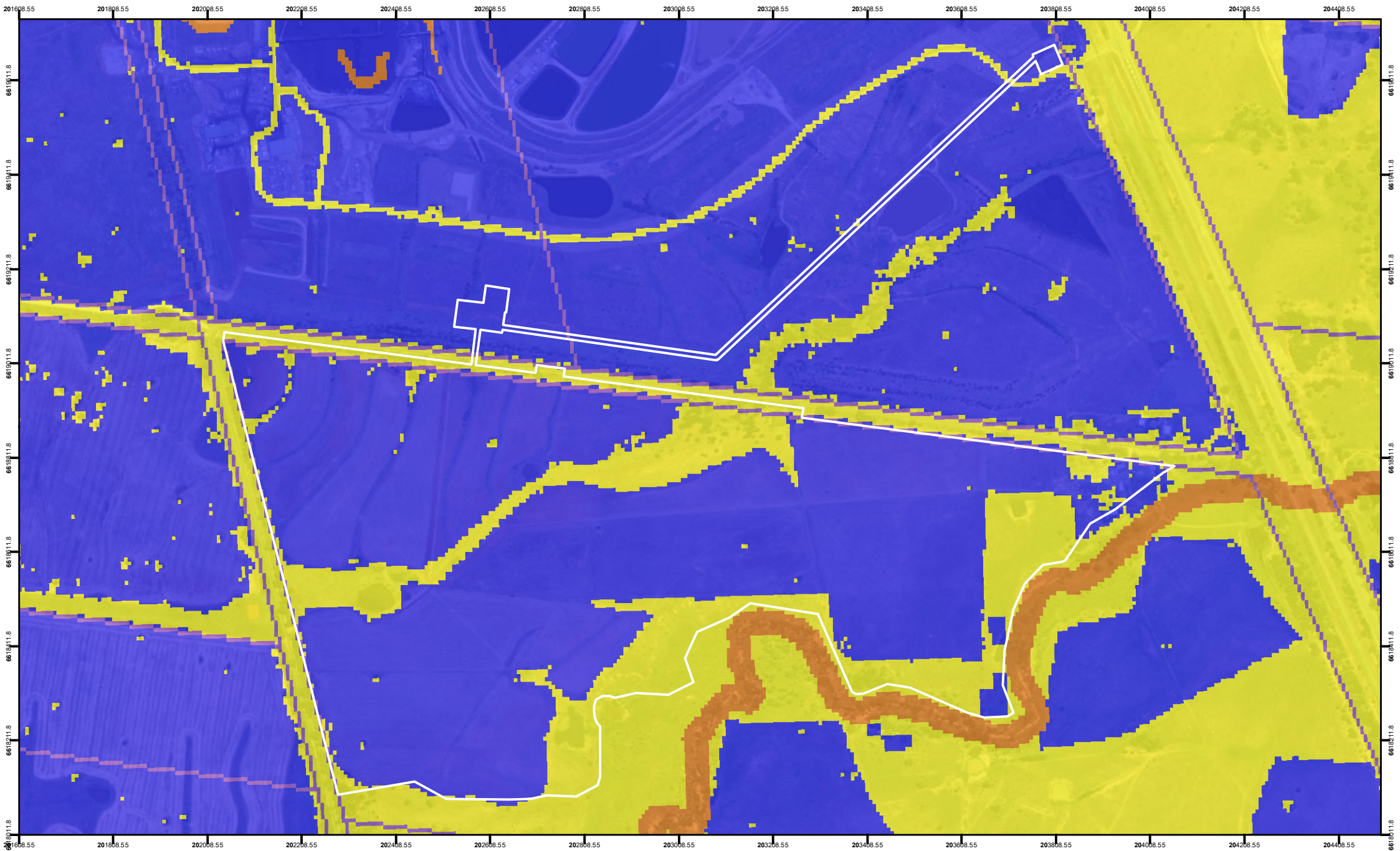
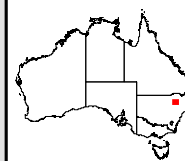


Figure 3-5:
Draft Native Vegetation Regulatory Map
Whitehaven Solar Farm Project

-  Study Area
- Draft native vegetation regulatory map**
-  Category 1 - exempt land
-  Category 2 - regulated land
-  Category 2 - sensitive and vulnerable regulated lands area of overlap
-  Category 2 - sensitive regulated land



REVISION	AUTHOR	REVIEWER	DATE
I	NC	ML	01/05/2024

COORDINATE SYSTEM: GDA 1994 MGA Zone 56		
SCALE: 1:10,000		
0	100	200
Metres		

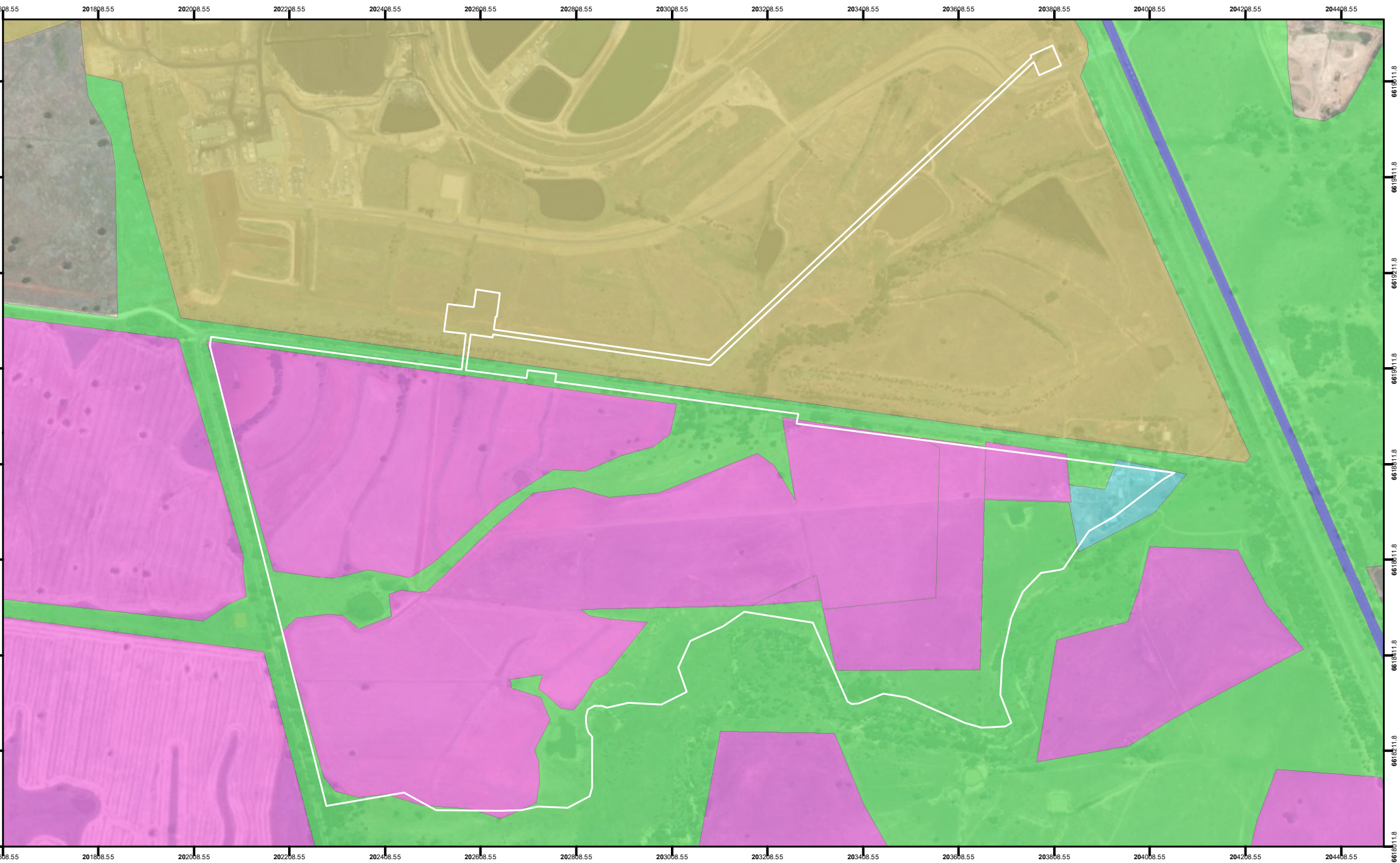




Figure 3-6:
NSW Land Use Mapping
Whitehaven Solar Farm Project

 Study Area

Landuse 2017 v1.2

 3.2.0 Grazing modified pastures

 3.3.0 Cropping

 5.4.0 Residential and farm infrastructure

 5.7.0 Transport and communication

 5.8.0 Mining

REVISION	AUTHOR	REVIEWER	DATE
I	NC	ML	01/05/2024

COORDINATE SYSTEM: GDA 1994 MGA Zone 56
SCALE: 1:10,000



0 100 200
Metres



Plate 3-1 Cultivated cleared land in Study Area



Plate 3-2 Cultivated cleared land in Study Area



Plate 3-3 Cultivated cleared land in Study Area



Plate 3-4 Cultivated cleared land in Study Area

3.5 Threatened Flora

Two species of threatened flora listed under the BC Act, Finger Panic Grass (*Digitaria porrecta*) and Pine Donkey Orchid (*Diuris tricolor*) were detected within the Study Area during the targeted flora searches, with locations shown in Figure 3-7 and Figure 3-8. Within the Study Area one individual plant of *Diuris tricolor* was detected, and 12 plants of *Digitaria porrecta*. No other threatened flora species were detected during the surveys. The surveys were in line with seasonal detection requirements for all potential threatened flora species. A full list of all recorded flora is presented in Appendix C.

No flora species listed as threatened under the EPBC Act were recorded.

Digitaria porrecta

Twelve *Digitaria porrecta* plants were detected in the Study area during surveys (Figure 3-7). Four individuals of *Digitaria porrecta* were detected on 17th January during the targeted flora survey. A further eight individuals were detected during a subsequent visit on 26th February 2024.

The four *Digitaria porrecta* plants detected in January 2023 were found in the road reserve on the far north-western corner of the Study Area. The additional eight plants detected in February 2024 were located within

the boundary of the property, between a fence and edge of crop land. All plants were recorded in a single patch of PCT 27 (Weeping Myall Woodland [good condition]).

In January 2023, within the seasonal timing for *Digitaria porrecta*, targeted searches were undertaken throughout all other PCTs in which this species is associated, and no further plants were found. It is hypothesised that the *Digitaria porrecta* populations detected, have persisted at that location because plants were protected from livestock in the road reserve as it has not been disturbed to the same extent as the vegetation within the property. The plants within the property boundary may have opportunistically seeded from the population in the road reserve.

The survey results concluded that the far north-western corner of the Study Area where the plants were detected is the only location where the species is present. This occupied area has been mapped as a species polygon as per the BAM.

Diuris tricolor

One individual plant of *Diuris tricolor* was detected in the far south of the Study Area (Figure 3-8). The specimen was found in PCT 101 semi-cleared vegetation zone (Figure 3-8). Targeted searches were undertaken throughout all PCTs in which this species can be associated, and it was not found. Semi cleared vegetation zones of associated PCTs in proximity to the detected plant are included in the species polygon. Areas of the Study area that are periodically cultivated and/or grazed by livestock, are not considered suitable for *Diuris tricolor* habitat, as the root systems would be destroyed and persistence or recolonisation of such habitat would be very unlikely (Figure 3-8).

The survey results suggest that the far southeast of the Study Area where the plant was detected is the only location where the species is currently present. However, due to the reasons listed below, to be conservative, habitat that was in reasonable condition for this species, and in proximity to the detected plant, in the Study Area, has been mapped as species polygon as per the BAM.

Constraints to detection during surveys includes:

- geophytic orchids can persist underground for one or more years as tubers without producing above-ground parts (DCCEEW, 2013), and
- in dry, inland regions some rare orchids more plants are dormant most years, rather than flowering (DCCEEW, 2013).



- Digitaria porrecta* Record
- Study Area
- Semi-arid Woodlands (Grassy Sub-formation)**
- Weeping Myall Woodland (Good) (PCT 27)

Figure 3-7:
Species Polygons (Area) Mapping
Digitaria porrecta
Whitehaven Solar Farm Project

REVISION	AUTHOR	REVIEWER	DATE
3	NC	BJ	23/05/2024
4	NC	BJ	16/08/2024

COORDINATE SYSTEM: GDA 1994 MGA Zone 56
SCALE: 1:10,000

0 100 200
Metres

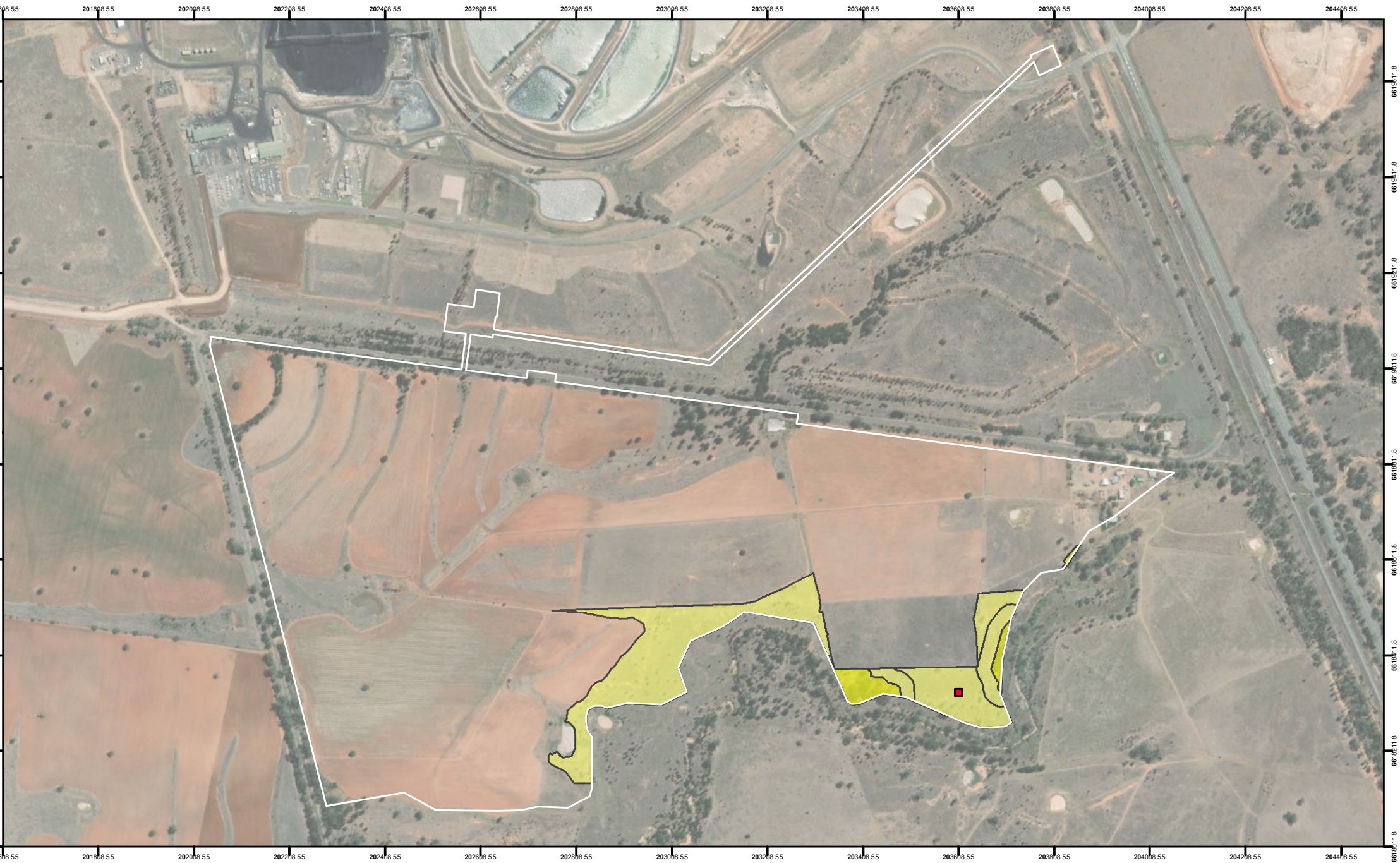


Figure 3-8:
Species Polygons (Area) Mapping
Diuris tricolor
Whitehaven Solar Farm Project

- Diuris tricolor* Record
- Study Area
- Semi-arid Woodlands (Grassy Sub-formation)**
 - Poplar Box - Yellow Box - Western Grey Box Grassy Woodland (Good) (PCT 101)
 - Poplar Box - Yellow Box - Western Grey Box Grassy Woodland (Semi-Cleared) (PCT 101)
 - Derived Grassland (Poor) (PCT 101)

REVISION	AUTHOR	REVIEWER	DATE
2	NC	BJ	17/05/2024
3	NC	BJ	16/08/2024

COORDINATE SYSTEM: GDA 1994 MGA Zone 56

SCALE: 1:10,000

0100200

Metres

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3.6 Threatened Fauna

Targeted searches for threatened fauna species were undertaken in the suitable habitat areas in the Study Area. One ecosystem credit species, Grey-crowned Babbler (eastern subspecies), listed as Vulnerable under the BC Act, was recorded on numerous occasions at several localities during the surveys. Two threatened species of microbat were confirmed by echolocation call recording identification, as detailed in Table 3-4. A full list of all recorded fauna is presented in Appendix D. No fauna species listed as threatened or migratory under the EPBC Act were recorded.

Table 3-4 Threatened fauna confirmed in Study Area

Scientific name	Common name	BC Act Status*	EPBC Status
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V	-
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V	-
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-

* V – Vulnerable.

The Anabat results are shown in the Microbat Call Identification Report in Appendix E. Eleven call types were reliably attributed to 10 distinct species plus the undifferentiated *Nyctophilus* genus. Due to the extensively cleared characteristics of the agricultural landscape in the Study Area, the bat specialist advised that the *Nyctophilus* calls probably belonged to *N. geoffroyi* and/or *N. gouldi*, not the threatened *N. corbeni*, which typically occurs only in large tracts of relatively undisturbed forest (Appendix E).

Glossy-black cockatoo (*Calyptorhynchus lathami*) was returned as a candidate species for the Study Area based on the compliant PCTs recorded. *C. lathami* was not detected during the field surveys. Suitable tree hollows are absent in the Development Footprint (Figure 1-2). Tree hollows were detected elsewhere in the Study Area, including three recorded at P7 in the BAM assessment (see BAM plot data for P7 in Appendix A Vegetation integrity plot data). Assessment of these hollows from the ground determined they were of low quality and suitability for Glossy-black cockatoo, however targeted surveys were conducted to provide more surety. Surveys for signs of breeding did not detect *C. lathami* individuals or evidence of breeding.

Masked owl (*Tyto novaehollandiae*) targeted surveys were conducted within seasonal survey requirements in August 2023. A follow up survey in September was just outside the season requirements specified in BioNet Threatened Biodiversity Data Collection (NSW DCCEEW, 2024a). Suitable roosting and breeding habitat (living or dead trees with hollows greater than 20 centimetres (cm) diameter) (NSW DCCEEW, 2024a) are absent in the Development Footprint (Figure 1-2), and those outside the Development Footprint (Figure 1-2) in P7 were assessed from the ground and determined they were of low quality and suitability for masked owl.

3.7 State Environmental Planning Policy (Biodiversity Conservation) 2021

The SEPP (Biodiversity Conservation) 2021 consolidated the previous policies, and came into effect. Development policies and the Koala Habitat Protection SEPP 2020 do not apply to Part 4 development applications (such as the Project) which are determined by a consent authority other than a local council. A review is, none the less, provided below.

The land associated with the Project is in the North West Slopes Koala Management Area, Narrabri LGA, and Zone RU1 Primary Production land zoning classification (Figure 3-3).

There is limited potential habitat for the Koala in the Study Area (Figure 1-3) and the area has been heavily cleared for a long time (Figure 3-4). The Study Area contains koala foraging and shelter habitat in PCTs 27, 55, 56, 88 and 101, with PCTs 56, 88 and 101 comprising foraging and shelter habitat, and PCTs 27 and 55 comprising shelter habitat (use trees) only due to the absence of koala feed tree species.

Koala feed tree species (OEH, 2018; DPE, 2022) recorded in PCTs 56, 88 and 101 habitat areas of the Study Area include: *Eucalyptus albens*, *Eucalyptus populnea*, and *Eucalyptus tereticornis*. Koala use tree species (OEH, 2018; DPE, 2022) recorded in these habitat areas of the Study Area include: *Callitris glaucophylla*, *Casuarina cristata*, *Eucalyptus pilligaensis* and *Eucalyptus populnea*.

Target koala SAT surveys did not detect evidence of koalas in the Study Area, most likely due to the fragmented nature of the potential habitat. Evidence of Koalas (scats) were recorded by AMBS (2020b) approximately 5 km to the west of the Project area within intact habitat on the edge of the Pilliga State Forest. Other nearest koala records in the previous 18 years are 16 km, 18 km and 23 km from the Study Area (Atlas of Living Australia – Spatial Portal, 2023).

4 Conclusion

Ecological surveys were undertaken to identify the biodiversity values existing in the Study Area. This Flora and Fauna Baseline Report will support the BDAR for the Project.

Ten native vegetation zones are recognised as occurring within the Study Area, comprising five PCTs in different condition states. The report identifies one TEC listed under the BC Act and two TECs listed under the EPBC Act, present in the Study Area. The majority of the Study Area (90.47 ha, 77 %) is classified as Category 1 – Exempt Land characterised by infrastructure, dams, exotic dominated pasture, cultivation and cropping.

Two species of threatened flora listed under the BC Act, Finger Panic Grass (*Digitaria porrecta*) and Pine Donkey Orchid (*Diuris tricolor*) were detected within the Study Area during the targeted flora searches. No other threatened flora species were detected during the surveys.

Three threatened fauna species listed under the BC Act were detected, including Grey-crowned Babbler (eastern subspecies), *Miniopterus orianae oceanensis* (Large Bent-winged Bat) and *Saccolaimus flaviventris* (Yellow-bellied Sheath-tail-bat).

No flora or fauna species listed as threatened or migratory under the EPBC Act were recorded.

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Appendix A – Vegetation Integrity Plot Data

Plot*	P1	P2	P4	P6	P7	P8	P9	P10	P11	P12	P13	P15	P16	P17	P18	P19	P20	P21	P22
PCT	55	55	55	101	101	101	101	101	101	56	88	27	55	88	88	55	55	101	101
Area	1.99	3.76	7.92	11.94	1.17	11.94	11.94	18.77	11.94	0.33	0.2	0.08	3.76	0.2	0.03	7.92	1.99	18.77	18.77
Patch Size	<5 ha	<5 ha	5-<25 ha	5-<25 ha	<5 ha	5-<25 ha	5-<25 ha	5-<25 ha	5-<25 ha	<5 ha	<5 ha	<5 ha	<5 ha	<5 ha	<5 ha	5-<25 ha	<5 ha	5-<25 ha	5-<25 ha
Condition Class	Semi-cleared	Good	DNG	Semi-cleared	Good	Semi-cleared	Semi-cleared	DNG	Semi-cleared	Good	Semi-cleared	Good	Good	Good	Revegetation	DNG	Semi-cleared	DNG	DNG
Zone	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
Easting	77831.7	77880.471	77869.133	77926.874	77914.348	77899.2	77790.836	77840.311	77867.873	77783.826	77845.176	77785.94	77822.61	77846.86	77835.1	77831.93	77869.46	77940.7	77848.92
Northing	66194.928	66193.821	66192.575	66188.206	66187.949	66189.705	66190.458	66190.591	66188.60	66194.122	66194.879	66195.98	66195.28	66194.83	66195.52	66196.46	66193.12	66190.98	66186.00
Bearing	185	210	250	140	305	255	70	22	106	58	90	352	347	168	165	345	187	339	105
COMPOSITION																			
Tree	3	1	0	1	3	1	2	0	1	3	3	1	4	1	2	0	1	0	0
Shrub	5	5	3	2	4	1	4	1	2	5	5	3	9	8	8	7	2	3	1
Grass	12	9	6	7	12	5	12	5	5	8	9	6	9	10	10	8	10	4	5
Forbs	13	8	10	12	19	13	9	5	7	14	15	15	6	3	5	8	8	3	5
Ferns	1	0	1	1	1	1	0	1	1	1	1	0	0	0	1	1	0	1	1
Other	0	0	0	0	0	0	1	0	0	2	1	1	0	2	0	0	0	0	0
STRUCTURE																			
Tree	18.1	50	0	0.5	75.3	15	12	0	1	73	20.2	40	50	60	17	0	1	0	0
Shrub	9	1.5	0.7	0.7	4.3	1	2.3	15	2.1	2.5	15.4	0.3	17.2	31.9	3.8	1.1	1.1	33.5	0.5
Grass	37.1	10	20.9	67.4	11.5	30.5	45.2	25.3	42.1	89.2	52.3	82.1	25.3	25.3	27.5	12.9	15.8	86	31.5
Forbs	9.6	1.7	8	1.4	3.7	5	2.2	2.3	0.8	2.7	2.4	13.5	1.4	2.1	1.3	3.5	3.7	15.2	0.5
Ferns	0.1	0	0.1	0.5	0.1	0.1	0	0.1	0.2	0.1	0.3	0	0	0	0.1	1	0	5	1
Other	0	0	0	0	0	0	0.1	0	0	0.2	0.1	5	0	0.2	0	0	0	0	0
FUNCTION																			

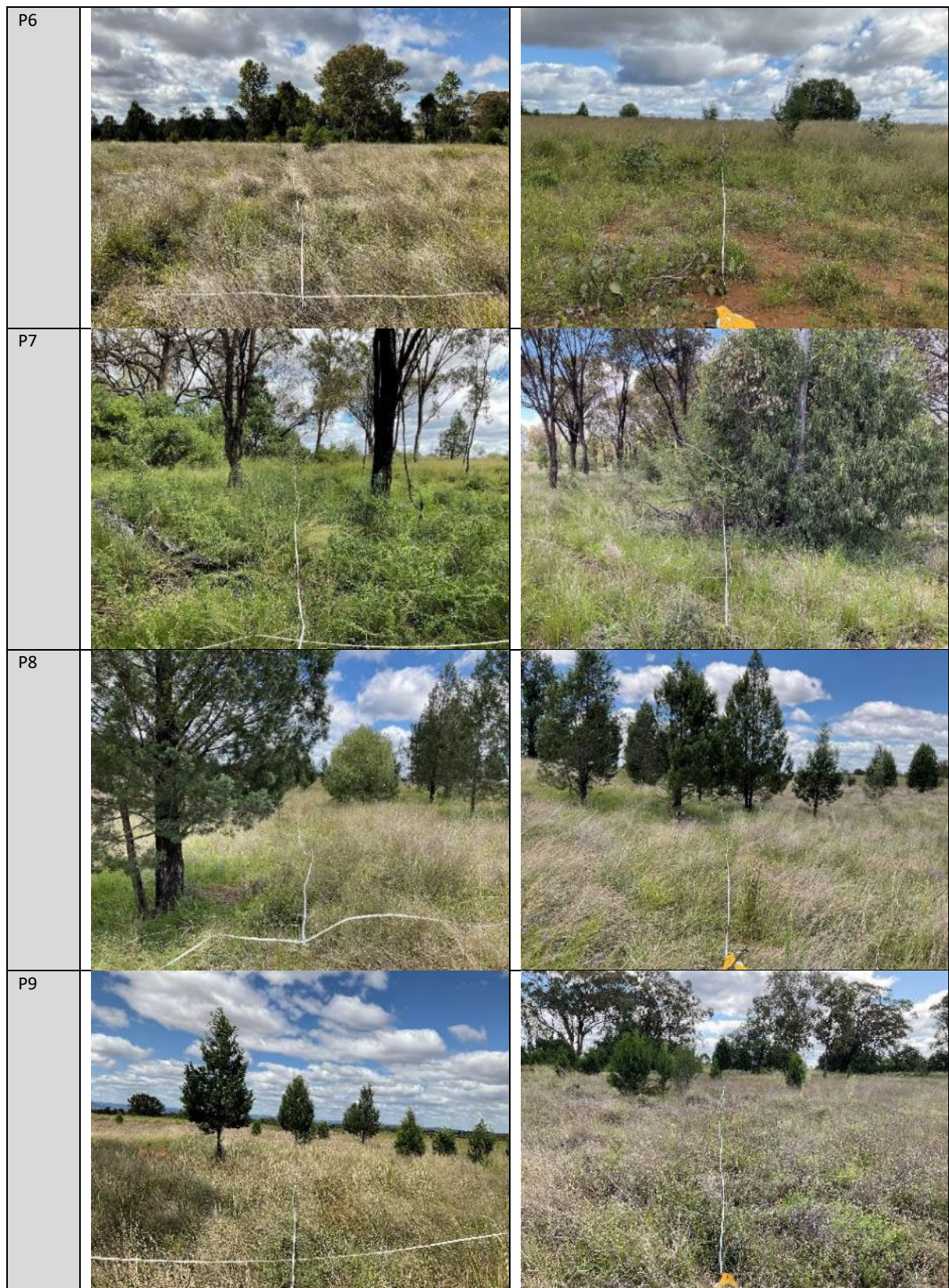
Plot*	P1	P2	P4	P6	P7	P8	P9	P10	P11	P12	P13	P15	P16	P17	P18	P19	P20	P21	P22
Large Trees	2	6	0	0	7	0	1	0	0	0	1	0	14	4	0	0	0	0	0
Hollow Trees	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Litter Cover	7	7	5.2	8.2	14	10.6	13	4.2	15	7.4	26	16	38.2	45.8	22	22	40	7.6	51
Length of Fallen Logs	0	0	0	0	23.6	0.9	0	0	0	3	0	0	34	19	0	0	0	0	0
Tree Stem 5- 9cm	1	1	0	0	1	1	1	0	1	1	0	15	50	35	6	0	3	0	0
Tree Stem 10- 19cm	1	1	0	0	1	1	1	0	0	1	1	7	27	7	6	0	1	0	0
Tree Stem 20- 29cm	1	1	0	0	1	1	0	0	1	1	1	2	7	0	6	0	0	0	0
Tree Stem 30- 49cm	1	1	0	0	1	0	1	0	0	0	1	0	14	4	1	0	0	0	0
Tree Stem 50- 79cm	0	1	0	0	0	0	0	0	0	0	1	0	0	4	0	0	0	0	0
Tree Regeneration (<5cm)	1	1	0	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1
High Threat Exotic Cover	1.5	5.1	0.6	0	0.1	0.1	0.3	0	0.1	0.1	0.6	0	1	1	12	0	0	0	0

*Plots P3, P5 and P14 were assessed in 2022, but later cultivated and used for cropping as observed during subsequent surveys and have therefore been reclassified as 'Exotic'.

Appendix B – Vegetation Integrity Plot and Interim Grassland Assessment Site Photographs

Table -B1 Vegetation integrity plot photographs

Plot	Start Point	End Point
P1		
P2		
P3	P3 was subsequently cultivated and turned to cropping following the capture of BAM data in 2022.	
P4		
P5	P5 was subsequently cultivated and turned to cropping following the capture of BAM data in 2022.	



P10		
P11		
P12		
P13		
P14	P14 was subsequently cultivated and turned to cropping following the capture of BAM data in 2022.	

P15		
P16		
P17		
P18		

P19		
P20		
P21		
P22		

Table -B2 Interim grassland assessment site photographs



IGGAM04



IGGAM05



IGGAM06



IGGAM07



IGGAM08



IGGAM09



IGGAM10



IGGAM11



IGGAM12



IGGAM13



IGGAM14



IGGAM15



IGGAM16



IGGAM17



IGGAM18



IGGAM19



IGGAM20



Appendix C – Flora Species List

*FG = Forb, GG = Grass and Grass-like, SG = Shrub, TG = Tree, EG = Fern, OG = Other

Growth Form Code*	Species name	Native (N)/ Non-High Threat Weed (N-HTW)/High Threat Weed (HTW)
FG	<i>Abutilon sp.</i>	N
FG	<i>Ajuga australis</i>	N
FG	<i>Alternanthera denticulata</i>	N
FG	<i>Arctotheca calendula</i>	N-HTW
FG	<i>Arthropodium milleflorum</i>	N
FG	<i>Asperula conferta</i>	N
FG	<i>Aster subulatus</i>	N-HTW
FG	<i>Asteraceae sp.</i>	N
FG	<i>Asteraceae sp.</i>	N-HTW
FG	<i>Atriplex semibaccata</i>	N
FG	<i>Atriplex sp.</i>	N
FG	<i>Bidens bipinnata</i>	N-HTW
FG	<i>Bidens pilosa</i>	HTW
FG	<i>Boerhavia dominii</i>	N
FG	<i>Brachyscome sp.</i>	N
FG	<i>Brassica tournefortii</i>	N-HTW
FG	<i>Brunoniella australis</i>	N
FG	<i>Calotis lappulacea</i>	N
FG	<i>Centaurium erythraea</i>	N-HTW
FG	<i>Centipeda minima</i>	N
FG	<i>Cheilanthes sieberi</i>	N
FG	<i>Chenopodium carinatum</i>	N
FG	<i>Chenopodium spp.</i>	N
FG	<i>Chrysocephalum apiculatum</i>	N
FG	<i>Cirsium sp.</i>	N-HTW
FG	<i>Conyza bonariensis</i>	N-HTW
FG	<i>Crassula sieberiana</i>	N
FG	<i>Crinum flaccidum</i>	N
FG	<i>Cullen tenax</i>	N
FG	<i>Cyclospermum leptophyllum</i>	N-HTW
FG	<i>Daucus glochidiatus</i>	N
FG	<i>Dichondra repens</i>	N
FG	<i>Dichondra sp.</i>	N
FG	<i>Echium plantagineum</i>	N-HTW
FG	<i>Einadia hastata</i>	N
FG	<i>Einadia nutans</i>	N
FG	<i>Eremophila debilis</i>	N
FG	<i>Erigeron bonariensis</i>	N-HTW
FG	<i>Erigeron bonariensis</i>	N-HTW
FG	<i>Eriochloa crebra</i>	N

Growth Form Code*	Species name	Native (N)/ Non-High Threat Weed (N-HTW)/High Threat Weed (HTW)
FG	<i>Euchiton japonicus</i>	N-HTW
FG	<i>Euchiton sphaericus</i>	N
FG	<i>Euphorbia drummondii</i>	N
FG	<i>Evolvulus</i> sp.	N
FG	<i>Galium aparine</i>	N-HTW
FG	<i>Gamochaeta</i> sp.	N-HTW
FG	<i>Geranium solanderi</i>	N
FG	<i>Glandularia aristigera</i>	N-HTW
FG	<i>Glycine clandestina</i>	N
FG	<i>Glycine</i> sp.	N
FG	<i>Gomphrena celosioides</i>	N-HTW
FG	<i>Goodenia glabra</i>	N
FG	<i>Goodenia heterophylla</i>	N
FG	<i>Goodenia</i> sp.	N
FG	<i>Hibiscus sturtii</i>	N
FG	<i>Hypericum</i> sp.	N-HTW
FG	<i>Hypochaeris glabra</i>	N-HTW
FG	<i>Hypochaeris</i> sp.	N-HTW
FG	<i>Juncus usitatus</i>	N
FG	<i>Lactuca serriola</i>	N-HTW
FG	<i>Lamiaceae</i> sp.	N
FG	<i>Leiocarpa brevicompta</i>	N
FG	<i>Leiocarpa</i> sp.	N
FG	<i>Leiocarpa tomentosa</i>	N
FG	<i>Leontodon rhagadioloides</i>	N-HTW
FG	<i>Lepidium africanum</i>	N-HTW
FG	<i>Lepidium bonariensis</i>	N-HTW
FG	<i>Lomandra confertifolia</i>	N
FG	<i>Lysimachia arvensis</i>	N-HTW
FG	<i>Lysimachia arvensis</i>	N-HTW
FG	<i>Maireana microphylla</i>	N
FG	<i>Medicago</i> sp.	N-HTW
FG	<i>Mentha satureioides</i>	N
FG	<i>Menthe</i> sp.	N
FG	<i>Microlaena stipoides</i>	N
FG	<i>Microtus</i> sp.	N
FG	<i>Neptunia gracilis</i>	N
FG	<i>Oenothera biennis</i>	N-HTW
FG	<i>Oenothera stricta</i>	N
FG	<i>Orchidaceae</i>	N
FG	<i>Oxalis perennans</i>	N

Growth Form Code*	Species name	Native (N)/ Non-High Threat Weed (N-HTW)/High Threat Weed (HTW)
FG	<i>Oxalis sp.</i>	N
FG	<i>Peripleura hispidula</i>	N
FG	<i>Petrorhagia dubia</i>	N-HTW
FG	<i>Phyllanthus virgatus</i>	N
FG	<i>Plantago debilis</i>	N
FG	<i>Polycarpum tetraphyllum</i>	N-HTW
FG	<i>Polygonum sp.</i>	N-HTW
FG	<i>Polymeria calycina</i>	N
FG	<i>Portulaca pilosa</i>	N-HTW
FG	<i>Rapistrum rugosum</i>	N-HTW
FG	<i>Rostellularia adscendens</i>	N
FG	<i>Rumex brownii</i>	N
FG	<i>Rumex crispus</i>	N
FG	<i>Rumex sp.</i>	N-HTW
FG	<i>Schenkia australis</i>	N
FG	<i>Scolymus hispanicus</i>	N-HTW
FG	<i>Senecio quadridentatus</i>	N
FG	<i>Sida rhombifolia</i>	N-HTW
FG	<i>Sida sp.</i>	N
FG	<i>Sida trichopoda</i>	N
FG	<i>Sisymbrium sp.</i>	N-HTW
FG	<i>Solanum americanum</i>	N-HTW
FG	<i>Solanum esuriale</i>	N
FG	<i>Solanum nigrum</i>	N-HTW
FG	<i>Solanum sp.</i>	N
FG	<i>Soliva sessilis</i>	N-HTW
FG	<i>Soliva sp.</i>	N-HTW
FG	<i>Sonchus oleracea</i>	N-HTW
FG	<i>Sonchus sp.</i>	N-HTW
FG	<i>Stachys arvensis</i>	N-HTW
FG	<i>Swainsona galegifolia</i>	N
FG	<i>Swainsona oroboides</i>	N
FG	<i>Taxodium orientale</i>	N-HTW
FG	<i>Tricoryne elatior</i>	N
FG	<i>Trifolium arvense</i>	N-HTW
FG	<i>Trifolium sp.</i>	N-HTW
FG	<i>Triptilodiscus pygmaeus</i>	N
FG	<i>Verbena bonariensis</i>	N-HTW
FG	<i>Verbena gaudichaudii</i>	N
FG	<i>Verbesina encelioides</i>	N-HTW
FG	<i>Vicia sativa</i>	N-HTW

Growth Form Code*	Species name	Native (N)/ Non-High Threat Weed (N-HTW)/High Threat Weed (HTW)
FG	<i>Vittadinia hispidula</i>	N
FG	<i>Vittadinia sp.</i>	N
FG	<i>Wahlenbergia communis</i>	N
FG	<i>Wahlenbergia gracilis</i>	N
FG	<i>Wahlenbergia sp.</i>	N
FG	<i>Xanthium occidentale</i>	HTW
FG	<i>Xerochrysum bracteatum</i>	N
GG	<i>Amphibromus nervosus</i>	N
GG	<i>Aristida calycina</i>	N
GG	<i>Aristida caput-medusae</i>	N
GG	<i>Aristida sp.</i>	N
GG	<i>Astrebla lappacea</i>	N
GG	<i>Austrostipa aristiglumis</i>	N
GG	<i>Austrostipa scabra</i>	N
GG	<i>Austrostipa scabra subsp. scabra</i>	N
GG	<i>Austrostipa sp.</i>	N
GG	<i>Austrostipa verticillata</i>	N
GG	<i>Bothriochloa biloba</i>	N
GG	<i>Bothriochloa bladhii</i>	N
GG	<i>Bothriochloa decipiens</i>	N
GG	<i>Bothriochloa pertusa</i>	N-HTW
GG	<i>Bothriochloa sp.</i>	N
GG	<i>Briza minor</i>	N-HTW
GG	<i>Bromus catharticus</i>	N-HTW
GG	<i>Bromus diandrus</i>	HTW
GG	<i>Bromus hordeaceus</i>	N-HTW
GG	<i>Bromus sp.</i>	N-HTW
GG	<i>Bulbine bulbosa</i>	N
GG	<i>Bulbine sp.</i>	N
GG	<i>Carex appressa</i>	N
GG	<i>Carex inversa</i>	N
GG	<i>Carex sp.</i>	N
GG	<i>Cenchrus ciliaris</i>	N-HTW
GG	<i>Chloris gayana</i>	HTW
GG	<i>Chloris truncata</i>	N
GG	<i>Chloris ventricosa</i>	N
GG	<i>Cynodon dactylon</i>	N
GG	<i>Cynodon imperfecta</i>	N-HTW
GG	<i>Cynodon incompletus</i>	N-HTW
GG	<i>Cyperus gracilis</i>	N
GG	<i>Dianella crinoides</i>	N

Growth Form Code*	Species name	Native (N)/ Non-High Threat Weed (N-HTW)/High Threat Weed (HTW)
GG	<i>Dianella sp.</i>	N
GG	<i>Dianella sp.</i>	N
GG	<i>Dichanthium sericeum</i>	N
GG	<i>Digitaria brownii</i>	N
GG	<i>Digitaria divaricatissima</i>	N
GG	<i>Digitaria porrecta</i>	N
GG	<i>Diuris tricolor</i>	N
GG	<i>Eleocharis plana</i>	N
GG	<i>Enteropogon acicularis</i>	N
GG	<i>Enteropogon ramosus</i>	N
GG	<i>Eragrostis brownii</i>	N
GG	<i>Eragrostis curvula</i>	HTW
GG	<i>Eragrostis elongata</i>	N
GG	<i>Eragrostis parviflora</i>	N
GG	<i>Eragrostis sororia</i>	N
GG	<i>Eragrostis sp.</i>	N
GG	<i>Eriochloa crebra</i>	N
GG	<i>Eriochloa pseudoacrotricha</i>	N
GG	<i>Fimbristylis dichotoma</i>	N
GG	<i>Holcus lanatus</i>	N-HTW
GG	<i>Juncus sp.</i>	N
GG	<i>Juncus usitatus</i>	N
GG	<i>Lachnagrostis filiformis</i>	N
GG	<i>Lolium perenne</i>	N-HTW
GG	<i>Lolium sp.</i>	N-HTW
GG	<i>Lomandra longifolia</i>	N
GG	<i>Lomandra multiflora</i>	N
GG	<i>Megathyrsus maximus</i>	HTW
GG	<i>Panicum decompositum</i>	N
GG	<i>Panicum effusum</i>	N
GG	<i>Panicum queenslandicum</i>	N
GG	<i>Paspalidium caespitosum</i>	N
GG	<i>Paspalidium gracile</i>	N
GG	<i>Paspalidium sp.</i>	N
GG	<i>Paspalum dilatatum</i>	HTW
GG	<i>Rytidosperma sp.</i>	N
GG	<i>Setaria sphacelata</i>	N-HTW
GG	<i>Sporobolus creber</i>	N
GG	<i>Sporobolus sp.</i>	N
GG	<i>Thellungia advena</i>	N
GG	<i>Themeda triandra</i>	N

Growth Form Code*	Species name	Native (N)/ Non-High Threat Weed (N-HTW)/High Threat Weed (HTW)
GG	<i>Urochloa foliosa</i>	N
OG	<i>Glycine clandestina</i>	N
OG	<i>Glycine tomentella</i>	N
OG	<i>Parsonsia eucalyptophylla</i>	N
OG	<i>Rhynchosia minima</i>	N
OG	<i>Unknown sp.</i>	HTW
SG	<i>Acacia deanei</i>	N
SG	<i>Acacia decora</i>	N
SG	<i>Alectryon oleifolius subsp. elongatus</i>	N
SG	<i>Atriplex semibaccata</i>	N
SG	<i>Brachychiton populneus</i>	N
SG	<i>Callitris glaucophylla</i>	N
SG	<i>Dodonaea viscosa</i>	N
SG	<i>Enchylaena tomentosa</i>	N
SG	<i>Eremophila mitchellii</i>	N
SG	<i>Eucalyptus albens</i>	N
SG	<i>Geijera parviflora</i>	N
SG	<i>Lycium ferocissimum</i>	HTW
SG	<i>Maireana microphylla</i>	N
SG	<i>Melhaniea oblongifolia</i>	N
SG	<i>Myoporum montanum</i>	N
SG	<i>Opuntia stricta</i>	HTW
SG	<i>Salsola australis</i>	N
SG	<i>Sclerolaena bicornis</i>	N
SG	<i>Sclerolaena birchii</i>	N
SG	<i>Sclerolaena muricata</i>	N
SG	<i>Sclerolaena sp.</i>	N
SG	<i>Sclerolaena tricuspis</i>	N
SG	<i>Senna artemisioides</i>	N
TG	<i>Acacia pendula</i>	N
TG	<i>Alectryon oleifolius</i>	N
TG	<i>Brachychiton populneus</i>	N
TG	<i>Callitris glaucophylla</i>	N
TG	<i>Casuarina cristata</i>	N
TG	<i>Eremophila mitchellii</i>	N
TG	<i>Eucalyptus albens</i>	N
TG	<i>Eucalyptus pilligaensis</i>	N
TG	<i>Eucalyptus populnea</i>	N
TG	<i>Eucalyptus tereticornis</i>	N

Appendix D – Fauna Species List (Anabat data in Appendix E)

Targeted searches and opportunistic sightings

NSW Status P = Protected; V = Vulnerable, * = non-native/exotic/introduced.

Scientific name	Common Name	NSW Status*	EPBC Status	Quantity	Sighting Location
<i>Acanthagenys rufogularis</i>	Spiny-Cheeked Honeyeater	P	-	22	On-site
<i>Acanthiza apicalis</i>	Inland Thornbill	P	-	2	On-site
<i>Acanthiza chrysorrhoa</i>	Yellow-Rumped Thornbill	p	-	1	On-site
<i>Acanthiza nana</i>	Yellow Thornbill	P	-	7	On-site
<i>Accipiter fasciatus</i>	Brown Goshawk	P	-	1	On-site
				1	Off-site
<i>Acridotheres tristis</i>	Common Myna	-	-	1	On-site
				1	Off-site
<i>Alisterus scapularis</i>	Australian King-Parrot	P	-	2	On-site
<i>Anas superciliosa</i>	Pacific Black Duck	P	-	10	On-site
				2	Off-site
<i>Antechinus sp.</i>	Antechinus sp.	-	-	3	On-site
<i>Aprosmictus erythropterus</i>	Red-Winged Parrot	P	-	1	On-site
<i>Ardea pacifica</i>	White-Necked Heron	P	-	1	On-site
<i>Austrelaps superbis</i>	Lowlands Copperhead	P	-	4	On-site
<i>Austronomus australis</i>	White-Striped Free-Tailed-Bat	P	-	2	On-site
<i>Cacatua galerita</i>	Sulphur-Crested Cockatoo	P	-	9	On-site
				19	Off-site
<i>Cacatua sanguinea</i>	Little Corella	P	-	20	On-site
				10	Off-site

<i>Chalcites basal</i>	Horsfield's Bronze-Cuckoo	P	-	1	On-site
<i>Chelodina longicollis</i>	Eastern Long-Necked Turtle	P	-	2	On-site
<i>Chlamydera maculata</i>	Spotted Bowerbird	P	-	1	Off-site
<i>Cincloramphus mathewsi</i>	Rufous Songlark	P	-	4	On-site
				3	Off-site
<i>Colluricincla harmonica</i>	Grey Shrike-Thrush	P	-	1	On-site
				1	Off-site
<i>Coracina novaehollandiae</i>	Black-Faced Cuckoo-Shrike	P	-	5	On-site
				1	Off-site
<i>Corcorax melanorhamphos</i>	White-Winged Chough	P	-	12	On-site
				5	Off-site
<i>Corvus coronoides</i>	Australian Raven	P	-	2	On-site
				26	Off-site
<i>Corvus mellori</i>	Little Raven	P	-	5	On-site
				7	Off-site
<i>Corvus orru</i>	Torresian Crow	P	-	1	On-site
<i>Cracticus nigrogularis</i>	Pied Butcherbird	P	-	3	On-site
				3	Off-site
<i>Cracticus torquatus</i>	Grey Butcherbird	P	-	3	On-site
				3	Off-site
<i>Crinia parinsignifera</i>	Beeping Froglet	P	-	79	On-site
<i>Ctenotus robustus</i>	Eastern Striped Skink	P	-	2	On-site
<i>Cyclorana verrucosa</i>	Rough Frog	P	-	3	On-site
<i>Dacelo novaeguineae</i>	Laughing Kookaburra	P	-	2	On-site
				1	Off-site

<i>Dendrocygna eytoni</i>	Plumed Whistling-Duck	P	-	4	Off-site
<i>Dicaeum hirundinaceum</i>	Mistletoebird	P	-	5	On-site
				1	N/A
<i>Entomyzon cyanotis</i>	Blue-Faced Honeyeater	P	-	10	On-site
<i>Eolophus roseicapilla</i>	Galah	P	-	40	On-site
				11	Off-site
<i>Eudynamys orientalis</i>	Eastern Koel	P	-	4	Off-site
<i>Eurostopodus mystacalis</i>	White-Throated Nightjar	P	-	2	On-site
<i>Falco berigora</i>	Brown Falcon	P	-	1	On-site
<i>Falco cenchroides cenchroides</i>	Nankeen Kestrel	P	-	3	On-site
<i>Felis catus</i>	Cat	*	*	3	On-site
<i>Fulica atra</i>	Eurasian Coot	P	-	6	On-site
<i>Gavicalis virescens</i>	Singing Honeyeater	P	-	7	On-site
<i>Gehyra dubia</i>	Dubious Dtella	P	-	5	On-site
<i>Glossopsitta concinna</i>	Musk Lorikeet	P	-	16	On-site
<i>Grallina cyanoleuca</i>	Magpie-Lark	P	-	8	On-site
				11	Off-site
<i>Gymnorhina tibicen</i>	Australian Magpie	P	-	14	On-site
				10	Off-site
<i>Heteronotia binoei</i>	Bynoe's Gecko	P	-	1	On-site
<i>Hirundo neoxena</i>	Welcome Swallow	P	-	11	On-site
<i>Lechriodus fletcheri</i>	Fletcher's Frog	P	-	10	On-site
<i>Lepus europaeus</i>	European Hare	*	*	2	On-site
<i>Lerista punctatovittata</i>	Eastern Robust Slider	P	-	8	On-site
<i>Lichmera indistincta</i>	Brown Honeyeater	P	-	1	On-site

<i>Limnodynastes fletcheri</i>	Fletcher's Frog	P	-	9	On-site
<i>Limnodynastes tasmaniensis</i>	Spotted Marsh Frog	P	-	114	On-site
				10	N/A
<i>Litoria caerulea</i>	Green Tree Frog	P	-	7	On-site
<i>Litoria latopalmata</i>	Broad-Palmed Rocket Frog	P	-	39	On-site
<i>Litoria peronii</i>	Emerald-Spotted Tree Frog	P	-	1	Road corridor
				87	On-site
<i>Litoria rubella</i>	Desert Tree Frog	P	-	31	On-site
<i>Macropus giganteus</i>	Eastern Grey Kangaroo	P	-	15	On-site
<i>Macropus rufogriseus</i>	Red-Necked Wallaby	P	-	2	Road corridor
<i>Malurus cyaneus</i>	Superb Fairy-Wren	P	-	17	On-site
				1	Off-site
<i>Malurus leucopterus</i>	White-Winged Fairy-Wren	P	-	13	On-site
				1	Off-site
<i>Manorina flavigula</i>	Yellow-Throated Miner	P	-	5	On-site
<i>Manorina melanocephala</i>	Noisy Miner	P	-	15	On-site
				3	Off-site
<i>Merops ornatus</i>	Rainbow Bee-Eater	P	-	4	On-site
<i>Myiagra rubecula</i>	Leaden Flycatcher	P	-	1	On-site
<i>Neobatrachus sudellae</i>	Sudell's Frog	P	-	4	On-site
<i>Northiella haematogaster</i>	Blue Bonnet	P	-	38	On-site
<i>Ocyphaps lophotes</i>	Crested Pigeon	P	-	15	On-site
				1	Off-site
<i>Oriolus sagittatus</i>	Olive-Backed Oriole	P	-	3	On-site
<i>Oryctolagus cuniculus</i>	Rabbit	*	*	1	On-site

<i>Pachycephala rufiventris</i>	Rufous Whistler	P	-	2	On-site
				1	Off-site
<i>Pardalotus striatus</i>	Striated Pardalote	P	-	1	On-site
<i>Petaurus breviceps</i>	Sugar Glider	P	-	1	On-site
<i>Petrochelidon nigricans</i>	Tree Martin	P	-	6	On-site
<i>Philemon citreogularis</i>	Little Friarbird	P	-	2	On-site
<i>Philemon corniculatus</i>	Noisy Friarbird	P	-	1	On-site
<i>Platycercus eximius</i>	Eastern Rosella	P	-	4	On-site
<i>Platyplectrum ornatum</i>	Ornate Burrowing Frog	P	-	46	On-site
<i>Plectorhyncha lanceolata</i>	Striped Honeyeater	P	-	7	On-site
				7	Off-site
<i>Podargus strigoides</i>	Tawny Frogmouth	P	-	1	On-site
<i>Pomatostomus temporalis temporalis</i>	Grey-Crowned Babbler (Eastern Subspecies)	V,P	-	2	Possible nest in road reserve
				24	On-site
				5	Off-site
				2	Road corridor
<i>Psephotus haematonotus</i>	Red-Rumped Parrot	P	-	1	Road corridor
				7	On-site
				2	Off-site
<i>Pseudonaja textilis</i>	Eastern Brown Snake	P	-	1	On-site
<i>Pteropus alecto</i>	Black Flying-Fox	P	-	1	On-site
<i>Pteropus scapulatus</i>	Little Red Flying-Fox	P	-	7	On-site
<i>Ptilonorhynchus maculatus</i>	Spotted Bowerbird	P	-	1	On-site
<i>Ptilotula penicillata</i>	White-Plumed Honeyeater	P	-	4	On-site
<i>Rattus rattus</i>	Black Rat	*	*	1	On-site

<i>Rattus sp.</i>	Rat	*	*	4	On-site
<i>Rhipidura leucophrys</i>	Willie Wagtail	P	-	14	On-site
				2	Off-site
<i>Stizoptera bichenovii</i>	Double-Barred Finch	P	-	4	On-site
				2	Off-site
<i>Strophurus williamsi</i>	Eastern Spiny-Tailed Gecko	P	-	5	Road corridor
				17	On-site
<i>Struthidea cinerea</i>	Apostlebird	P	-	48	On-site
				1	Off-site
<i>Sus scrofa</i>	Pig	*	*	25	On-site
<i>Synoicus ypsilophora</i>	Brown Quail	P	-	1	On-site
<i>Tachybaptus novaehollandiae</i>	Australasian Grebe	P	-	2	On-site
<i>Tachyglossus aculeatus</i>	Short-Beaked Echidna	P	-	2	On-site
<i>Taeniopygia bichenovii</i>	Double-Barred Finch	P	-	2	On-site
<i>Taeniopygia guttata</i>	Zebra Finch	P	-	9	On-site
<i>Trichoglossus moluccanus</i>	Rainbow Lorikeet	P	-	1	On-site
<i>Trichosurus vulpecula</i>	Common Brushtail Possum	P	-	1	On-site
<i>Turnix varius</i>	Painted Button-Quail	P	-	1	On-site
<i>Uperoleia rugosa</i>	Chubby Gungan	P	-	55	On-site
<i>Vanellus miles</i>	Masked Lapwing	P	-	1	On-site
<i>Vespadelus vulturnus</i>	Little Forest Bat	P	-	1	On-site
<i>Vulpes vulpes</i>	Fox	*	*	1	On-site

Appendix E – Microbat Call Identification Report (Balance Environmental)



Microbat Call Identification Report

Prepared for (“Client”):	Ausecology Pty Ltd
Survey location/project name:	Whitehaven Solar Farm Project
Survey dates:	15-16 Nov. 2022 & 16-20 Jan. 2023
Client project reference:	
Job no.:	AUE-2301
Report date:	10 March 2023; updated 16 May 2024

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Methods

Data received

Balance! Environmental received ultrasonic acoustic data recorded using Anabat detectors deployed at eight separate sites (**Figure 1**) over two survey periods (see **Table 1**). Three detector types were used, with data from the Chorus and Swift units received in full-spectrum WAV format, while the Express data were received as ZCA files (one per detector-night). Individual acoustic trigger events (ZC “call sequence” files) were extracted from the ZCA files using the “Convert ZCA” function in *Anabat Insight* (Version 2.0.6; Titley Scientific, Brisbane).

Call analysis and identification

All analyses were performed with *Anabat Insight*. The complete set of WAV and ZC files were first passed through a noise filter, which set aside files that contained only non-bat background noise. Files that passed the noise filter (i.e., contained bat calls) were then processed with the Decision Tree analysis tool to group similar calls and assign tentative species labels.

All Decision Tree groups were reviewed manually to confirm and/or reassign correct species identities. Manual species verification was achieved by comparing call spectrograms and derived metrics of labelled files with those of reference calls from southern and central Queensland and/or with published call descriptions (e.g. Reinhold et al. 2001). The likelihood of a species’ occurrence in the study area was confirmed by referring to published distributional information (e.g., Australasian Bat Society 2022; Churchill 2008; van Dyck et al. 2013).

Where calls could not be reliably identified to a single species due to overlapping call characteristics (“unresolved” calls), they were assigned to multi-species groups. All members of such groups should be considered probably present at the relevant site.

Reporting standard

The format and content of this report follows Australasian Bat Society standards for the interpretation and reporting of bat call data (Reardon 2003), available on-line at <http://www.ausbats.org.au/>.

Species nomenclature follows Armstrong et al. (2020).

Table 1 Bat detector deployment schedule: Whitehaven Solar Farm Project, summer 2022-2023.

Site	Detector			Nights deployed	Location	
	Name	Type	Serial #		Latitude	Longitude
TS1	AB001	Express	SN324796	15-16 Nov	-30.5303	149.9085
TS2	AB002	Express	SN324755	15-16 Nov	-30.5323	149.8972
TS3	AB003	Swift	SN622897	15-16 Nov	-30.5254	149.9055
TS4	AB004	Swift	SN622897	15-16 Nov	-30.5246	149.8964
TS6	AB006	Chorus	SN655143	15-16 Nov	-30.5311	149.9029
TS7	AB001	Express	SN324796	17-18 Jan	-30.5246	149.9012
TS8	AB002	Express	SN324755	17-20 Jan	-30.5256	149.8956
TS9	AB006	Chorus	SN655143	16-20 Jan	-30.5306	149.9094



Figure 1 Anabat deployment locations: Whitehaven Solar Farm Project, summer 2022-2023.

Results

Noise filtration yielded a final dataset of 4009 ultrasonic files, within which 4375 bat calls were identified. Some 65% (2844) of those calls were attributed unequivocally to distinct taxa, while the other 1531 "unresolved" calls could not be reliably identified and were assigned to several multi-species groups (see **Table 2**).

Eleven call types were reliably attributed to 10 distinct species plus the undifferentiated *Nyctophilus* genus. Given the extensively cleared nature of the agricultural landscape in the study area (see **Figure 1**), the *Nyctophilus* calls probably belonged to *N. geoffroyi* and/or *N. gouldi*, not the threatened *N. corbeni*, which typically occurs only in large tracts of relatively undisturbed forest (Turbill & Ellis 2006).

More than 75% (1160) of the "unresolved" calls belonged to five species that were otherwise positively identified at most sites: *Chalinolobus gouldii*; *Ozimops ridei*; *Scotorepens balstoni*; *Vespadelus vulturnus*; and *Miniopterus orianae oceanensis*.

Another 130 unresolved calls potentially represented up to three additional free-tailed bat species, including:

- *Ozimops lumsdenae*
 - 20 calls had somewhat erratic, curvilinear pulses with characteristic frequencies (Fc) around 24-26 kHz and of longer duration (Dur) than calls that were assigned positively to *O. planiceps*
 - *O. lumsdenae* reaches the southern limits of its range in northern New South Wales
- *Ozimops petersi*
 - 96 calls, potentially belonging to this species, had Fc values consistently in the range ~27-28 kHz, which is intermediate between *O. planiceps* and *O. ridei* and more typical of *O. petersi* calls recorded in south-western Queensland (G. Ford, pers. obs.)
 - *O. petersi* is probably near the easterly limit of its range if it does occur in the study area
- *Setirostris eleryi*
 - This species produces calls that are often similar to those made by *Scotorepens greyii*, numerous calls of which were positively identified.
 - The unresolved calls had Fc~36-38 kHz with a shorter initial frequency sweep and longer pulse-duration, relative to *S. greyii*, and strong “hook-shaped” pulses, often with a short, sharp down-sweep on the end of the hooks.
 - More definitive identification of *S. eleryi* is achievable when calls containing feeding-buzz sequences, but none were evident in the present dataset, hence the uncertainty over this species’ occurrence.

Finally, 241 calls in the frequency range Fc~34-38 were from “unknown” species, with 161 of those calls detected at just one site (TS8). Many of the calls in this category had characteristics similar to calls produced by *Scoteanax rueppellii* and *Falsistrellus tasmaniensis*, but there is a low likelihood of either species being present in the study area. It is probable that the calls in this group represent site-specific call variants from several species, including, *S. balstoni*; *S. greyii*; *O. ridei*; *S. eleryi*; and *C. gouldii*.

Example spectrograms for each species were extracted from the dataset and appear in **Appendix 1**.

Table 2 Bats recorded during the Whitehaven Solar Farm Project surveys, November 2022 and January 2023.

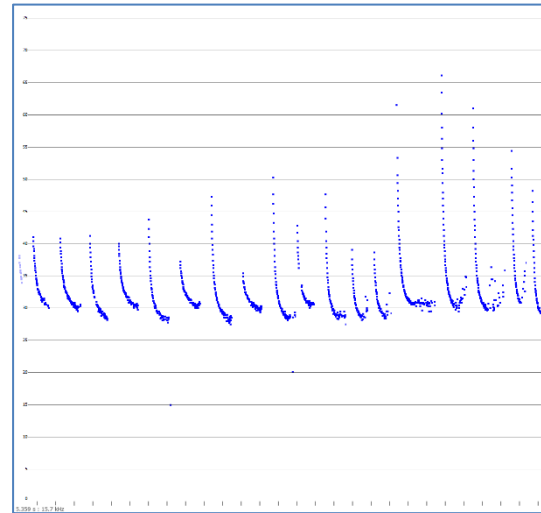
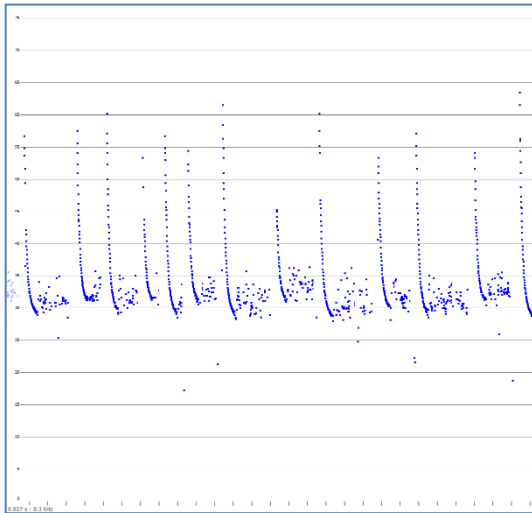
Number of calls per detector-night per species or unresolved species group.

Site:	TS1	TS2	TS3	TS4	TS6	TS7	TS8	TS9	Species Total
Positively identified calls									
<i>Chalinolobus gouldii</i>	25	110	30	33	36	11	196	61	502
<i>Chalinolobus morio</i>	1	9		18	1		30	10	69
<i>Nyctophilus</i> sp.	3	3	1	4	3	2	78	9	103
<i>Scotorepens balstoni</i>	19	101	2	3		4	56	14	199
<i>Scotorepens greyii</i>	14	74	6	5	16	6	240	18	379
<i>Vespadelus vulturnus</i>	51	73	10	16	17	9	139	106	421
<i>Miniopterus orianae oceanensis</i>	3	13	3	1	1		6		27
<i>Austronomus australis</i>			5	9	2		2	1	19
<i>Ozimops planiceps</i>	3	10	31	31	22	1	102		200
<i>Ozimops ridei</i>	138	35	44	15	18	5	540	18	813
<i>Saccolaimus flaviventris</i>	6	3	24	48	16		15		112
Unresolved calls									
<i>C. gouldii</i> / <i>Ozimops</i> sp.	24	29	8	22	3	62	634	100	882
<i>C. gouldii</i> / <i>S. balstoni</i>	8	26				9	124	64	231
<i>O. planiceps</i> / <i>O. lumsdenae</i>	1	1	4	6	4		4		20
<i>O. planiceps</i> / <i>O. petersi</i>	2	4	4	5	1		41		57
<i>O. ridei</i> / <i>O. petersi</i>	3	1	6	6	2		21		39
<i>S. greyii</i> / <i>Setirostris eleryi</i>	4				1		9		14
<i>V. vulturnus</i> / <i>M. o. oceanensis</i>			2	4	2		39		47
unknown_35-38 kHz	20	34	3	1	13	4	161	5	241
Site Total	325	526	183	227	158	113	2437	406	4375

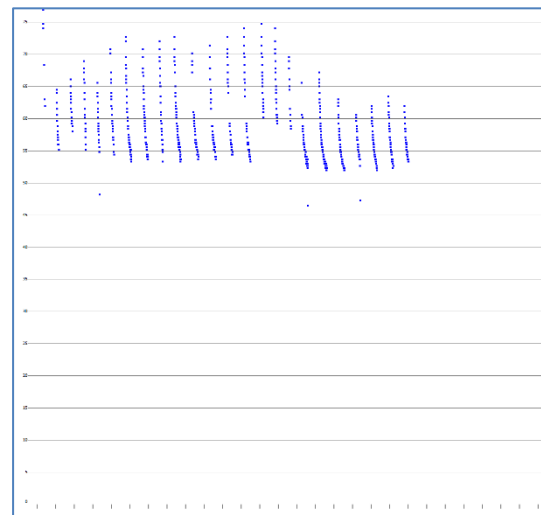
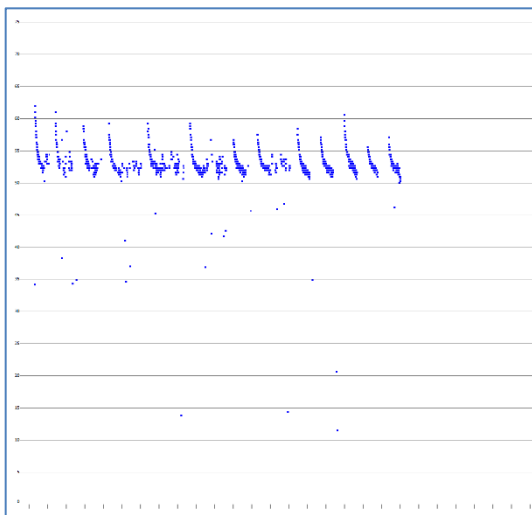
References

- Armstrong, K.N., Reardon, T.B., and Jackson, S.M. (2020). A current taxonomic list of Australian Chiroptera. *Australasian Bat Society*. Version 2020-06-09.
URL: <http://ausbats.org.au/species-list/4593775065>
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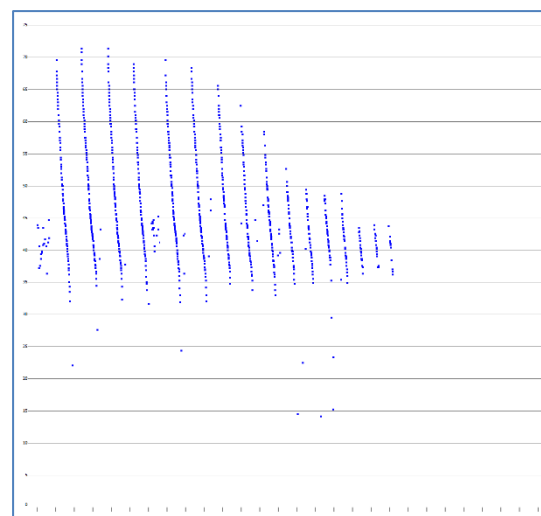
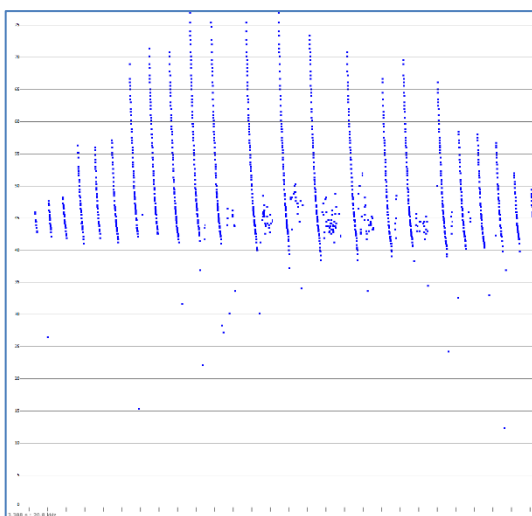
Appendix 1 Representative bat-calls recorded during the Whitehaven Solar Farm Project surveys, summer 2022-23. Time between pulses removed; time-scale (x-axis) 10ms per tick



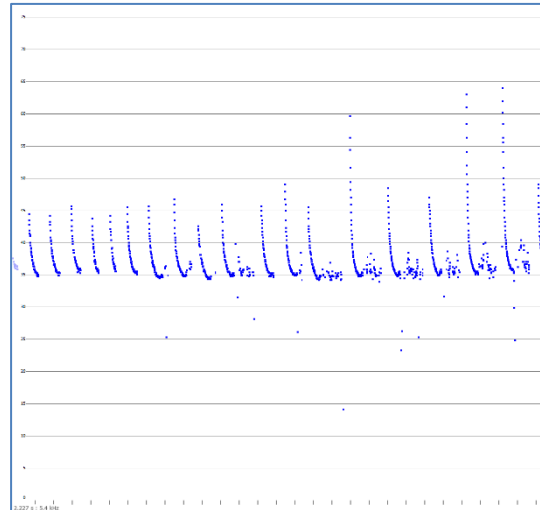
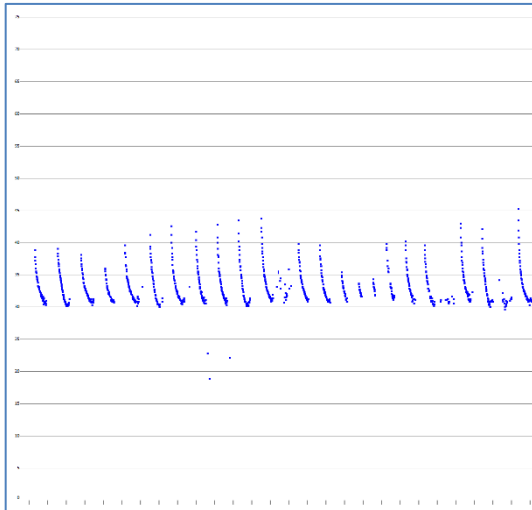
Chalinolobus gouldii



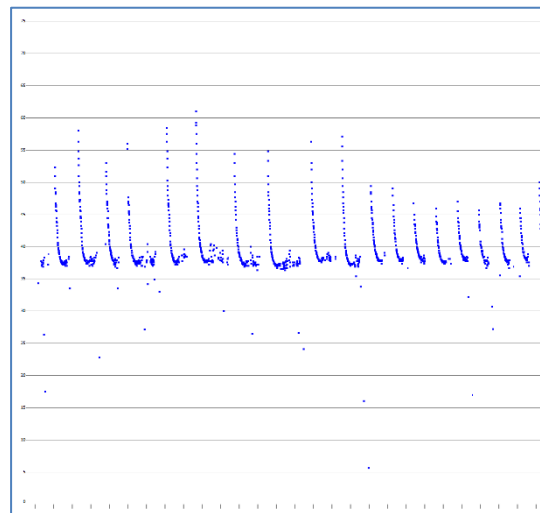
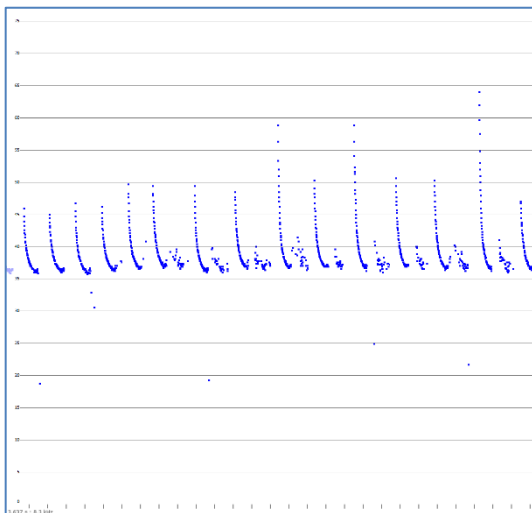
Chalinolobus morio



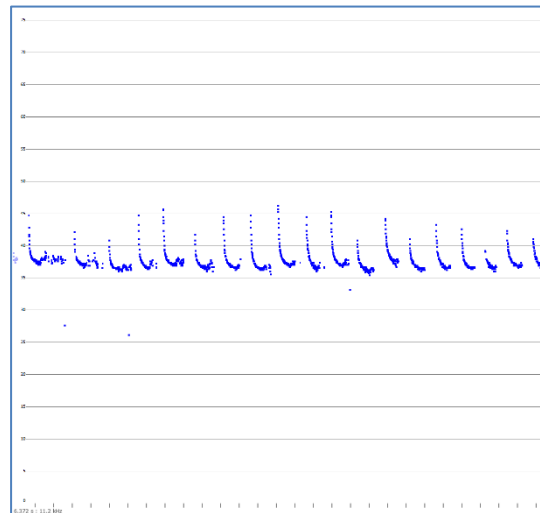
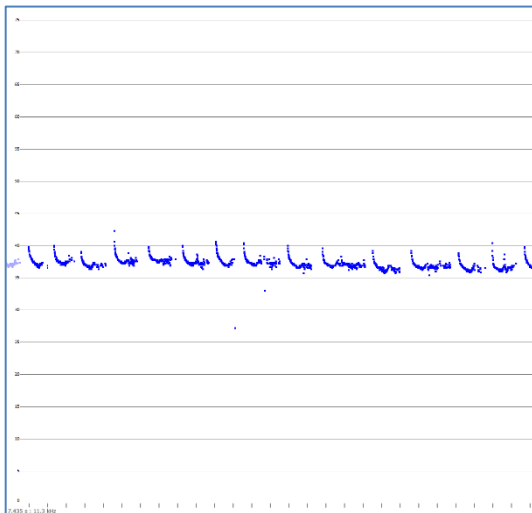
Nyctophilus sp.



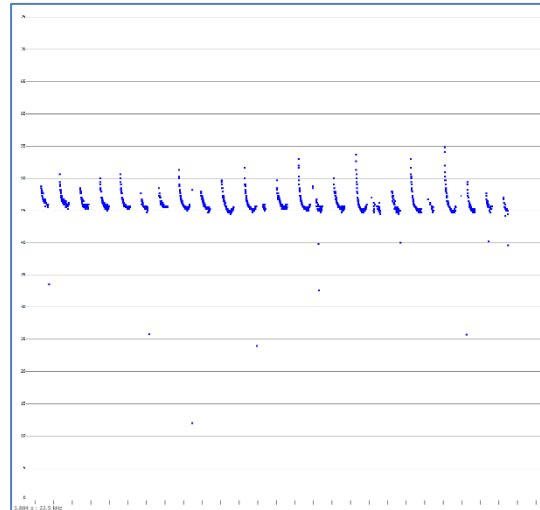
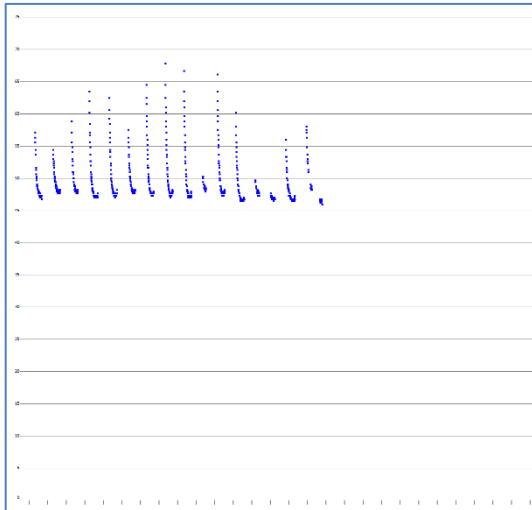
Scotorepens balstoni



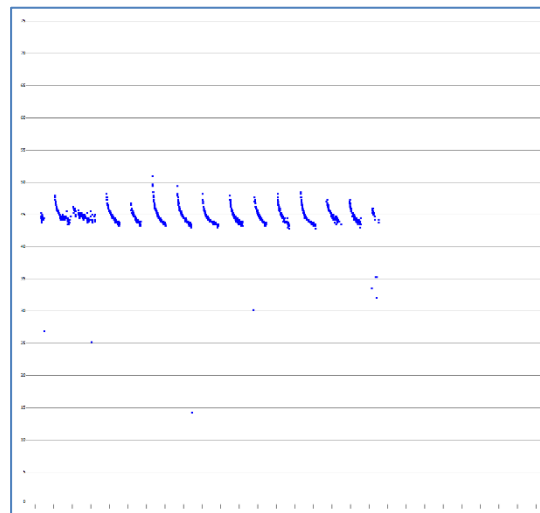
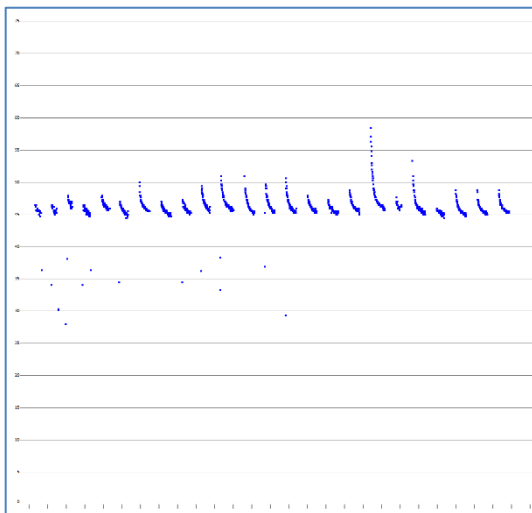
Scotorepens greyii



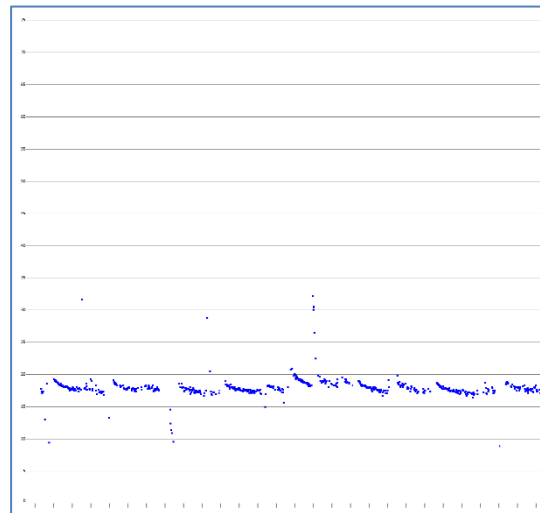
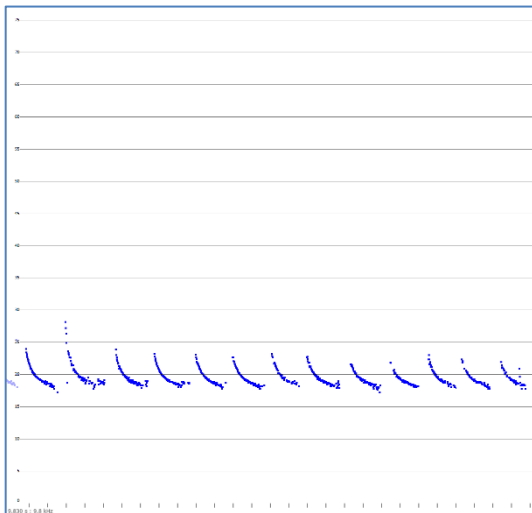
S. greyii or Setirostris eleryi



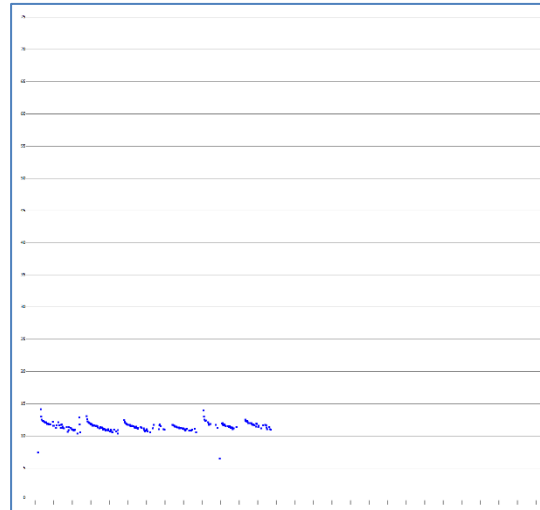
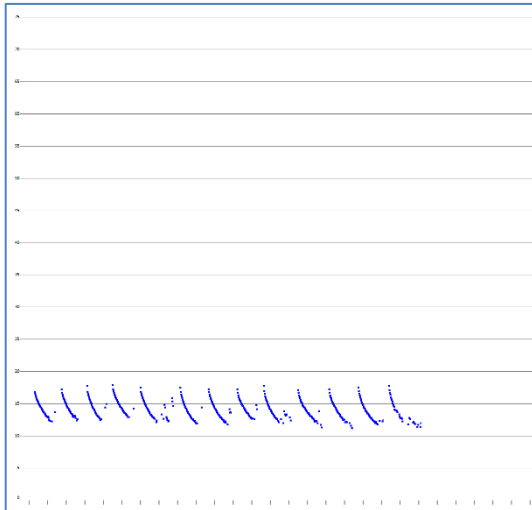
Vespadelus vulturnus



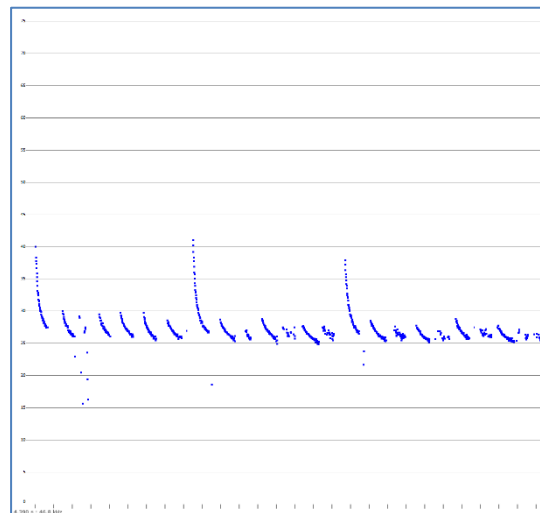
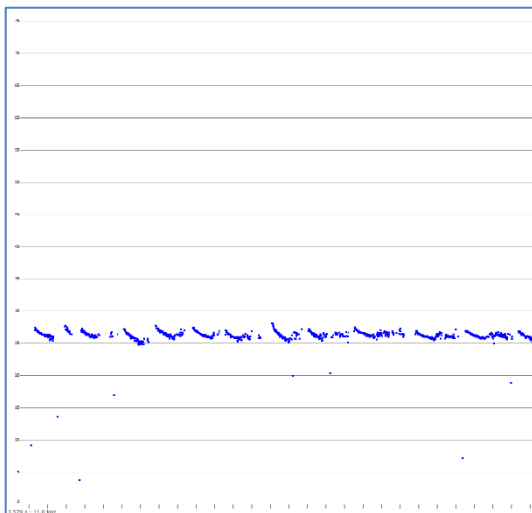
Miniopterus orianae oceanensis



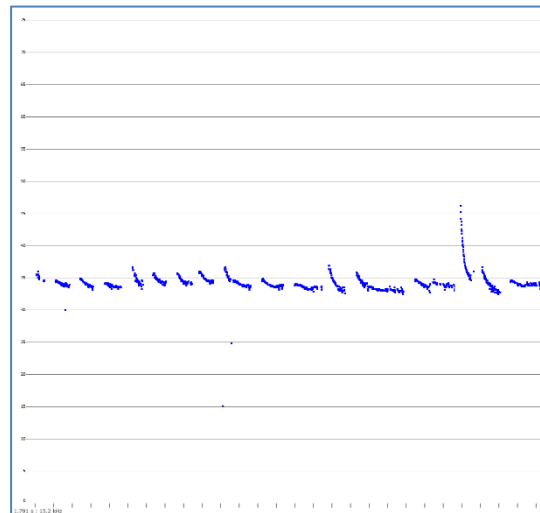
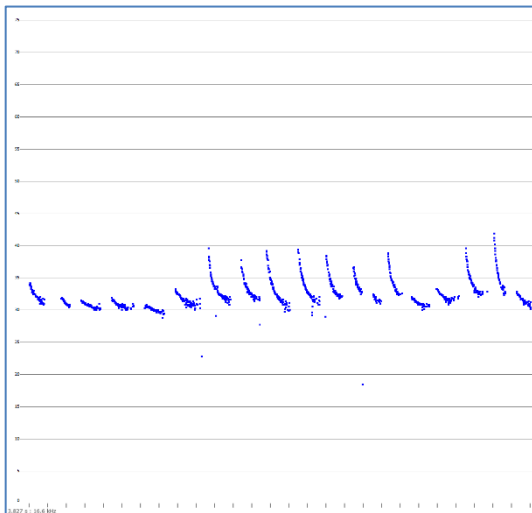
Saccolaimus flaviventris



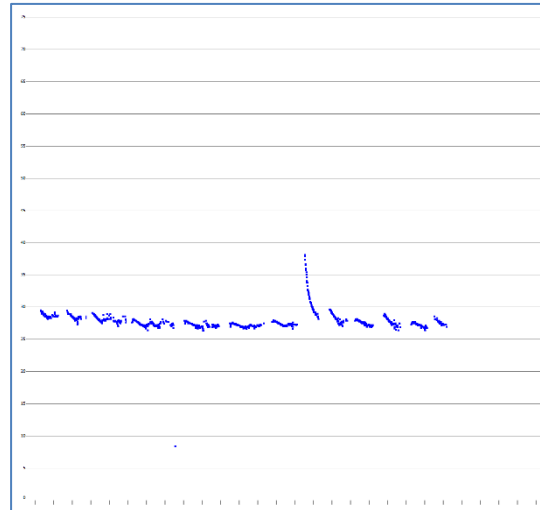
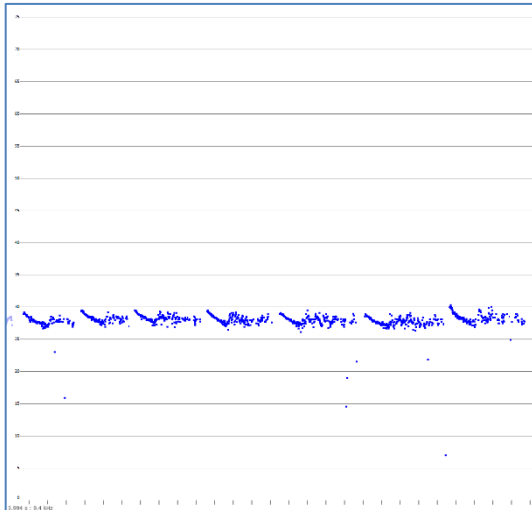
Austronomus australis



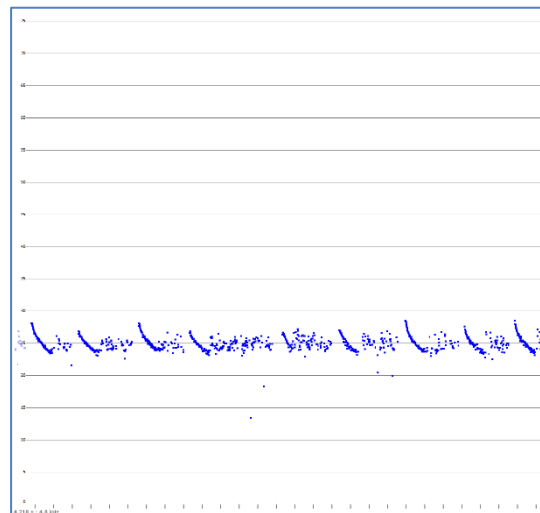
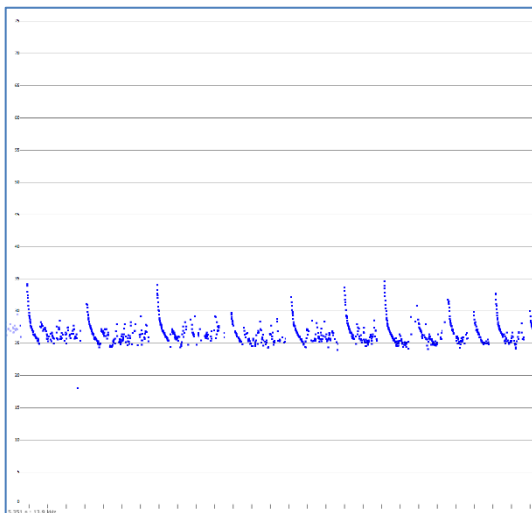
Ozimops planiceps



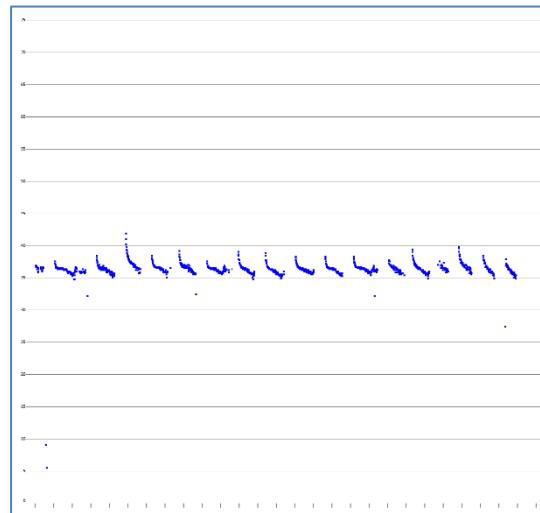
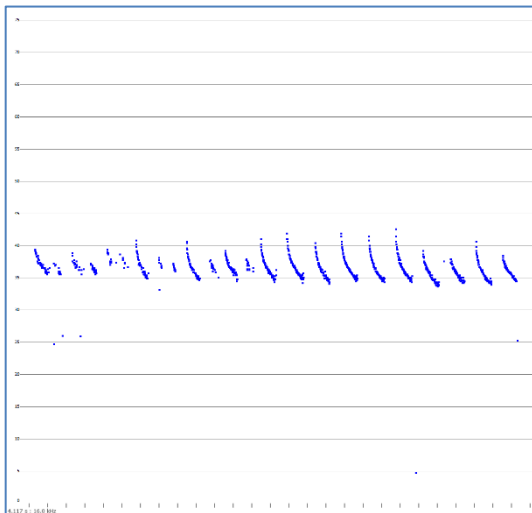
Ozimops ridei



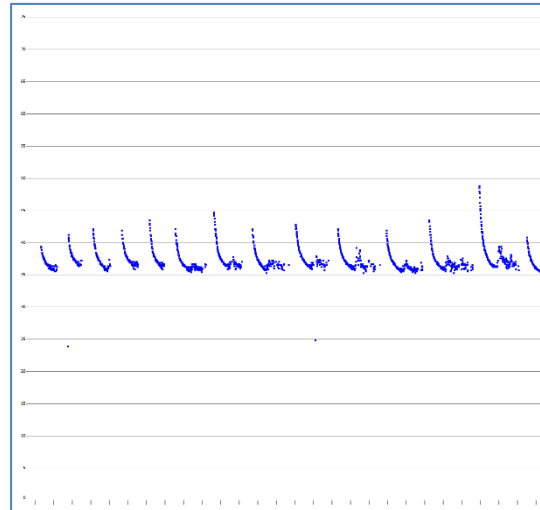
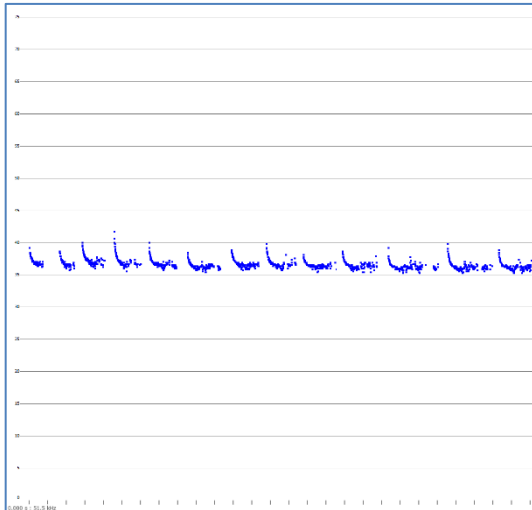
Possible *Ozimops petersi*



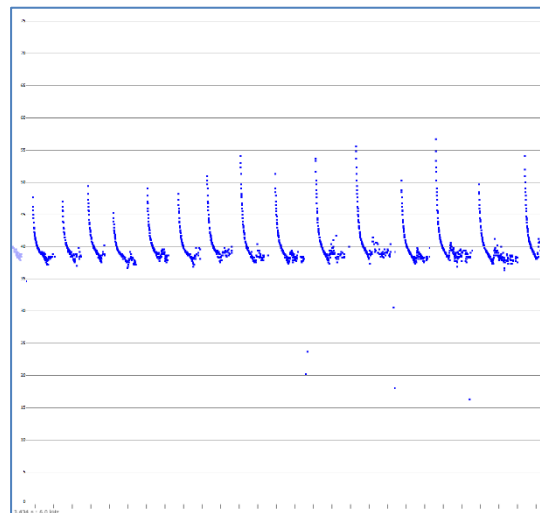
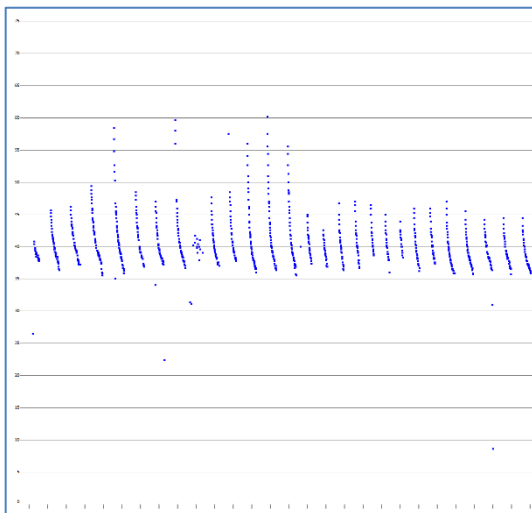
Possible *Ozimops lumsdenae*



Unknown calls – 34-38 kHz range: similar to *Scoteanax rueppellii*



Unknown calls – 34-38 kHz range: potentially *Setirostris eleryi*



Unknown calls – 34-38 kHz range: similar to *Falsistrellus tasmaniensis*

ATTACHMENT C
VEGETATION INTEGRITY (SITE CONDITION) DATA

Table C1 Vegetation Integrity (Site Condition) Data

Plot	PCT	Area	Patch Size	Condition Class	Zone	Easting	Northing	Bearing	Comp Tree	Comp Shrub	Comp Grass	Comp Forbs	Comp Ferns	Comp Other	Struc Tree	Struc Shrub	Struc Grass	Struc Forbs	Struc Ferns	Struc Other	Fun Large Trees	Fun Hollow Trees	Fun Litter Cover	Fun Len Fallen Logs	Fun Tree Stem 5 to 9	Fun Tree Stem 10 to 19	Fun Tree Stem 20 to 29	Fun Tree Stem 30 to 49	Fun Tree Stem 50 to 79	Fun Tree Regen	Fun High Threat Exotic
P1	55	0.84	>101	Semi-cleared	55	778312	6619493	185	3	5	12	13	1	0	18.1	9.0	37.1	9.6	0.1	0.0	2	0	7.0	0.0	1	1	1	1	0	1	1.5
P2	55	0.79	>101	Good	55	778805	6619382	210	1	5	9	8	0	0	50.0	1.5	10.0	1.7	0.0	0.0	6	0	7.0	0.0	1	1	1	1	1	1	5.1
P4	55	4.48	>101	DNG	55	778691	6619258	250	0	3	6	10	1	0	0.0	0.7	20.9	8.0	0.1	0.0	0	0	5.2	0.0	0	0	0	0	0	0	0.6
P10	101	15.5	>101	DNG	55	778403	6619059	22	0	1	5	5	1	0	0.0	15.0	25.3	2.3	0.1	0.0	0	0	4.2	0.0	0	0	0	0	0	0	0.0
P11	101	0.39	>101	Semi-cleared	55	778679	6618860	106	1	2	5	7	1	0	1.0	2.1	42.1	0.8	0.2	0.0	0	0	15.0	0.0	1	0	1	0	0	1	0.1
P12	56	0.28	>101	Good	55	777838	6619412	58	3	5	8	14	1	2	73.0	2.5	89.2	2.7	0.1	0.2	0	0	7.4	3.0	1	1	1	0	0	1	0.1
P13	88	0.08	>101	Semi-cleared	55	778452	6619488	90	3	5	9	15	1	1	20.2	15.4	52.3	2.4	0.3	0.1	1	0	26.0	0.0	0	1	1	1	1	0	0.6
P18	88	0.03	>101	Revegetation	55	778351	6619552	165	2	8	10	5	1	0	17.0	3.8	27.5	1.3	0.1	0.0	0.0	0	22	0.0	6	6	6	1	0	1	12
P19	55	4.48	>101	DNG	55	778319	6619646	345	0	7	8	8	1	0	0.0	1.1	12.9	3.5	1.0	0.0	0	0	22	0.0	0	0	0	0	0	1	0
P20	55	0.84	>101	Semi-cleared	55	778695	6619312	187	1	2	10	8	0	0	1.0	1.1	15.8	3.7	0.0	0.0	0	0	40	0.0	3	1	0	0	0	1	0
P21	101	15.5	>101	DNG	55	779407	6619098	339	0	3	4	3	1	0	0.0	33.5	86.0	15.2	5.0	0.0	0	0	7.6	0.0	0	0	0	0	0	1	0
P22	101	15.5	>101	DNG	55	778489	6618600	105	0	1	5	5	1	0	0.0	0.5	31.5	0.5	1.0	0.0	0	0	51	0.0	0	0	0	0	0	1	0

Note: P17 was in 88 Good which is avoided.

ATTACHMENT D
BAM BIODIVERSITY CREDIT REPORT

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00037031/BAAS17080/22/00037032	Whitehaven Solar Farm Project	14/03/2024
Assessor Name	Report Created	BAM Data version *
Jamie Gleeson	08/10/2024	67
Assessor Number	BAM Case Status	Date Finalised
BAAS17080	Finalised	08/10/2024
Assessment Revision	Assessment Type	
0	Major Projects	

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAI	Ecosystem credits
Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.												
1	55_Semi-cleared	Not a TEC	59.3	54.0	0.84	PCT Cleared - 83%	High Sensitivity to Gain			2.00		23

BAM Credit Summary Report

2	55_Good	Not a TEC	66	64.2	0.79	PCT Cleared - 83%	High Sensitivity to Gain			2.00		25
3	55_DNG	Not a TEC	35.1	31.9	4.5	PCT Cleared - 83%	High Sensitivity to Gain			2.00		71
										Subtotal		119
Pilliga Box - White Cypress Pine - Buloke shrubby woodland in the Brigalow Belt South Bioregion												
7	88_Semi-cleared	Not a TEC	56.8	56.8	0.08	PCT Cleared - 38%	High Sensitivity to Gain			1.50		2
8	88_Revegetation	Not a TEC	41.7	41.7	0.03	PCT Cleared - 38%	High Sensitivity to Gain			1.50		1
										Subtotal		3
Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW												
6	56_Good	Not a TEC	64.5	63.3	0.28	PCT Cleared - 78%	High Sensitivity to Gain			2.00		9
										Subtotal		9
Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion												
4	101_DNG	Not a TEC	36.9	34.4	15.5	PCT Cleared - 75%	High Sensitivity to Gain			2.00		266

BAM Credit Summary Report

5	101_Semi-cleared	Not a TEC	44	38.5	0.39	PCT Cleared - 75%	High Sensitivity to Gain			2.00		7
											Subtotal	273
											Total	404

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAIL	Species credits
Diuris tricolor / Pine Donkey Orchid (Flora)									
101_Semi-cleared	38.5	38.5	0.15	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	2
								Subtotal	2

ATTACHMENT E
BAM BIODIVERSITY CREDIT REPORT (LIKE FOR LIKE)



BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00037031/BAAS17080/22/00037032	Whitehaven Solar Farm Project	14/03/2024
Assessor Name	Assessor Number	BAM Data version *
Jamie Gleeson	BAAS17080	67
Proponent Names	Report Created	BAM Case Status
	08/10/2024	Finalised
Assessment Revision	Assessment Type	Date Finalised
0	Major Projects	08/10/2024

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Nil		

Additional Information for Approval

PCT Outside Ibra Added

BAM Biodiversity Credit Report (Like for like)

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
55-Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.	Not a TEC	6.1	0	119	119
101-Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	Not a TEC	15.9	0	273	273
56-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Not a TEC	0.3	0	9	9
88-Pilliga Box - White Cypress Pine - Buloke shrubby woodland in the Brigalow Belt South Bioregion	Not a TEC	0.1	0	3	3

BAM Biodiversity Credit Report (Like for like)

55-Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	North-west Floodplain Woodlands This includes PCT's: 55	North-west Floodplain Woodlands >=70% and <90%	55_Semi-cleared	No	23	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	North-west Floodplain Woodlands This includes PCT's: 55	North-west Floodplain Woodlands >=70% and <90%	55_Good	No	25	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

	North-west Floodplain Woodlands This includes PCT's: 55	North-west Floodplain Woodlands >=70% and <90%	55_DNG	No	71	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
56-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 101, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	56_Good	No	9	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

88-Pilliga Box - White Cypress Pine - Buloke shrubby woodland in the Brigalow Belt South Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Pilliga Outwash Dry Sclerophyll Forests This includes PCT's: 88, 141, 148, 397, 411, 702, 1090, 1384	Pilliga Outwash Dry Sclerophyll Forests <50%	88_Semi-cleared	No	2	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Pilliga Outwash Dry Sclerophyll Forests This includes PCT's: 88, 141, 148, 397, 411, 702, 1090, 1384	Pilliga Outwash Dry Sclerophyll Forests <50%	88_Revegetation	No	1	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

101-Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 101, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	101_DNG	No	266	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 101, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	101_Semi-cleared	No	7	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

BAM Biodiversity Credit Report (Like for like)

Species	Vegetation Zone/s	Area / Count	Credits
Diuris tricolor / Pine Donkey Orchid	101_Semi-cleared	0.2	2.00

Credit Retirement Options

Like-for-like credit retirement options

Diuris tricolor / Pine Donkey Orchid	Spp	IBRA subregion
	Diuris tricolor / Pine Donkey Orchid	Any in NSW

ATTACHMENT F
BAM BIODIVERSITY CREDIT REPORT (VARIATIONS)

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id

00037031/BAAS17080/22/00037032

Assessor Name

Jamie Gleeson

Proponent Name(s)

Assessment Revision

0

Proposal Name

Whitehaven Solar Farm Project

Assessor Number

BAAS17080

Report Created

08/10/2024

Assessment Type

Major Projects

BAM data last updated *

14/03/2024

BAM Data version *

67

BAM Case Status

Finalised

Date Finalised

08/10/2024

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Nil		

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

BAM Biodiversity Credit Report (Variations)

PCT

No Changes

Predicted Threatened Species Not On Site

Name

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
55-Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.	Not a TEC	6.1	0	119	119.00
101-Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	Not a TEC	15.9	0	273	273.00
56-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Not a TEC	0.3	0	9	9.00
88-Pilliga Box - White Cypress Pine - Buloke shrubby woodland in the Brigalow Belt South Bioregion	Not a TEC	0.1	0	3	3.00

55-Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
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BAM Biodiversity Credit Report (Variations)

	North-west Floodplain Woodlands This includes PCT's: 55	North-west Floodplain Woodlands > =70% and <90%	55_Semi-cleared	No	23	Liverpool Plains,Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	North-west Floodplain Woodlands This includes PCT's: 55	North-west Floodplain Woodlands > =70% and <90%	55_Good	No	25	Liverpool Plains,Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	North-west Floodplain Woodlands This includes PCT's: 55	North-west Floodplain Woodlands > =70% and <90%	55_DNG	No	71	Liverpool Plains,Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region

BAM Biodiversity Credit Report (Variations)

	Semi-arid Woodlands (Grassy sub-formation)	Tier 2 or higher threat status	55_Semi-cleared	No	23	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Semi-arid Woodlands (Grassy sub-formation)	Tier 2 or higher threat status	55_Good	No	25	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Semi-arid Woodlands (Grassy sub-formation)	Tier 2 or higher threat status	55_DNG	No	71	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
56-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 101, 237, 244, 248, 251, 628	Floodplain Transition Woodlands > =70% and <90%	56_Good	No	9	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region

BAM Biodiversity Credit Report (Variations)

	Grassy Woodlands	Tier 2 or higher threat status	56_Good	No	9	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
88-Pilliga Box - White Cypress Pine - Buloke shrubby woodland in the Brigalow Belt South Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Pilliga Outwash Dry Sclerophyll Forests This includes PCT's: 88, 141, 148, 397, 411, 702, 1090, 1384	Pilliga Outwash Dry Sclerophyll Forests <50%	88_Semi-cleared	No	2	Liverpool Plains,Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Pilliga Outwash Dry Sclerophyll Forests This includes PCT's: 88, 141, 148, 397, 411, 702, 1090, 1384	Pilliga Outwash Dry Sclerophyll Forests <50%	88_Revegetation	No	1	Liverpool Plains,Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region

BAM Biodiversity Credit Report (Variations)

	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Tier 4 or higher threat status	88_Semi-cleared	No	2	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Tier 4 or higher threat status	88_Revegetation	No	1	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
101-Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 101, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	101_DNG	No	266	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 101, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	101_Semi-cleared	No	7	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					

BAM Biodiversity Credit Report (Variations)

	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Grassy Woodlands	Tier 2 or higher threat status	101_DNG	No	266	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Grassy Woodlands	Tier 2 or higher threat status	101_Semi-cleared	No	7	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Diuris tricolor / Pine Donkey Orchid	101_Semi-cleared	0.2	2.00

BAM Biodiversity Credit Report (Variations)

Credit Retirement Options Like-for-like options

Diuris tricolor/ Pine Donkey Orchid	Spp		IBRA region
	Diuris tricolor/Pine Donkey Orchid		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Vulnerable	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.