Valley of the Winds

APPENDIX G
BIODIVERSITY ASSESSMENT REPORT

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Valley of the Winds Wind Farm
Biodiversity Development Assessment Report

UPC/AC Renewables

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DOCUMENT TRACKING

Project Name	Valley of the Winds Wind Farm
Project Number	20NEW16283
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Accredited Assessor Certification	Alex Pursche **I certify that this BDAR is prepared in good faith, is the truth, and that I have no actual or perceived conflict of interest.**
Prepared by	Alex Pursche
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Approved by	**Lily Gorrell**
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Executive Summary

Eco Logical Australia Pty Ltd (ELA) was commissioned by UPC\AC Renewables Australia (UPC) to prepare a Biodiversity Development Assessment Report (BDAR) under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Biodiversity Assessment Method (BAM) for the development of the Valley of the Winds Windfarm (the project), near Coolah, NSW,

This report has been prepared to meet the requirements of the Biodiversity Assessment Method (BAM) established under Section 6.7 of the NSW BC Act. The accredited BAM assessor who prepared the assessment is Alex Pursche (BAAS17019).

The project was also referred to the Commonwealth Department of Agriculture, Water and the Environment for potential impacts to matters of national environmental significance protected by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

On 13 July 2020, a delegate of the Federal Minister for the Department of Agriculture, Water and the Environment determined that the project was a controlled action under section 75 of the EPBC Act and therefore requires assessment and approval under the EPBC Act. The assessment of environmental impacts for the project is being undertaken under the *Amended Bilateral Agreement* between the Australian Department of Agriculture, Water and the Environment and the New South Wales Department of Planning, Industry and Environment.

The detailed project design is currently in preparation and this BDAR has been applied by assessing a development site within which all direct impacts (both construction and operation) would be expected to occur based on the current wind farm layout.

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

The development site, which includes both construction and operational footprints covers approximately 1,344 ha and is primarily used for sheep and cattle grazing and cropping. The majority of native vegetation is modified by both historical and ongoing farming practices and is generally restricted to isolated paddock trees or small patches of paddock trees with a modified understorey. Paddock areas, representing over 61% of the development site, are considered to be Category 1 – Exempt Land. These areas no longer comprise native plant communities due to historical agricultural activities including cropping and pasture improvement. Areas of native vegetation across in the region have been subject to an intense fire in 2017, which has permanently modified the structure and function of vegetation across the development site.

Nine Plant Community Types (PCTs) were recorded in the study area totalling 6,353 ha including:

- 42 River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
- 84 River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
- 272 White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes

- 281 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
- 461 Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion
- 478 Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion
- 479 Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
- 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
- 616 Grey Myrtle - Rusty Fig dry rainforest in sandstone gorges of the upper Hunter Valley, mainly Sydney Basin Bioregion

Portions of PCT 272 that occur within the Brigalow Belt South IBRA Bioregion have been assessed to meet the threshold for Inland Grey Box Endangered Ecological Community (EEC) under both the BC Act and EPBC Act.

PCT 281 and 483 can conform to White Box - Yellow Box - Blakely's Red Gum Grassy Woodland, a Critically Endangered Ecological Community (CEEC) listed under the BC Act and EPBC Act. All of PCT 281 and 483 within the development site has been conservatively assessed to meet the CEEC threshold under the BC Act. Within the development site 64.23 ha was assessed as meeting the condition thresholds for the CEEC listed under the EPBC Act.

Flora and fauna habitats across the development site are generally significantly degraded, typical of a highly modified farming landscape. Assessment and survey of potential threatened species habitats recorded fifteen threatened fauna species and one flora species within or adjacent to the development site:

- Barking Owl
- Black Falcon
- Black-chinned Honeyeater
- Dusky Woodswallow
- Grey-crowned Babbler
- Little Lorikeet
- Masked Owl
- Speckled Warbler
- Spotted Harrier
- Varied Sittella
- White-throated Needletail
- Large Bentwing-bat
- Large-eared Pied Bat
- Squirrel Glider
- Yellow-bellied Sheathtail-bat
- *Dichanthium setosum*

Where appropriate, species polygons have been calculated for those candidate species identified as known to the study area.

An assessment of the impacts of the project on matters of national environmental significance (MNES) within the development site was undertaken to fulfil the requirements of the Commonwealth Minister for the Environment under referral 2020/8668. Following revision of the project impacts, Assessments of significance were completed for all MNES known or likely to be impacted. Assessments concluded that the only MNES likely to be significantly impacted was White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland due to the permanent removal of 64.23 ha of this CEEC.

Similarly, an assessment on the impacts to aquatic habitats have been undertaken in accordance with the NSW *Fisheries Management Act 1994* (FM Act). Whilst the development site includes numerous 1st and 2nd order streams, they are all ephemeral and present little habitat for aquatic threatened species. Two waterways within the study area (Coolaburragundy River and Talbragar River) have been identified as potential Key Fish Habitat for threated species. Both of these waterways will need to be crossed by electrical infrastructure as part of connecting the project together. Impacts to these two waterways are likely to be negligible, and no impacts are proposed within the riparian corridor of these aquatic habitats.

This assessment includes areas of the development site that have not yet been surveyed due to access restrictions or project refinements in response to the findings of other environmental and social impact assessments. UPC has committed to undertaking detailed survey of these areas post approval, but as a precautionary approach, potential impacts within these unsurveyed areas have been included within this report, and where appropriate, species credit species have been assumed present. Based on the findings of this assessment, the potential impacts requiring offsets are detailed in Table 1 and Table 2 below:

Table 1 Ecosystem credits required

PCT Number	PCT Name	BC Act	EPBC Act	Area impacted	Credits required
42	River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Not listed	Not listed	0.66	41
84	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Not listed	Not listed	1.14	11
272	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	EEC	EEC (portions thereof)	12.68	131
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	CEEC	CEEC (portions thereof)	53.81	1,646
461	Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	Not listed	Not listed	0	0
478	Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion	Not listed	Not listed	0.11	3

PCT Number	PCT Name	BC Act	EPBC Act	Area impacted	Credits required
479	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Not listed	Not listed	51.69	1,019
483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	CEEC	CEEC (portions thereof)	374.70	6,120
616	Grey Myrtle - Rusty Fig dry rainforest in sandstone gorges of the upper Hunter Valley, mainly Sydney Basin Bioregion	Not listed	Not listed	0	0

Table 2 Species credits required

Species	Common Name	Number of individuals / Habitat (ha) in study area	Credits required
Dichanthium setosum	Bluegrass	3 patches of approximately 6 tussocks occupying 0.84 ha	0 – no individuals or habitats impacted
Chalinolobus dwyeri	Large-eared Pied Bat	180.49 ha of potential breeding habitat 4,155 ha of foraging habitats	4,336 for foraging habitats. No breeding habitat impacted.
Tyto novahollandiae	Masked Owl	3.13 ha (one potential breeding tree)	0 – no individuals or habitats impacted
Ninox connivens	Barking Owl	49.16 ha	261
Petaurus norfolcensis	Squirrel Glider	3,106ha	2,108

This BDAR has been prepared in accordance with the BAM. The development site has been designed to avoid and minimise impacts and is predominately located in areas of low or no biodiversity value. The residual impact of the proposed development requires 8,966 ecosystem credits and 19,688 species credits.

This assessment also includes the assumption of species credits on land that has not been accessed. This assumption increases the total species credit liability by 12,332 credits which the proponent commits to survey for once land access is available.

Contents

List of Figures

List of Tables

Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	Critically Endangered Ecological Community
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DNG	Derived Native Grassland
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	NSW *Fisheries Management Act 1994*
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LLS	Local Land Service
NSW	New South Wales
NOW	NSW Office of Water
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SSI	State Significant Infrastructure
TEC	Threatened Ecological Community
VIS	Vegetation Information System
WM Act	NSW *Water Management Act 2000*

Terminology

The following terminology has been used throughout this report for the purposes of describing the impacts of the Project in the context of a biodiversity assessment in accordance with the NSW Biodiversity Assessment Method (DPIE, 2020).

Terminology	Description
Construction footprint	Includes all areas of land impacted by the construction of the wind turbines and supporting infrastructure, including construction compounds, laydown areas, batching plants and construction access tracks.
Development site	Includes all areas of the construction and operational footprint.
Direct impacts	Impacts that are assessed by the BAM and result from the clearing of vegetation for development. These impacts directly affect habitat and individuals (DPIE, 2020).
Indirect impacts	Impacts that occur when the Project affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the Project and prescribed impacts (DPIE, 2020).
Operational footprint	Includes all areas of land containing all wind farm elements, including underground reticulation, turbine locations, substations, transmission line and accessways.
Prescribed impacts	Are those that may affect biodiversity values in addition to, or instead of, impacts from clearing vegetation. These may include, but are not limited to, impacts to movement of threatened species that maintains their life cycle, or impacts of wind turbine strikes on protected animals.
the Project	The construction and operation of the Valley of the Winds Wind Farm, including all elements encompassed within the development area.
SEARs	Secretary's Environmental Assessment Requirements
Study area	a 500m buffer area from the project centreline

1. Introduction

This Biodiversity Development Assessment Report (BDAR) has been prepared by Alex Pursche, an Accredited Person (BAAS17021) to apply the Biodiversity Assessment Method (BAM) under the NSW *Biodiversity Conservation Act 2016* (BC Act).

All credit calculations have been undertaken using the BAM Calculator (BAMC) version in case number 21959. Separate BAMC calculations have been undertaken to delineate the credit requirements of the project for each bioregion, as well as for the Transmission line and Wind farm elements as follows:

Wind farm:

- Brigalow Belt South (00021959/BAAS17021/20/00021962)
- NSW South-western Slopes (00021959/BAAS17021/20/00021961)
- Sydney Basin (00021959/BAAS17021/20/00021960)

Transmission line

- Brigalow Belt South (00021959/BAAS17021/22/00032036)
- NSW South-western Slopes (Not required – no impacts)
- Sydney Basin (00021959/BAAS17021/21/00028366)

The study area spans three bioregions: Brigalow Belt South, South Western Slopes, and Sydney Basin. The confluence of these three bioregions occurs north of the Leadville Cluster (Figure 1). The majority of the study area occurs in Brigalow Belt South IBRA region, which typifies the vegetation and species generally identified during this study.

As the project spans multiple IBRA regions, a separate calculation has been undertaken in the BAMCC for each IBRA region. As such the identification of predicted (ecosystem) species and candidate (species credit) species has been prepared in triplicate. The assessment of habitats, species distribution, and geographic limitations for candidate species has been undertaken within, using the most prevalent IBRA subregion within the study area for each IBRA region. Similarly, species associations and habitat mapping for each IBRA region has been assigned to only those PCT's the species is predicted to occur in.

For ease of readability, this assessment has been drafted as a single BDAR, with data presented on common figures for each IBRA region.

As the project is generally narrow and extends across the landscape, it has been assessed as a linear development with a study area of 500m buffer from the project centreline.

Due to the scale of the project, figures presented in this report are shown at the scale of each wind farm cluster (approximately 80,000:1). To show compliance with survey guidelines as well as survey details, detailed maps are provided (at a scale of 1:5,000) as an appendix to this report.

1.1. Introduction

Eco Logical Australia Pty Ltd (ELA) were engaged by UPC/AC Renewables to undertake a biodiversity assessment for the Valley of the Winds Wind Farm (the Project), suitable for inclusion in the Environmental Impact Statement (EIS).

The Project is located within the Warrumbungle Shire Local Government Area (LGA) between the towns of Coolah and Leadville in central west of NSW (Figure 1).

The Project proposes to construct and operate 148 turbines. The wind turbines will be broadly located in three areas known as the Mount Hope, Girragulang Road and Leadville clusters.

The Project will supply approximately 800 megawatts (MW) of electricity into the National Electricity Market (NEM).

The Project meets the threshold for State Significant Development (SSD) under Clause 20 of Schedule 1 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SEPP S&RD). As the Project is declared to be an SSD under the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act) and must be assessed via an EIS, the consent authority for the Project is NSW Department of Planning and Environment (DPE). Due to potential for significant impacts to Matters of National Environmental Significance (MNES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the Project has been declared a 'Controlled Action' and will also require consent from the Commonwealth Minister for the Environment.

As a SSD, the impacts to biodiversity must be assessed using the Biodiversity Assessment Method (BAM) (DPIE, 2020), which is a repeatable method for assessing biodiversity impacts. The BAM is a mandated methodology under the BC Act. Under the BAM, impacts to biodiversity are quantified through two credit types:

- Ecosystem credits – which includes impacts to vegetation (and some predicted threatened fauna species that are easily predicted by vegetation surrogates).
- Species credits – which includes all threatened flora, amphibians, invertebrates, reptiles, and some avian and mammal species.

The number of ecosystem credits and species credits required by a development is directly related to the condition and extent of vegetation (and habitats) impacted and is measured using the Biodiversity Assessment Method Credit Calculator (BAMC). The BAMC utilises vegetation integrity collected in the field, as well as native vegetation extent data within the study area, to estimate the number of ecosystem credits that will be required. The BAMC also provides a list of candidate threatened species that must be considered during the biodiversity assessment.

This report includes two base maps, the Location Map (Figure 3) and the Site Map (Figure 4).

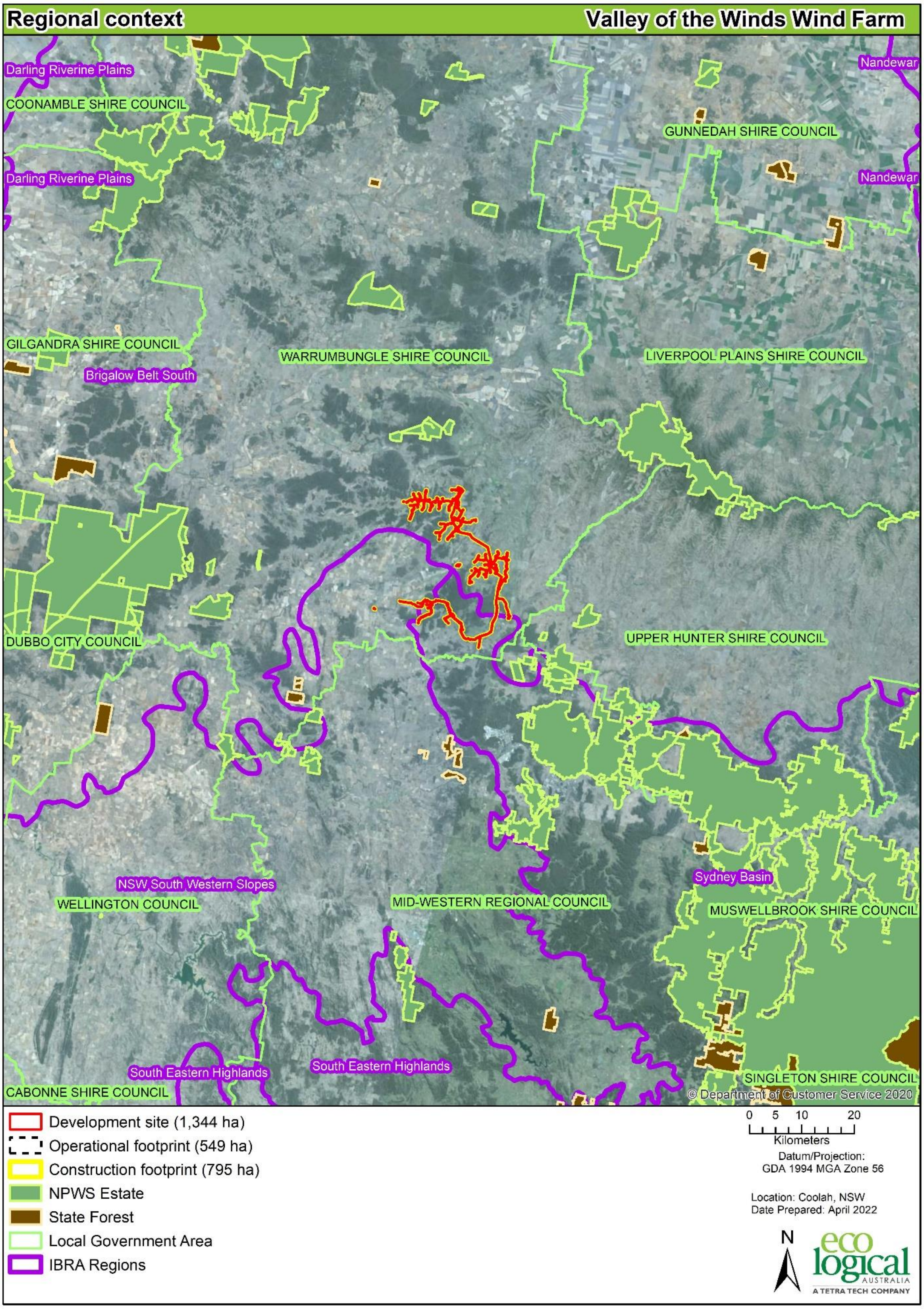


Figure 1 Regional context

1.2. General description of the development site

The proposed Valley of the Winds Wind Farm is nested between the towns of Coolah, Leadville and Uarbry within the Warrumbungle Shire Local Government Area (LGA) (Figure 1).

The Black Stump Way runs from Coolah to Leadville and passes through the centre of the Project, with the Mount Hope cluster to the north and the Leadville and Girragulang Road clusters to the south. Moorefield Road branches off the Black Stump Way and provides access to the southern end of the Girragulang Road cluster. The Golden Highway runs along the southern extent of the Project and provides major access points to the southern end of the Leadville cluster and to the proposed transmission line west of Uarbry. Access to the northern extent of the Project and to the Mount Hope cluster is via Mount Hope Road. Besides the major access ways, the majority of the site is accessed via private landholder farm tracks.

There are three land zonings across the study area, including RU5 within the villages of Uarbry & Leadville, SP2 within the Golden Highway road easement, and RU1 for all other remaining areas of the study area . Land tenure within the study area is almost entirely held in private ownership, with the exception of Council road easements. Within the study area there are no areas of the NPWS estate.

The average annual temperate in Dunedoo (the nearest Bureau of Meteorology weather station) is a minimum of 9.7°C and maximum of 24.0°C (BoM 2021). On average the area receives 613 mm of rainfall per year (BoM 2021).

In February and March of 2017 much of the remnant vegetation in the project development area was impacted by the Sir Ivan bushfire. The vegetation in the Girragulang Road and Leadville clusters, as well as the transmission line route, was severely impacted and experienced high severity crown fires. Four years later much of this vegetation is still significantly damaged. These areas may take up to 50 years to recover from this fire event.

1.3. Brief description of the proposal

The project would consist of approximately 148 wind turbines and supporting infrastructure, including a high voltage transmission line which would run approximately 13 kilometres from the Girragulang Road cluster to a connection point with the Central-West Orana REZ Transmission line proposed by TransGrid and the NSW Government. The project would supply approximately 800 megawatts (MW) of electricity into the National Electricity Market (NEM).

The wind farm would be located close to the townships of Coolah and Leadville, with the transmission line running generally south to its connection with the Central-West Orana REZ Transmission line. The project would be entirely within the Warrumbungle Local Government Area (LGA).

The project would involve the construction, operation and decommissioning of three clusters of wind turbines, that would be connected electrically. These are:

- Mount Hope cluster – approximately 76 turbines
- Girragulang Road cluster – approximately 51 turbines
- Leadville cluster – approximately 21 turbines.

The project includes the following key components:

- approximately 148 wind turbines with a maximum tip height of 250 metres and a hardstand area at the base of each turbine
- electrical infrastructure, including:
    - substations in each cluster and a step-up facility at the connection to the Central-West Orana REZ Transmission line
    - underground 33 kilovolt electrical reticulation connecting the turbines to the substations in each cluster
    - overhead transmission lines (up to 330 kilovolt) dispatching electricity from each cluster
    - other electrical infrastructure as required including a potential battery energy storage system (BESS)
    - a high voltage transmission line (up to 500 kilovolt) connecting the wind farm to the Central-West Orana Transmission line
- other permanent on-site ancillary infrastructure:
    - permanent operation and maintenance facilities
    - meteorological masts (up to thirteen)
- access track network:
    - access and egress points to each cluster from public roads including potential intersection upgrades
    - operational access tracks and associated infrastructure within each cluster on private property
- temporary construction ancillary facilities:
    - potential construction workforce accommodation on site
    - construction compounds
    - laydown areas
    - concrete batching plants
    - quarry sites for construction material (rock for access tracks and hardstands).

At the end of its practical life, the wind farm would be decommissioned, and the site returned to its pre-existing land use in consultation with the affected landholders.

1.4. Development site footprint

The development site footprint includes both the operational and construction footprints required to install and operate the wind farm.

The development site, including the construction and operational footprint, are presented in Figure 2.

1.5. Sources of information used

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

- BioNet Vegetation Classification

- Bionet Atlas Database (accessed December 2021)
- BioNet Threatened Biodiversity Data Collection
- PlantNET (The NSW Plant Information Network System). Royal Botanic Gardens and Domain Trust, Sydney (PlantNET 2021)
- Atlas of Living Australia (ALA 2021)
- Australian Virtual Herbarium (AVH 2020)

Additional sources of information accessed for this assessment are presented in Appendix A.

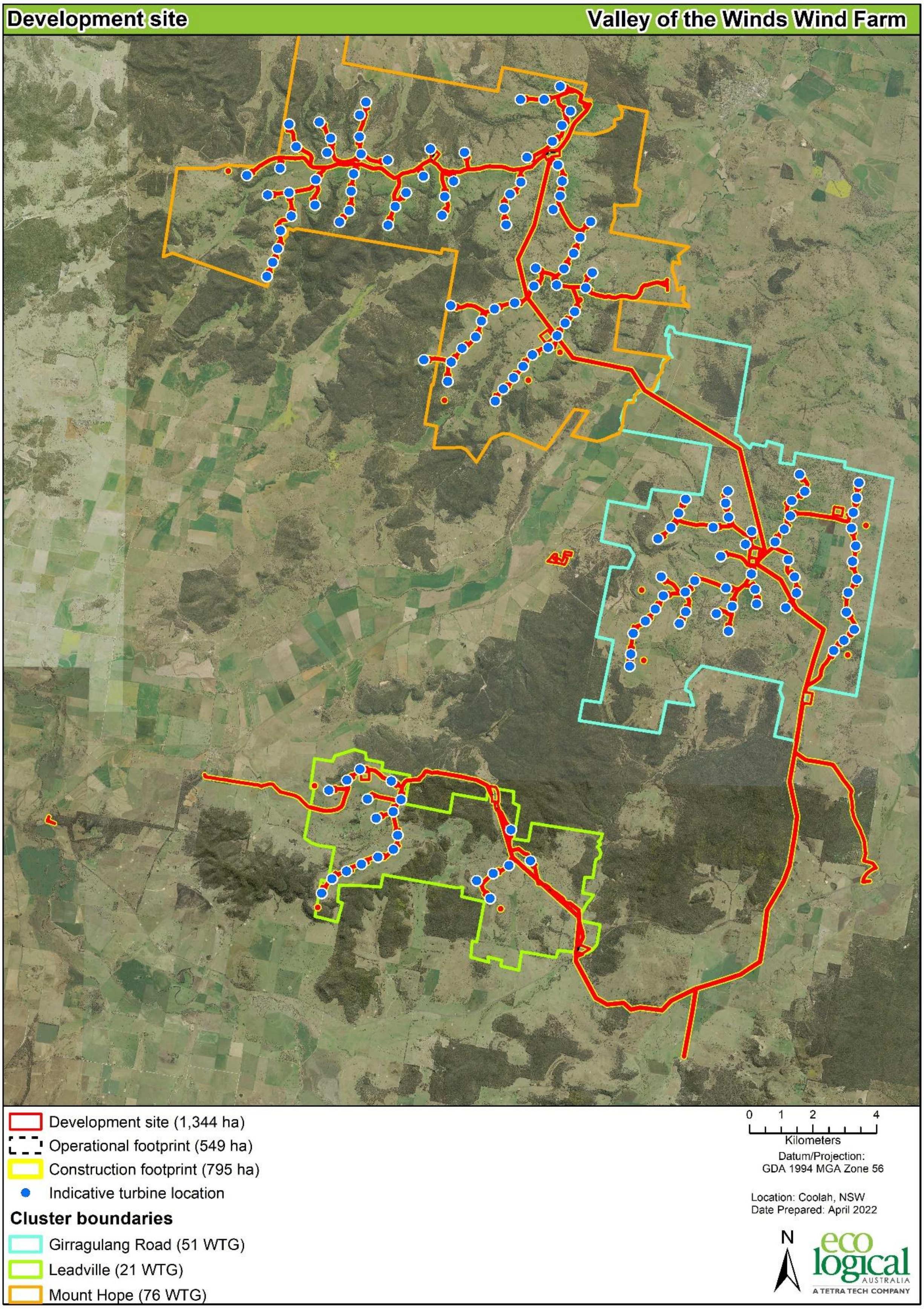


Figure 2 Development site

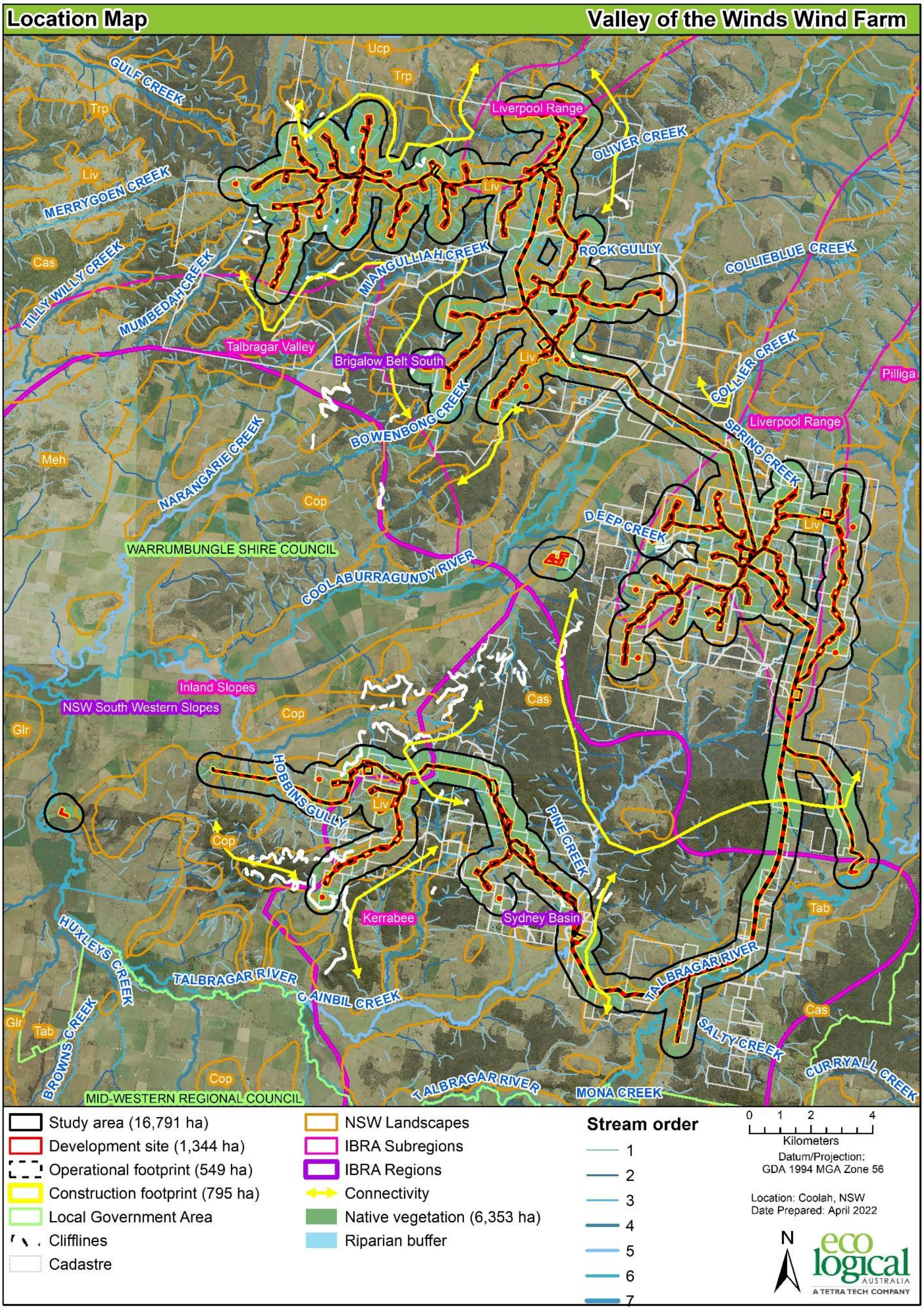


Figure 3: Location Map

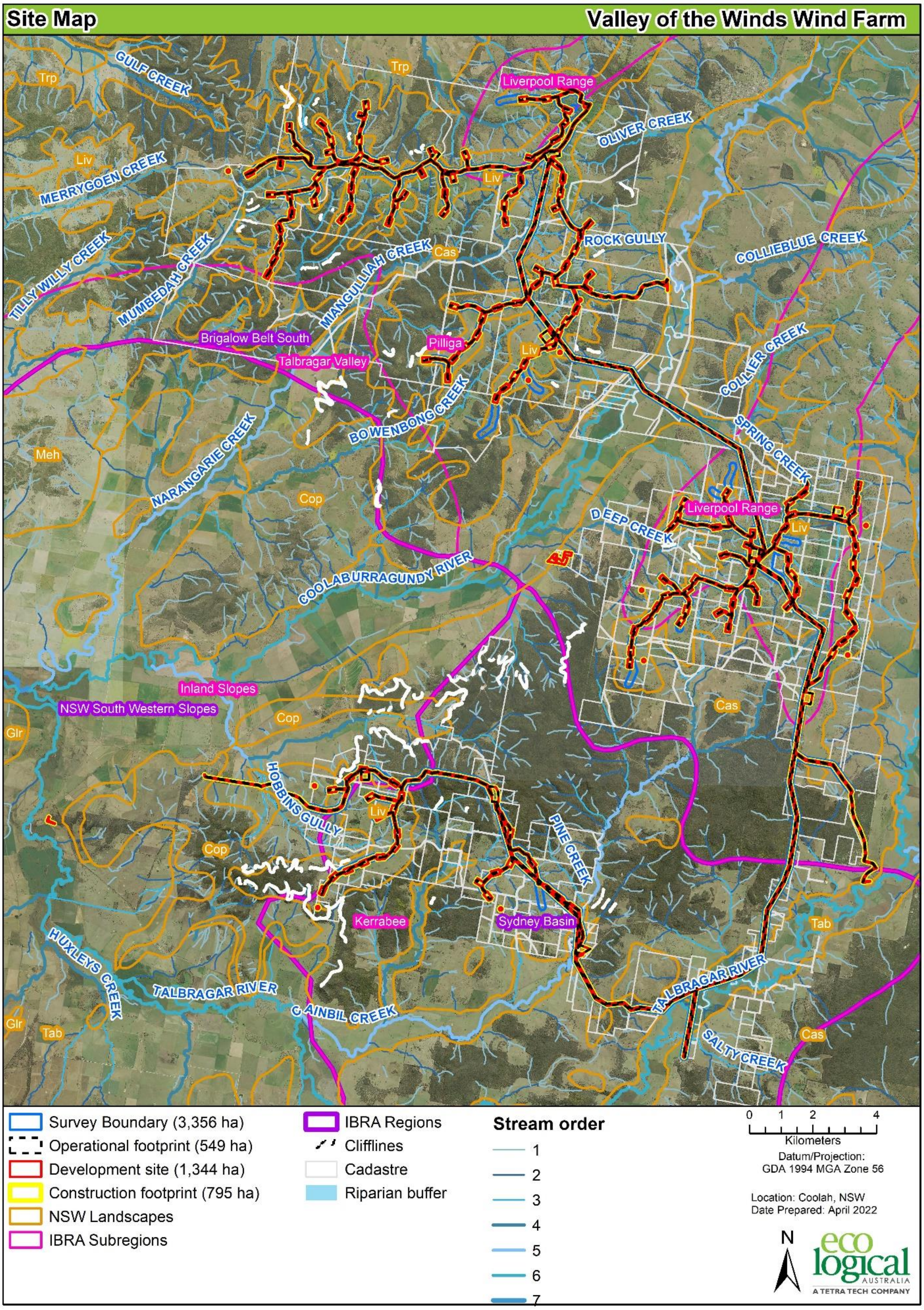


Figure 4: Site Map

1.6. Legislative context

Legislation relevant to the development site is outlined in Table 3.

Table 3: Legislative context

Name	Relevance to the project	Report Section
Commonwealth		
Environmental Protection and Biodiversity Conservation Act 1999	Matters of National Environmental Significance (MNES) have been identified on or near the development site. This report assesses impacts to MNES and concludes that the development is likely to have a significant impact on MNES.	MNES are addressed in Chapter 11
State		
Environmental Planning and Assessment Act 1979	The EP&A Act is the principal planning legislation for NSW. It provides a framework for the overall environmental planning and assessment of development proposals. The proposed development is State Significant Development and is to be assessed under Part 4.1 of the EP&A Act. Secretary's Environmental Assessment Requirements have been issued and require assessment of: - biodiversity values and the likely biodiversity impacts of the development including impacts associated with transport route road upgrades in accordance with the Biodiversity Conservation Act 2016 (NSW), including a detailed description of the proposed regime for minimising, managing and reporting on the biodiversity impacts of the development over time, and a strategy to offset any residual impacts of the development in accordance with the Biodiversity Conservation Act 2016 (NSW); - the likely impacts on koalas and their habitat in accordance with the requirements of State Environmental Planning Policy No. 44 – Koala Habitat Protection; and - assess the impact of the project on birds and bats from blade strikes, low air pressure zones at the blade tips (barotrauma), and alteration to movement patterns resulting from the turbines and considering cumulative effects of other wind farms in the vicinity.	Biodiversity values are assessed in Section 1-4. Impacts area assessed in Sections 5-6.
Biodiversity Conservation Act 2016	The proposed development requires submission of a Biodiversity Development Assessment Report.	This report is a BDAR prepared in accordance with the BAM (2020).
Local Land Services Amendment Act 2016	The LLS Act applies to this assessment, with respect to the development of the Native Vegetation Regulatory Map.	
Planning Instruments		
SEPP (State and Regional Development) 2011	The proposed development is identified as an SSD under this SEPP.	
SEPP (Infrastructure) 2007 (ISEPP)	The ISEPP aims to provide the framework to effectively deliver infrastructure projects throughout NSW. Relevant to this proposal, Clause 34(1b) of the ISEPP provides that development for the purpose of a solar energy system may be carried out by any person with consent on any land providing it is not within a prescribed residential zone. The proposal is located within land zoned Primary Production (RU1). Primary Production	

Name	Relevance to the project	Report Section
	(RU1) is not a prescribed residential zone and therefore the proposed development is permissible with consent pursuant to Clause 34(1b).	
State Environmental Planning Policy 44 (Koala Habitat Protection)	SEPP 44– Koala Habitat Protection only applies to developments where Council is the determining authority. In this case as specifically requested in the SEARs. This report considers whether the development site impacts potential or core Koala habitat as described in SEPP44	Koala habitat is described in Chapter 11
Warrumbungle Local Environment Plan (LEP) 2013	The project is a State Significant Development and will comply with EP&A Act and all relevant State Planning Instruments. The proposed development will aim to comply with LEP requirements and objectives in consultation with Warrumbungle Shire Council. Clause 6.3(2) of the LEP relates to mapped areas of Terrestrial Biodiversity. The development has been designed to avoid, minimise and mitigate impacts to mapped areas of Biodiversity.	

2. Landscape features

The site context for this assessment has been selected using the linear-based method and therefore the study area is a 500 m buffer around the impact centreline and wind turbine points.

The landscape features considered for this assessment are presented in Table 4, Figure 3 and Figure 4.

Table 4: Landscape features

Landscape feature	Development site	Study Area (500m buffer)	Data source
IBRA Region(s)	• Brigalow Belt South (BBS) • Sydney Basin (SB) • NSW South Western Slopes (SWS)	• BBS • SB • SWS	Interim Biogeographic Regionalisation for Australia, Version 7
IBRA subregion(s)	• Liverpool Range • Pilliga • Kerrabee • Inland Slopes	• Liverpool Range • Pilliga • Kerrabee • Inland Slopes • Talbragar Valley	Interim Biogeographic Regionalisation for Australia, Version 7
Rivers and streams	There are numerous first and second order streams across the Project development area. Major waterways identified in the database review include: • Coolabaragundy River • Talbragar River		NSW LPI Waterway mapping
Estuaries and wetlands	The assessment area does not contain any mapped wetlands.		NSW directory of important wetlands
Connectivity of different areas of habitat	Areas of connectivity are mapped on the Location map		Aerial imagery
Geological features of significance and soil hazard features	None present		Aerial imagery
Areas of Outstanding Biodiversity Value	The assessment area does not contain any Areas of Outstanding Biodiversity Value.		Register of Declared Areas of Outstanding Biodiversity Value (DPIE 2020)
NSW (Mitchell) Landscapes	• Liverpool Range Valleys and Footslopes • Cape Hills Granite • Cassilis Slopes • Coolah Tops • Gulgong Ranges • Merrygoen Hills and Slopes • Upper Castlereagh Alluvial Plains • Trinkey Plateau • Talbragar – Upper Macquarie Terrace Sand		NSW (Mitchell) Landscapes - version 3.1 (DPIE 2016)

Landscape feature	Development site	Study Area (500m buffer)	Data source
Additional features required to be assessed	No additional landscape features identified		Project SEARs
Percent (%) native vegetation extent	There are no differences between the mapped vegetation extent and the aerial imagery. The development footprint is approximately 1,344 ha and contains approximately 289 ha of woodland/forest native vegetation. Brigalow Belt South IBRA Region: The assessment area is approximately 12,322 ha and contains approximately 4,818 ha of native vegetation (39%). Sydney Basin IBRA Region: The assessment area is approximately 3,447 ha and contains approximately 1,220 ha of native vegetation (35%). NSW South West Slopes IBRA Region: The assessment area is approximately 1,022 ha and contains approximately 310 ha of native vegetation (30%).		Calculated using aerial imagery and ArcGIS software

2.1. Fire history

A significant portion of the development site was devastated by the Sir Ivan Fire in February 2017 which was started by a lightning strike near Leadville, NSW. The fire burned from west to east, and then turned north burning over 55,000 ha, and destroying 35 homes, more than 2,000 stock, and over 5,700km of fencing. The greatest intensity of the fire was within the forested area between the towns of Leadville and Uarbry, where the heat of the fire has resulted in near total loss of biodiversity. The extent of the Sir Ivan Fire is shown on Figure 5.

The intensity of the fire has led to a near total loss of living canopy within forested areas, which now contains a dense mid-storey of *Acacia sp.*, sparse sandy ground layer containing *Lomandra longifola* and other species tolerant of high shading and highly draining soils. The canopy consists of stags that are completely exposed to sunlight, and cease to function as a typical upper stratum in a forest community.

The severity of the fire, in a relatively low rainfall area, followed by a severe drought has created an alternate ecosystem, with little post fire recovery (now 4.5 years ago) as shown Photograph 1 and Photograph 2.

Grassy woodlands more intensively grazed, were not burned with the same intensity of forest areas, most likely due to a reduced fuel load on the ground and less capacity for flames to spread through the canopy. These open woodland areas that were subject to the Sir Ivan Fire, have recovered and are not discernibly different to unburned areas of woodlands (excepting occasional evidence of charring on retained trees).

All other areas of the development site have not been burned in recent times.

Consideration was given to the Guideline for applying the *Biodiversity Assessment Method at severely burnt sites* (DPIE, 2020), to determine if any areas of the development site were also burned in the 2019-2020 summer bushfires. No areas of the development site were identified on this map. Following the flow chart in Figure 6, no areas of the subject land include any of the Burnt Area Classes, and so the BAM is to be applied, rather than apply any of the burn severity rules.

Photograph 1 Burned ironbark forest near Uarbry, NSW

Photograph 2 Burned ironbark forest within investigation area

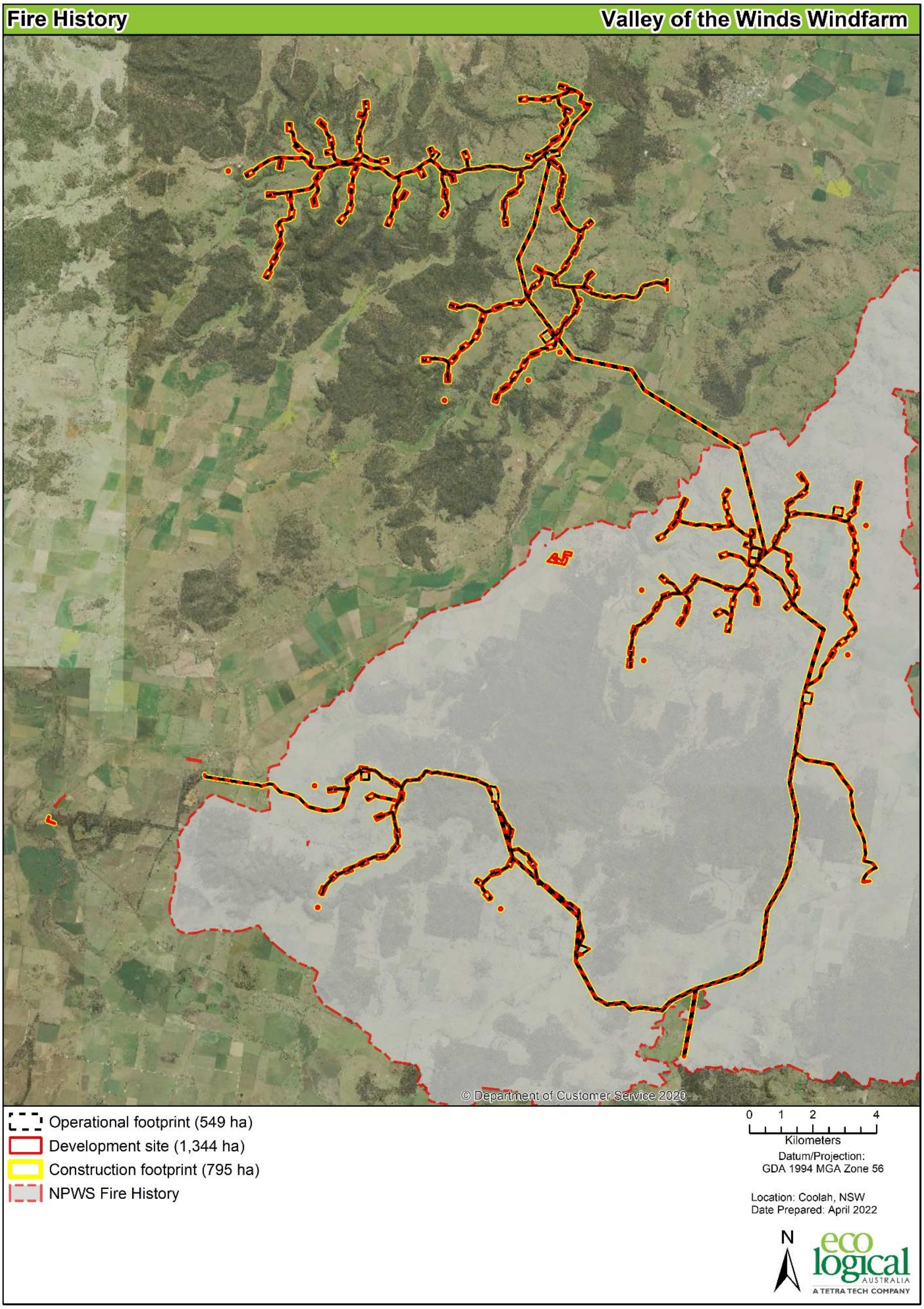


Figure 5 Fire history

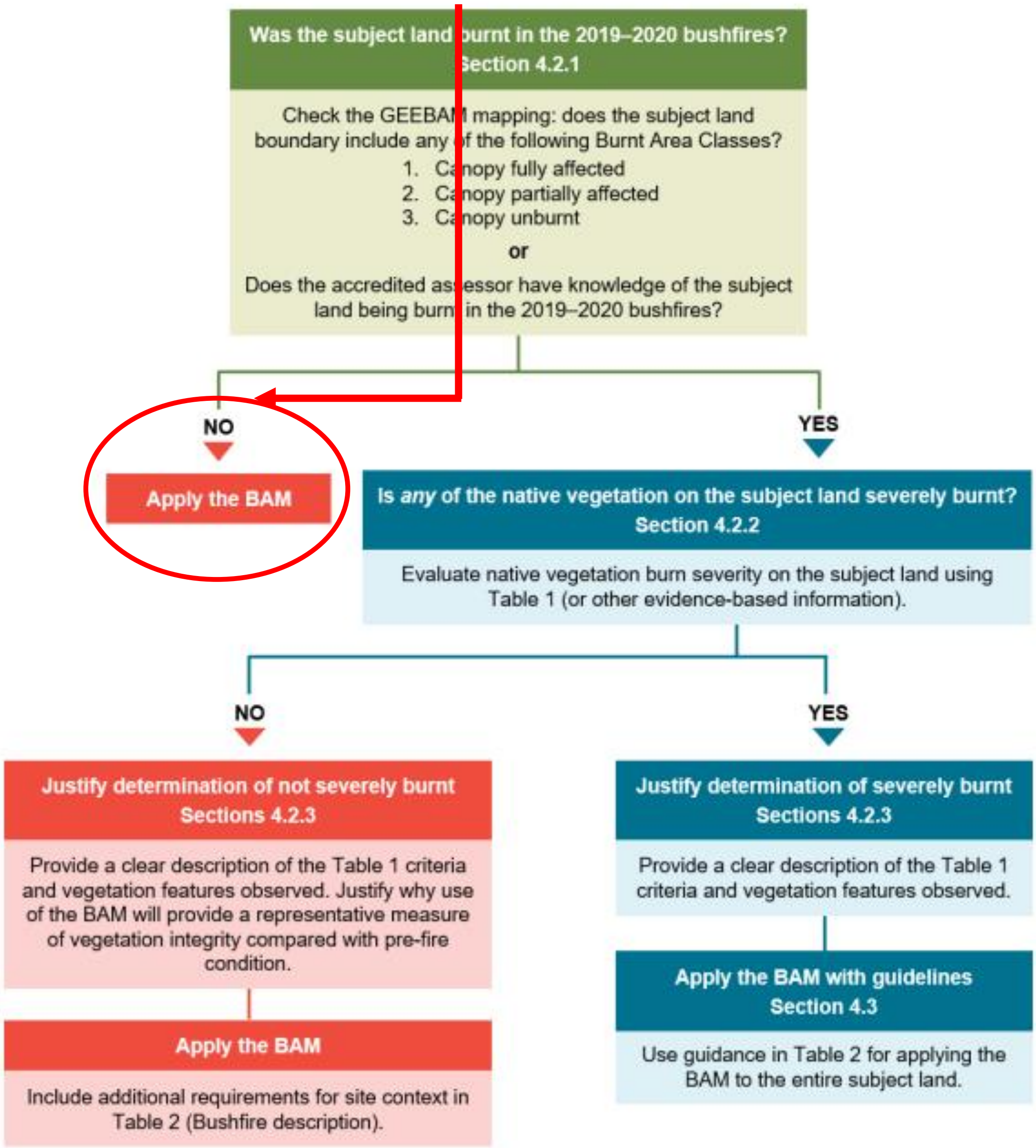


Figure 6 Determine whether native vegetation on a subject land is severely burnt and requires application of the Guideline to the Biodiversity Assessment Method assessment.

2.2. Landuse history

The region has been subject to agriculture since settlement in the mid 1800's. Historic aerial imagery (from 1955 till present; Photograph 3 to Photograph 9Photograph 12), shows that the cleared areas of the study area have been cleared for over 50 years, and that also the paddock trees observed in the present day predate this clearing event. Historic imagery also reveals that existing areas of vegetation on steep sandstone slopes, are not regenerated from previous events and are potentially pre-European remnant patches of forest.

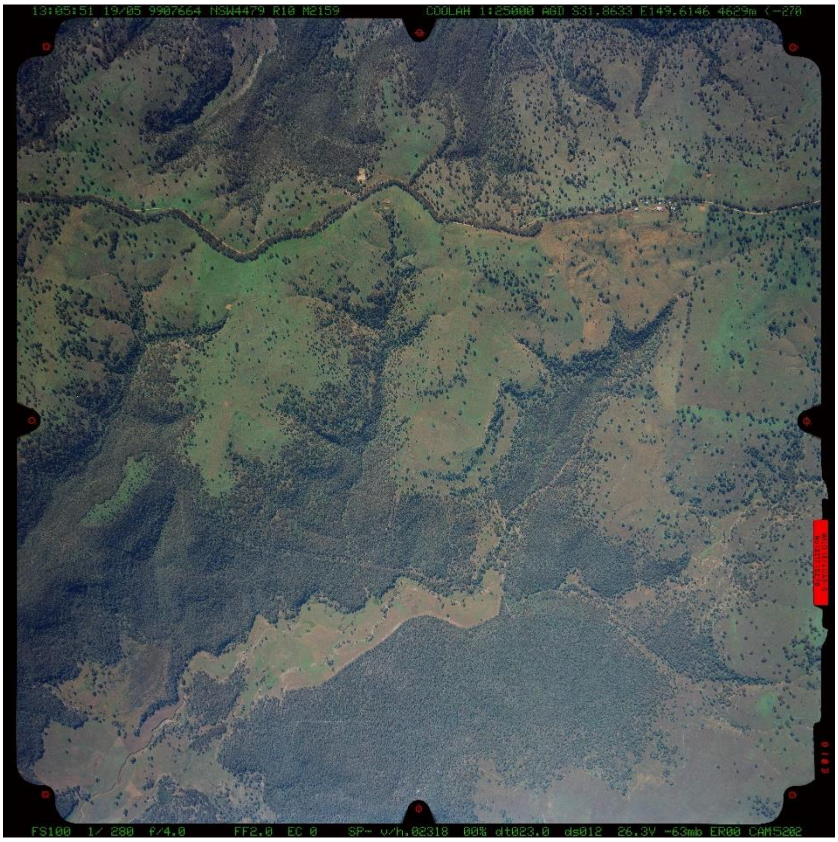
More recent chromatic aerial imagery from 1994 – 1999 reveals some of the extent of pasture improvement, with large portions of the landscape a vibrant green from superphosphate usage. This bright colour is also likely to be a result of pasture improvement from under sowing of common pasture species such as *Phlaris aquatica*, *Lolium perenne,* and *Hoardeum vulgare* which are prevalent groudcovers throughout the majority of the study area.

The study area consists almost entirely of moderate to high intensity agricultural use. The majority of host landholders operate agricultural enterprises as their primary income, and as such all accessible areas of land are continuously used for cropping, grazing, or pasture improvement. The most commonly undertaken agricultural pursuit is beef farming.

The intensity of agricultural usage of the landscape is further substantiated by the Landuse 2017 spatial dataset by NSW Department of Planning, Industry and Environment (DPIE). This dataset is produced following the *Native vegetation regulatory map method statement* (DPIE, 2017), which describes the input datasets, spatial interrogation, and methodology of ALUM classification for the purposes of defining the native vegetation regulatory map. Across the study area, fourteen landuse categories are identified, of which 87% are linked to agricultural activity, 11% residual native vegetation, and the remaining 2% residential and infrastructure related land uses.

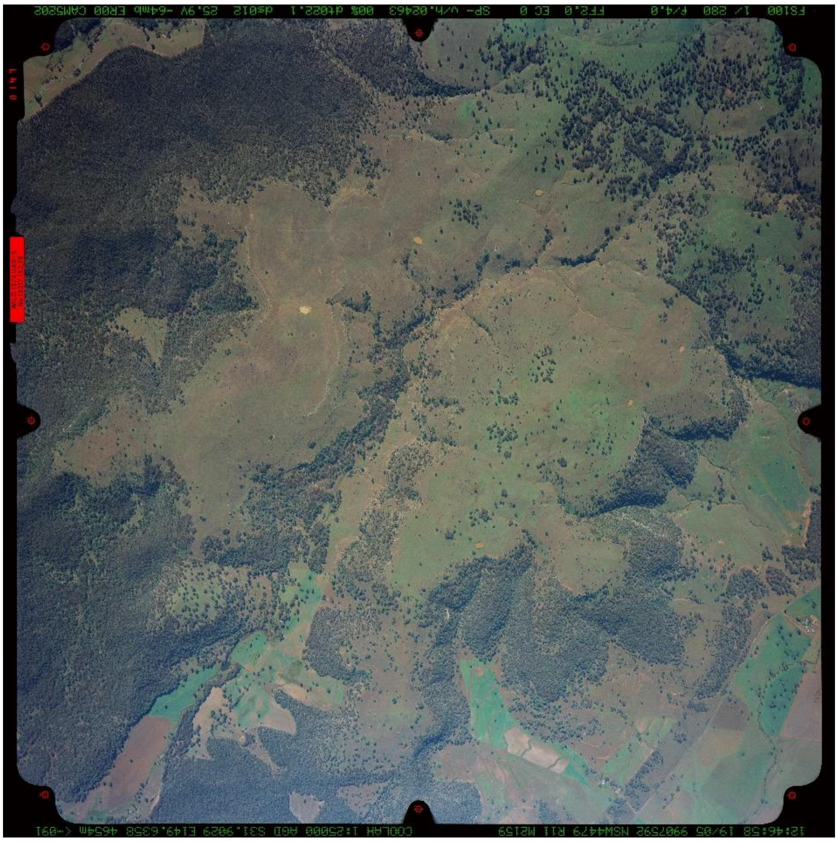
Of the landuse layers identified, 60% of the study area is consistent with exempt land under s60H of the *Local Land Services Act 2013* (LLS Act). Further detail of the completion of the NSW Native Vegetation regulatory map is provided in Section 2.3 of this report.

Photograph 3 Historic imagery at Northern area of Mount Hope Cluster (1955; NSW LPI)



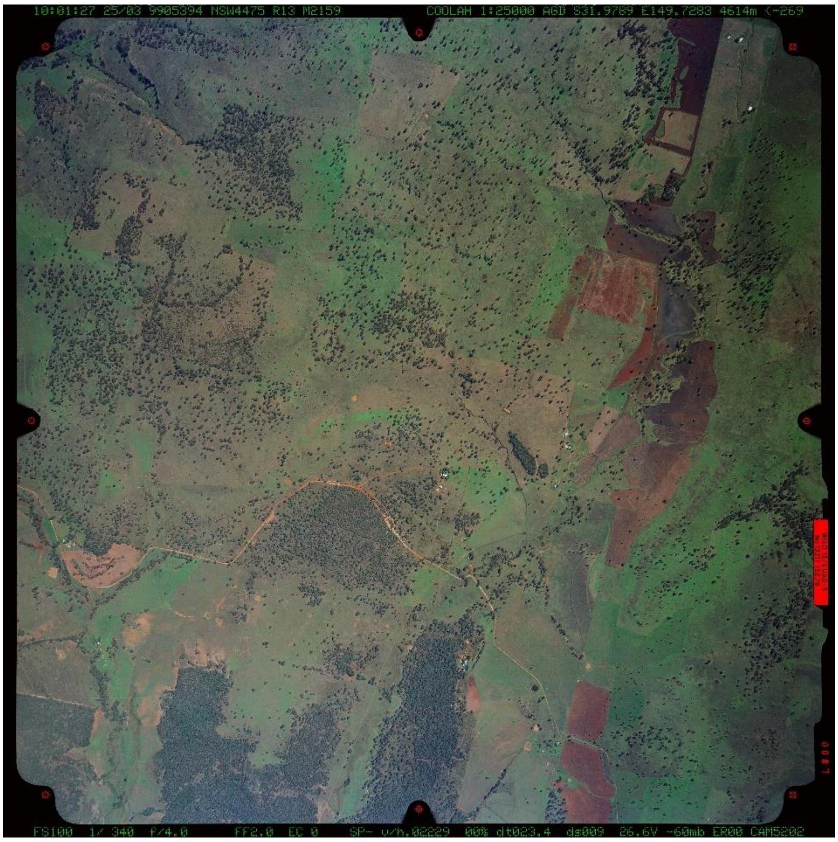
Photograph 4 Historic imagery at Northern area of Mount Hope Cluster (1999; NSW LPI)

Photograph 5 Historic imagery at southern area of Mount Hope Cluster (1955; NSW LPI)

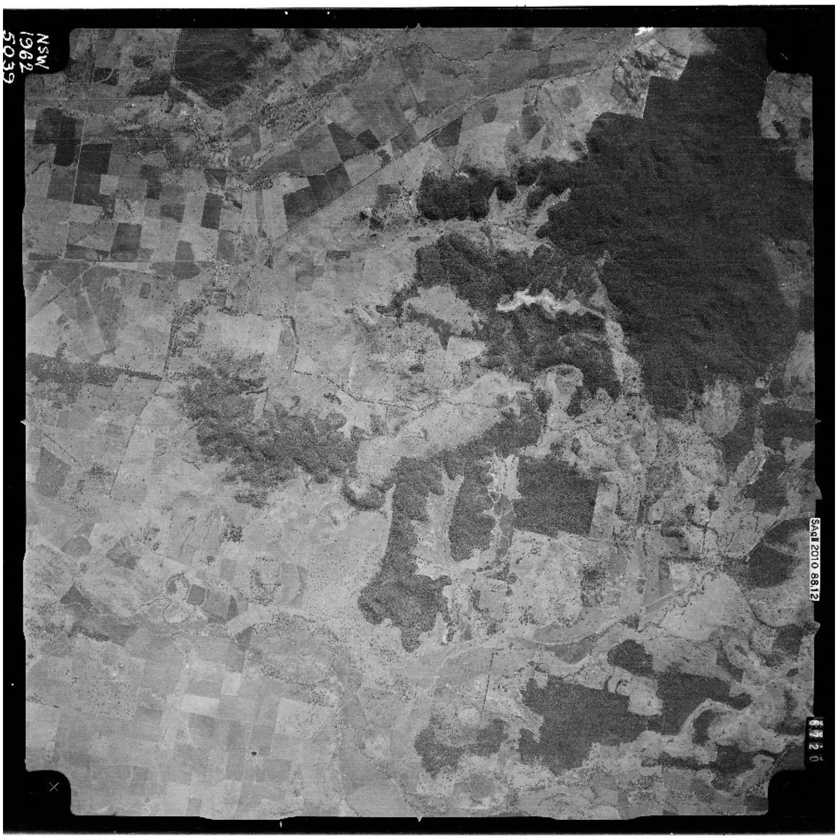


Photograph 6 Historic imagery at southern area of Mount Hope Cluster (1999; NSW LPI)

Photograph 7 Historic imagery from Girragulang Road cluster (1970; NSW LPI)

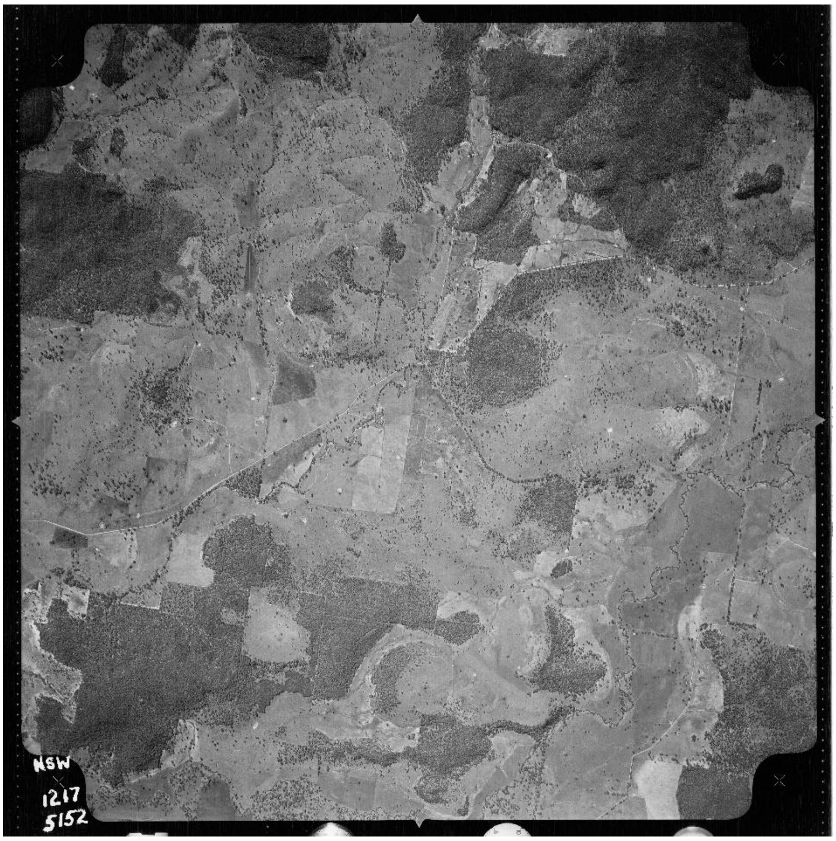


Photograph 8 Historic imagery from Girragulang Road cluster (1999; NSW LPI)

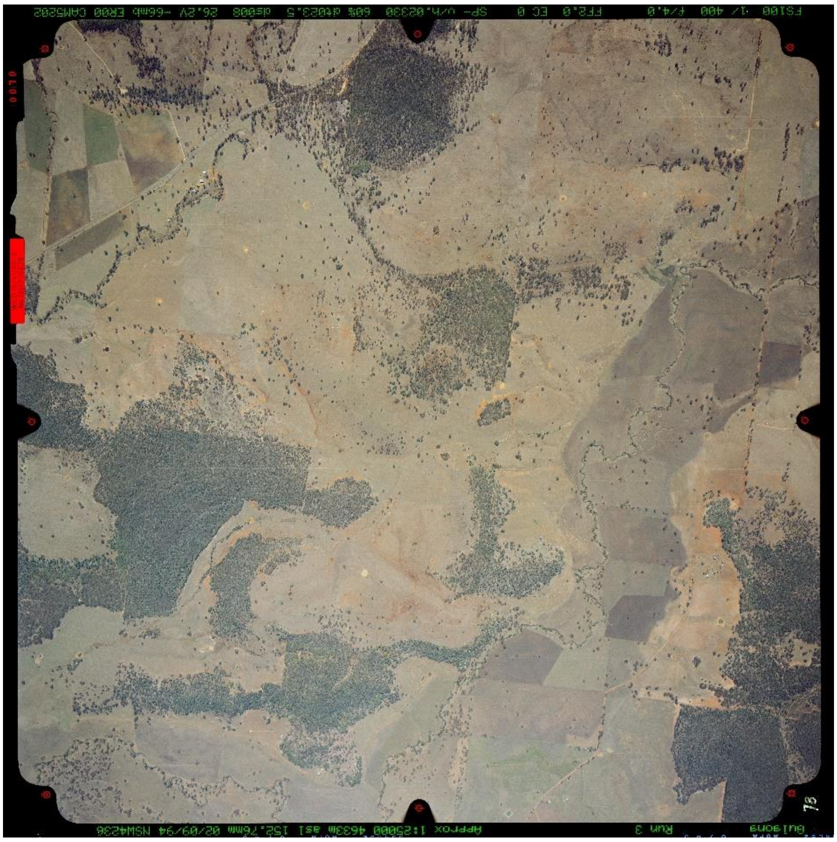


Photograph 9 Historic imagery from Leadville cluster (1971; NSW LPI)

Photograph 10 Historic imagery from Leadville cluster (1994; NSW LPI)



Photograph 11 Historic imagery from southern transmission line (1964; NSW LPI)



Photograph 12 Historic imagery from southern transmission line (1994; NSW LPI)

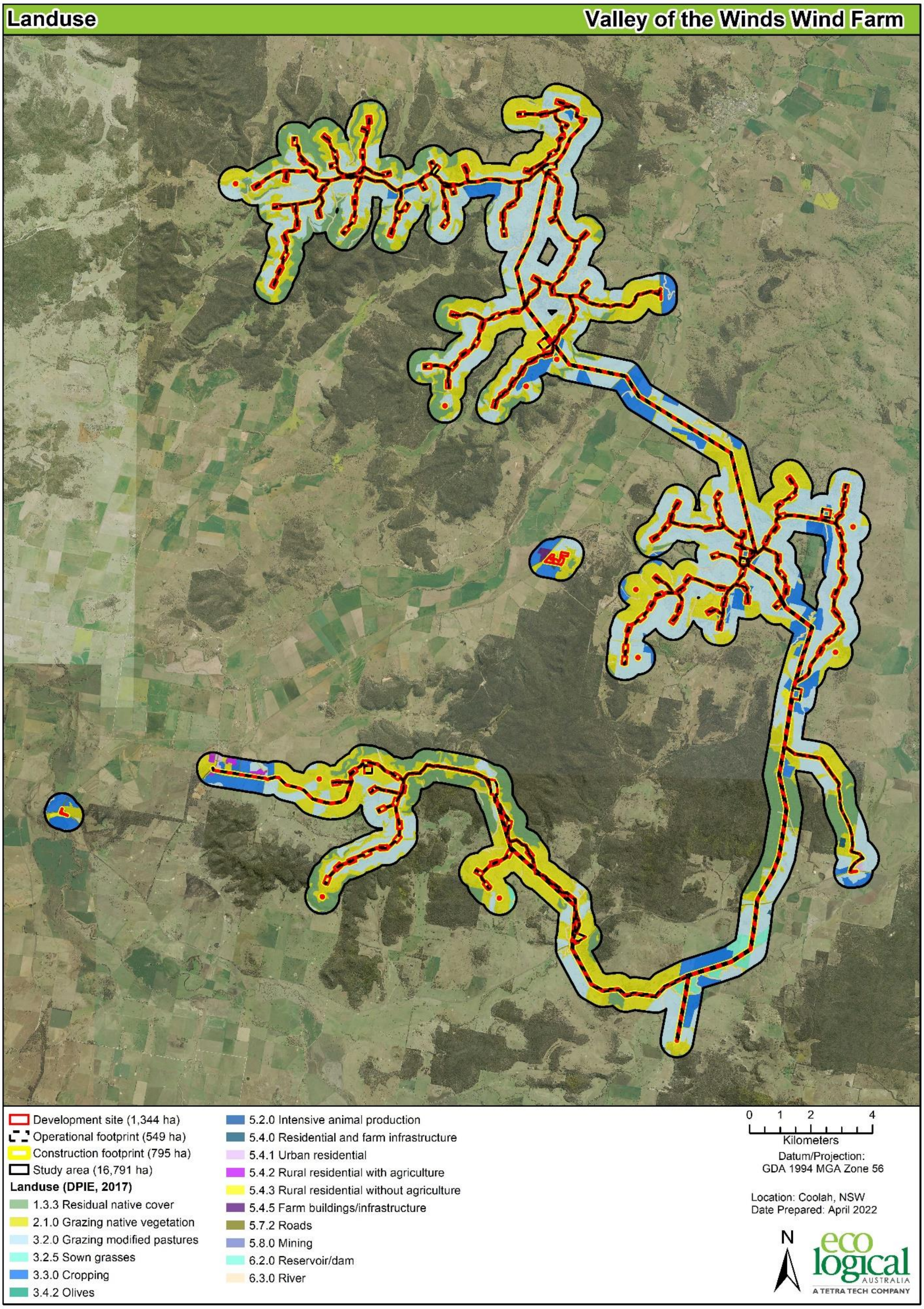


Figure 7 Landuse mapping

2.3. Native vegetation regulatory map assessment

Under the LLS Act, all land in NSW is categorised into three broad types:

- **Category 1 – Exempt land**, where clearing of vegetation is unregulated (s60H LLS Act)
- **Category 2 – Regulated land**, where a biodiversity assessment is required for any activity requiring clearing of native vegetation. Category 2 land can be Vulnerable regulated land, Sensitive regulated land, or Vulnerable and sensitive regulated land (s60I LLS Act)
- **Excluded land** – where the LLS Act (and the two land categories described above) does not apply (s60A LLS Act).

The BAM does not assess biodiversity values for native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of the LLS Act), other than the additional biodiversity impacts under clause 6.1 of the NSW *Biodiversity Regulation 2017* (BC Regulation). Category 1, Category 2, and Excluded land should be shown on the Native Vegetation Regulatory map (NVR map). An interim map is currently published on https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=NVRMap however the location of Category 1 – Exempt land is not provided. Significant areas of Category 2 – regulated land are also not shown on this map. As such ELA have developed a mapping approach to provide a completed NVR Map, to be applied to this assessment.

The land category criteria and approach below was confirmed by the NSW Biodiversity Conservation and Science Division (BCSD) in Dubbo. Below are the criteria for the mapping approach.

2.3.1. Criteria for Category 1 – exempt land

- Land cleared of native vegetation as at 1 January 1990, or lawfully cleared between 1 January 1990 and the commencement of the LLS Act,
- Land that contains grassland or other non-woody vegetation that have been significantly disturbed or modified, therefore taken to be cleared (criteria established in the LLS Reg),
- Land that contains low conservation value grasslands or groundcover,
- Land that contains native vegetation identified as regrowth in a property vegetation plan,
- Land that is Biodiversity Certified,
- Land authorised to be re-categorised e.g. certificate authorising clearing under the LMC.

2.3.2. Criteria for Category 2 – regulated land

- The land was not cleared of native vegetation as at 1 January 1990 (unless section 60H (2) or (3) requires the land to be designated as category 1-exempt land),
- The land was unlawfully cleared of native vegetation after 1 January 1990,
- The land contains native vegetation that was grown or preserved with the assistance of public funds (other than funds for forestry purposes),
- The land contains grasslands that are not low conservation value grasslands (or low conservation grassland beneath the canopy/drip-line of woody native vegetation),
- The land is (or was previously) subject to a private native forestry plan approved under Part 5B of the LLS Act,
- The land is a travelling stock reserve (unless the land is in the Western Division of the State)
- The land is identified as “proximity area for coastal wetlands” or “proximity area for littoral rainforest” by State Environmental Planning Policy (Coastal Management) 2018 if that land is in

the coastal wetlands and littoral rainforests area of the coastal zone referred to in the Coastal Management Act 2016

2.3.3. Criteria for excluded land (from s60A LLS Act):

- urban areas of the State to which State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 applies,
- National park estate and other conservation areas, namely—
    - a wilderness area declared under the NSW *Wilderness Act 1987*, or
    - land reserved under the NSW *National Parks and Wildlife Act 1974* or acquired by the Minister administering that Act under Part 11 of that Act, or
    - land dedicated or set apart as a flora reserve under the NSW *Forestry Act 2012* (or any Act repealed by that Act), or
    - land to which an interim heritage order or listing on the State Heritage Register under the NSW *Heritage Act 1977* applies, or
    - a declared area of outstanding biodiversity value under the NSW *Biodiversity Conservation Act 2016*, or
    - an area declared to be critical habitat under Division 3 of Part 7A of the NSW *Fisheries Management Act 1994*, or
    - a declared World Heritage property within the meaning of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, or
    - land dedicated or reserved under the NSW *Crown Lands Act 1989* for similar public purposes for which land is reserved, declared or listed under the other Acts referred to in this paragraph, or
    - land to which an interim protection order under Part 11 (Regulatory compliance mechanisms) of the NSW *Biodiversity Conservation Act 2016* applies, or
    - Lord Howe Island,
- State forestry land, namely—
    - land that is a State forest or timber reserve under the NSW *Forestry Act 2012*, or
    - land acquired under Division 4 of Part 3 of the *Forestry Act 2012* for the purposes of a State forest (not being any such land acquired for the purposes of a timber plantation).

2.3.4. Interpretation of mapping resources

Below is how the interpretation of these factors are applied to this project. The following datasets are available for use in the determination of Native Vegetation Regulatory Map land mapping:

- The existing **Interim native vegetation regulatory map**, available at https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=NVRMap
- **NSW Landuse 2017 v1.2 (DPIE, 2020)** which classifies landuse history across NSW in accordance with the Australian Land Use and Management ALUM Classification Version 8
- **Native vegetation regulatory map method statement** (DPIE, 2017), which describes the input datasets, spatial interrogation, and methodology of ALUM classification for the purposes of defining the native vegetation regulatory map. This document provides classification of landuse history, into the three land categories described above.

- **NSW Native Vegetation Extent 5m Raster v1.2** which assists on discriminating tree cover and woodlands from other terrain elements.

The interpretation of each land category is described below in Table 5. These three datasets are the primary resources for determining native vegetation regulatory mapping, as they are NSW government endorsed products. These datasets are also the baseline of the assessment of the 'Reasonable approximation of category 2 – regulated land and category 1 – exempt land' (Appendix B; DPIE, 2020).

Broadly, to be classified as Category 1 land and would need to not contain woody vegetation, would need to be mapped as a Category 1 ALUM unit, and would also need to occur on rural land where the LLS act applies. Land will be mapped to the most appropriate map unit, based on the lines of evidence available.

Below are primary and supplementary lines of evidence that have been applied within the study area. Primary evidence would firstly establish the baseline land category map, and supplementary evidence can be used to inform a mapping decision in areas that may have doubt. The primary lines of evidence are taken to be the most certain lines of evidence, as they are all products of the NSW DPIE.

This application of the NVR map has only been applied to the study area, and only on participating landholder properties.

The final NVR map for the study area is shown in Figure 8.

Table 5 Native vegetation regulatory map mapping protocol

Primary lines of evidence								Supplementary lines of evidence that may also be used				
Category	Interim Native Vegetation Regulatory Map		Landuse mapping (DPIE, 2017)		NSW Native vegetation extent 5m (DPIE, 2017)		Land tenure	Existing biodiversity values (ELA, 2021)		Historic aerial imagery (where available)		Interim Grasslands and other Groundcover Assessment Method (DPIE, 2017)
Category 1 - Exempt land	Category 1 land is not shown on this map	and	Land identified as Category 1 under the Australian Land Use and Management classification system as per Figure 7 of the Native Vegetation Regulatory Map Method Statement and the Landuse 2017 spatial file	and	Any land with the following attributes: Not native, water, candidate native grasslands, forestry plantation. Tree cover matrix is also included in this category, as it regularly represents analysis error within the landscape (as per DPIE example below). Areas that actually contain trees are captured in Category 2 – regulated land	and	Any land not excluded under s60a of the LLS Act	Cleared land with no native biodiversity (roads, houses, sheds and yards, crops). Low condition grazing pasture dominated (>50% cover) by exotic pasture species (as demonstrated through VI and floristic plot data) are also included in this category.	or	Imagery shows land was cleared of native vegetation prior as of 1 January 1990 (evidence of cropping, pasture improvement, bulldozed roads and boundaries etc)	or	Low conservation value grasslands or groundcovers
Category 2 - Regulated land	Land identified as sensitive or regulated or sensitive and regulated Category 2 land	or	Land identified as Category 2 under the Australian Land Use and Management classification system as per Figure 7 of the Native Vegetation Regulatory Map Method Statement and the Landuse 2017 spatial file	or	Any land with the following attributes: Tree cover	or	Any land not excluded under s60a of the LLS Act	Woodland and forest with existing trees and shrubs that was not cleared prior as of 1 January 1990. High composition and structure native pastures and derived native grasslands with high vegetation integrity.	or	Imagery shows land contains woodland or forest	or	Moderate or high conservation value grasslands or groundcovers
Excluded land	Land identified as excluded land	or	Land identified as Excluded under the Australian Land Use and Management classification system as per Figure 7 of the Native Vegetation Regulatory Map Method Statement and the Landuse 2017 spatial file	or	N/A	or	Any land excluded under s60a of the LLS Act	N/A	or	N/A	or	N/A

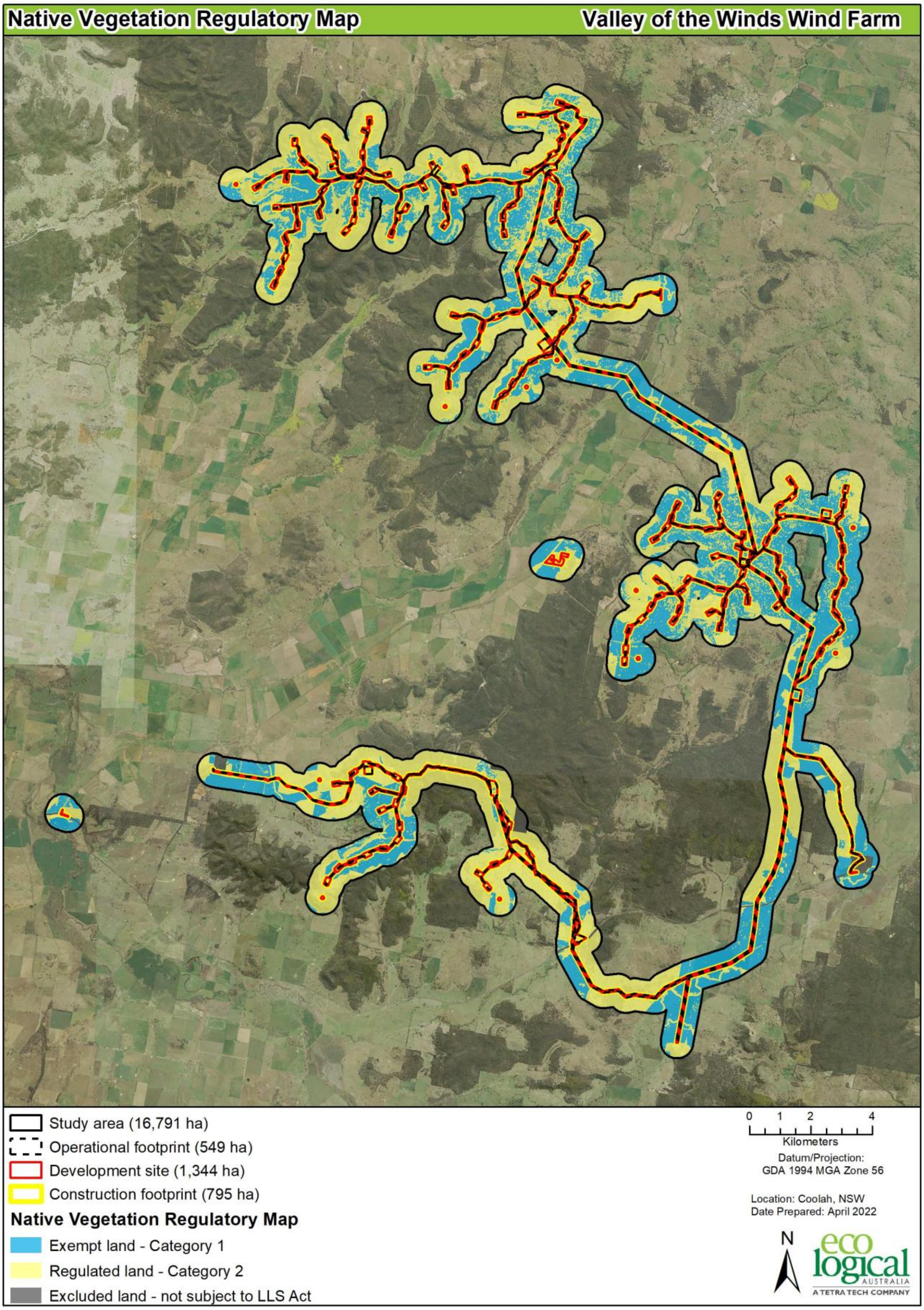


Figure 8 Native Vegetation Regulatory Map

3. Native Vegetation

The majority of the study area is located on land that is currently, and historically, used for grazing and agriculture. In these areas the native understorey and midstorey are diminished and often contain significant amounts of non-native vegetation.

Vegetation within the Leadville area is the most poorly degraded within the study area, due to ongoing agricultural practices and a significant uncontrolled fire in 2017, which burnt a large portion of remnant vegetation between the Girragulang Road and Mount Hope clusters. Due to the severity of the fire and drought conditions for a large period following the fire event, the vegetation in this area may take more than 50 years to recover.

There are some patches of better condition native vegetation around the slopes adjacent to the study areas at the Girragulang Road and Mount Hope clusters, as well as in riparian areas in steep gullies north of the study area.

3.1. Geology of the study area

The Liverpool Range is the largest lava field province in NSW. The lava field province is dated between 32 and 40 million years with the lava fields made up from multiple eruption fissures rather than a single volcanic vent (NPWS 2003). These volcanic eruptions flowed over the existing topography, covering the sandstone formed by sediments and river gravels around 150 million years ago (NPWS 2003).

Geology mapping of the region has been undertaken at a 1:250,000 scale by the Department of Mineral Resources (Figure 9; DMR, 2002). The majority of the underlying geology of the study area buffer is mapped as basalt (43%) with sandstone (33%) also making significant contributions. The majority of basalt geology mapping is associated with the Tertiary Liverpool Range Volcanics and the majority of the sandstone geology is associated with the Jurassic Pilliga Sandstone group.

Similarly, Great Soil Group (GSG) mapping also indicates that the majority of the study area includes Chocolate Soils on ridgelines in the north of the study area, and Earthy Sands in the southern portion of the study area. Soils along the Talbragar River are Black Earths (Figure 10). Soil landscapes were also considered across most of the study area primarily as part of the Soil and Land Resources of the Merriwa Plateau 1:100,000 mapping (OEH 2014), as well as the Soil Landscapes of Dubbo 1:250,000 mapping (DPIE 2018). The most widespread soil landscapes within the 500m investigation area are summarized in Table 6. An additional 16 soil landscapes occur within the buffer but make up <4% of the total area.

Tertiary Volcanics basalt-derived soils (Ant Hill) are the predominate soil type in the study area and cover the high elevation plateau of undulating hills from approximately 300 – 800 m ASL. The basalt soils range from shallow lithosols on hills crests, to deeper chocolate soils and brown clays on lower slopes (Photograph 13). Sandstone derived soils (Turill) also make up a high proportion of soil types in the study area, particularly at the southern end (Photograph 14). These soil types are significantly lower in fertility and water holding capacities in comparison to the basalt derived soils. Smaller areas of fertile soils occur on floodplains and alluvial terraces derived from basaltic alluvium (Photograph 15).

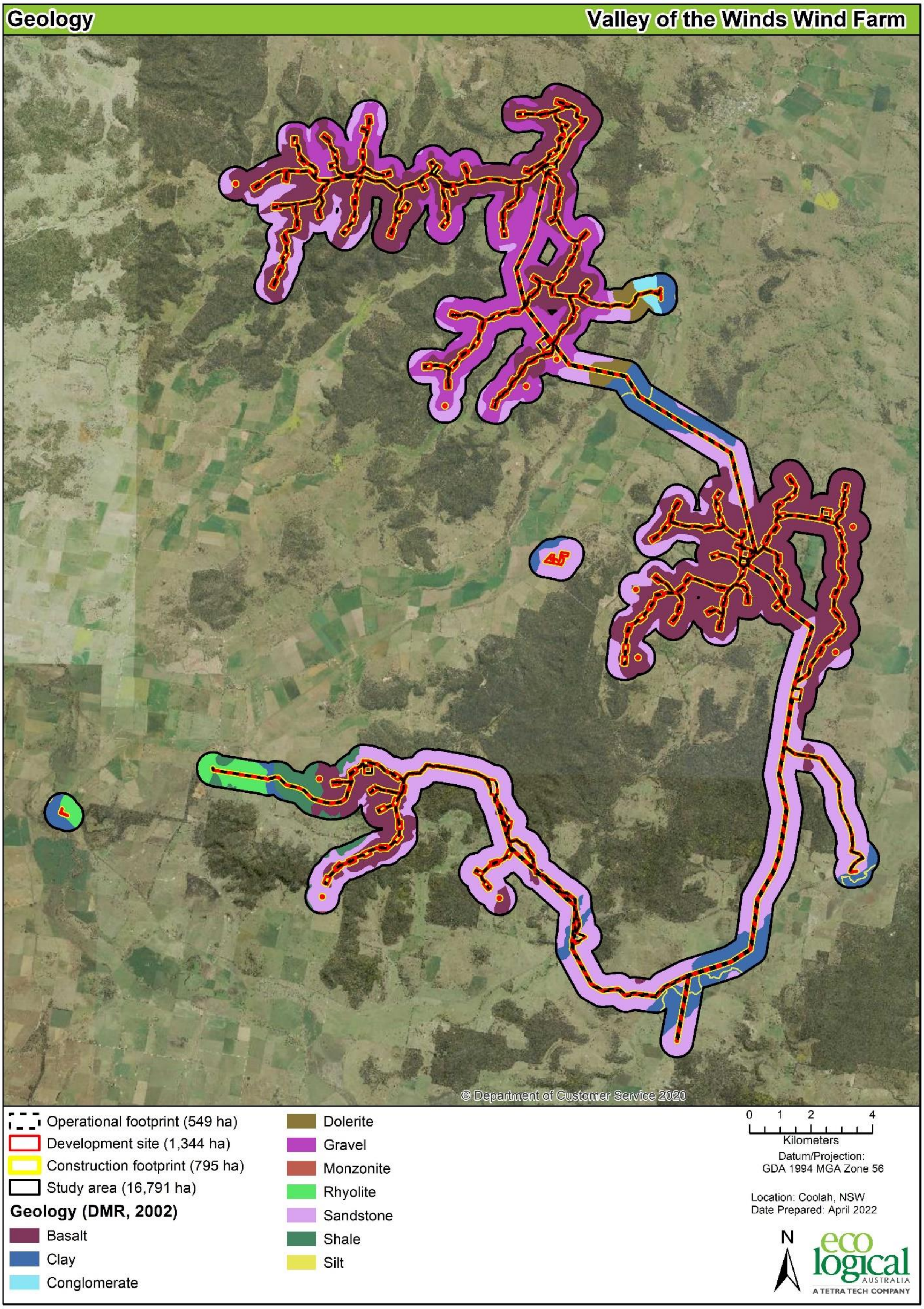


Figure 9 Geology

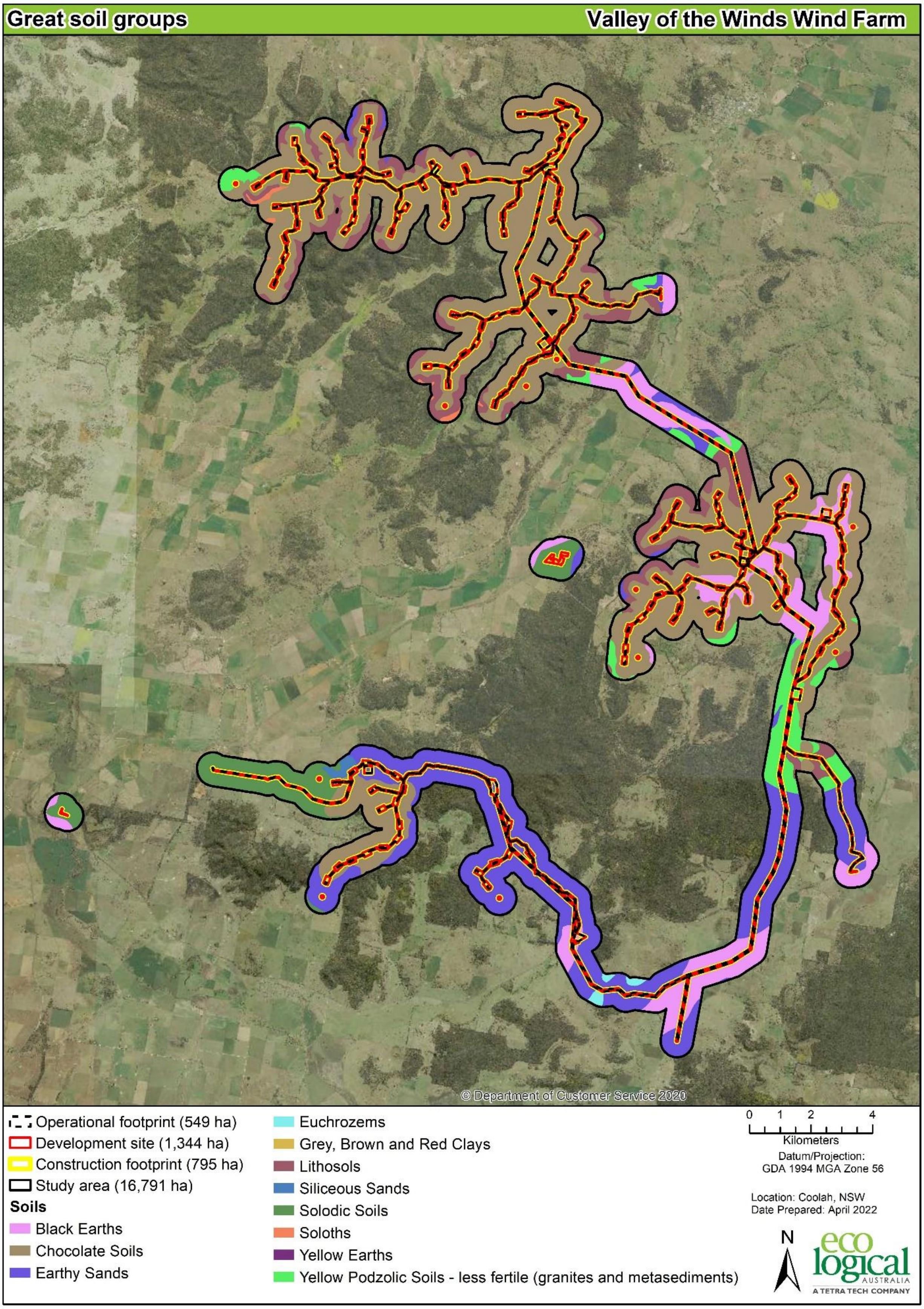


Figure 10 Great soil group mapping

Photograph 13 Chocolate brown soils derived from basalt parent material

Photograph 14 Sandy creek bed with sandy alluvium and sandstone parent material

Photograph 15 Basalt derived alluvial soils on floodplains used for intensive cropping and grazing

Table 6: Soil landscapes mapped in the study area

Source	Name	Description
OEH 2014, DPIE 2018	Ant Hill	Rolling hills with benched side slopes on **Tertiary Basalt** of the Merriwa Plateau occurring mainly in the Hunter Region with some extending into the Central West catchment. Slopes 20 - 32%, local relief 90 - 200 m, elevation 300 - 1160 m. Extensively cleared woodland and open-woodland.
OEH 2014	Ant Hill variant a	Undulating to rolling low hills on **Tertiary basalts** of the Merriwa Plateau. Slopes 5 - 20%, local relief 30 - 100 m, elevation 300 - 800 m. Extensively cleared open-forest and woodland.
DPIE 2018	Turill	Undulating low hills with some sandstone outcrop. **Narrabeen Sandstone**, mudstone, and Jurassic shale and sandstone. Relief to 30 - 90 m; slopes 5 - 20%. Dry sclerophyll woodland dominated by broad leaved ironbark, red ironbark and narrow-leaved ironbark.
OEH 2014	Cranbourne	Level to undulating **Tertiary basalt** plateaux and broad benches of the Merriwa Plateau and southern Liverpool Ranges. Level to gently inclined slopes generally <5%, local relief to 30 m, elevation ranges from 360 - 780 m. Open-forests and woodland mostly cleared for grazing and cropping.
OEH 2014	Summerhill	Undulating rises to rolling rises on **Jurassic sandstone often influenced by Tertiary basalt** flows in the west of the Hunter Region. Slopes 3 - 15% (typically <10%), local relief <30 m, elevation 230 - 570 m. Rock outcrop including ironstones generally <20%. Extensively cleared open-forest and woodland.
OEH 2014	Summerhill variant a	Rolling rises and rolling low hills on **Pilliga Sandstone** beds in the west of the Hunter Region. Slopes 10 - 33%, local relief <30 m, elevation 230 - 570 m. Rock outcrop <20%. Partially cleared open-forests for cattle grazing on native pastures.
OEH 2014	Munmurra	Steep to precipitous hillslopes and gorges of **Jurassic quartz and lithic sandstone**, conglomerate and siltstone of the Pilliga and Purlewaugh Beds in the Central West and Hunter Regions. Slopes 25 - 150% (typically >33%), local relief 30 - 140 m, elevation 260 - 510 m. Uncleared open-forests and shrubby woodland.

3.2. Survey Effort

3.2.1. Areas without survey access

The survey effort presented below includes detailed site inspections and investigations to the entirety of the wind farm clusters, as well as a significant portion of the transmission line routes. South of the Golden Highway, there was limited field access to the development site. As such, PCT mapping, threatened species habitat assessment, and surveys were conducted using the most practical means without illegal trespass onto private land.

Areas that have not been accessed and do not have any field investigations, will have those studies completed at such a time when access becomes available. Until this time, desktop information as well as the findings of remaining surveys have been used to infer vegetation types in areas without access.

3.2.2. Initial site inspections and vegetation validation

The initial site inspections were carried out by ELA Senior Ecologists Martin Sullivan, Alex Pursche and Tom Kelly during three survey periods in 2019 and 2020. Data was collected within the project investigation area, with the primary aim of these initial site surveys being to:

- Collect Rapid Data Points (RDPs) to validate vegetation and assist in developing a Plant Community Type (PCT) map across the wind farm study area.
- Consider the extent of Threatened Ecological Communities (TECs) listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) or Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) across the project investigation area.
- Identify habitats for threatened species.
- Validate suitability of regional spatial datasets for use for the project (such as landuse history and cliffline mapping).

The majority of the study area was accessible by existing tracks or paddocks. Approximately 230 RDPs were taken within vegetation patches, as well as locations where changes in vegetation community boundaries occurred.

All field data was collected using mobile devices loaded with ESRI Collector for ArcGIS software and relevant Geographic Information System (GIS) datasets (target plots, aerial imagery, vegetation mapping, drainage, contours etc.) and ESRI Survey123.

Vegetation validation RDPs recorded the dominant canopy, midstorey and groundcover species; structural cover condition; vegetation structure; potential PCT; priority or environmental weed species and cover; threatened species and count; soil texture; fire history; vegetation condition; landform element and pattern; notes; photo number; surveyor; and date were recorded. RDPs are less comprehensive than full floristic vegetation plots, however they allow for rapid identification of PCTs which could then be extrapolated through Aerial Photographic Interpretation (API).

The following vegetation formations were identified across the study area (Figure 11):

- Dry sclerophyll Forests (Shrubby sub-formation)
- Forested Wetlands
- Grassy Woodlands

- Rainforests

In addition, Low Condition Native Grassland and Exotic/cleared areas were also identified within the study area.

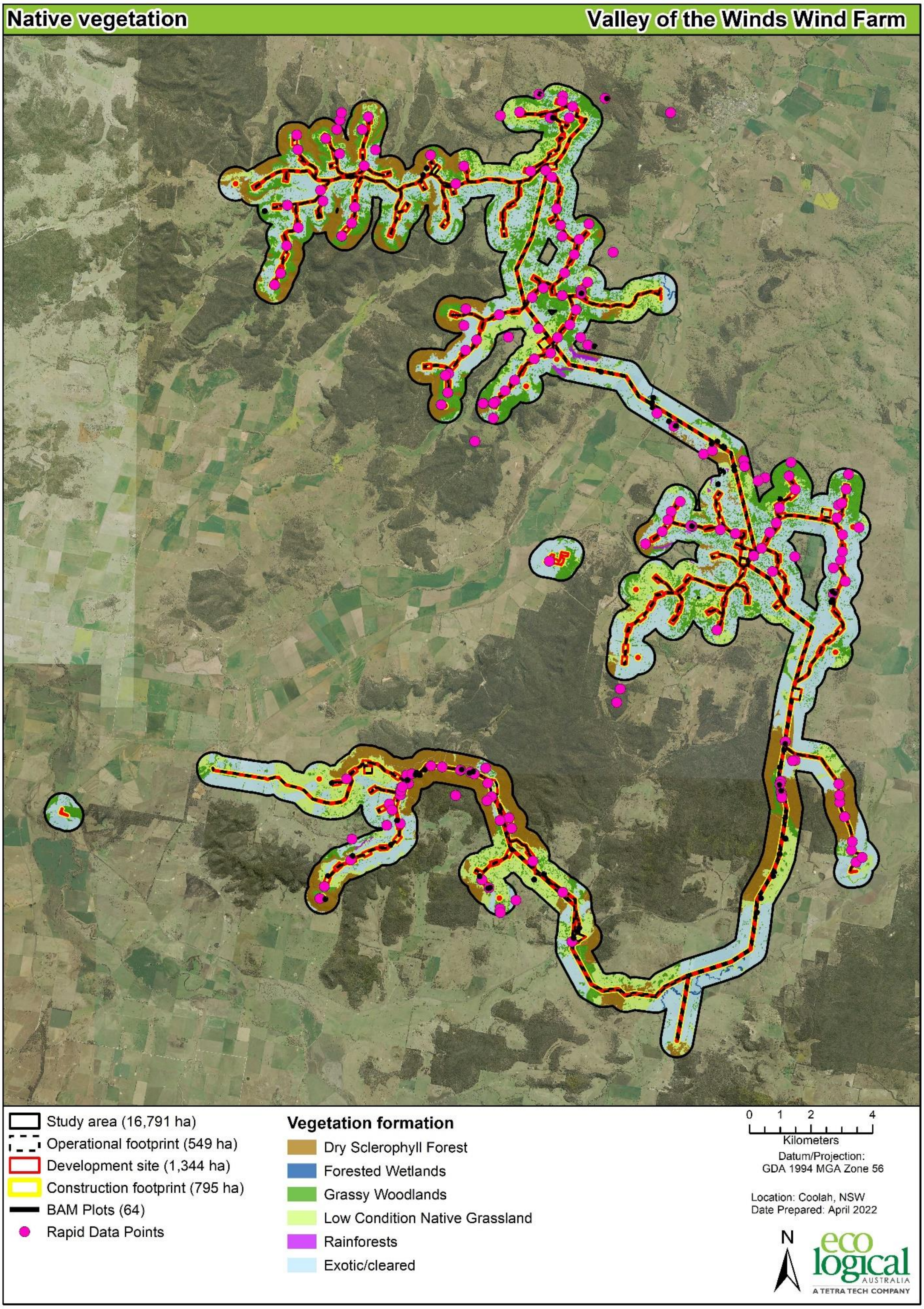


Figure 11 Native vegetation formations

3.2.3. Unmanned Aerial Vehicle survey

An Unmanned Aerial Vehicle (drone) was utilised to enhance the accuracy of Plant Community Type mapping. A DJI Mavic Air was flown by a registered operator in accordance with the Civil Aviation Safety Authority (CASA) standard operating conditions. High resolution photographs were taken across the study area. Aerial photographs allowed for post flight analysis of dominant canopy species, vegetation structure, condition and interpretation of cover of various Plant Community Types (Photograph 16).

Photograph 16 Example of drone aerial image showing transition (left to right) from Narrow-leaved Ironbark - Cypress Pine shrubby open forest to Eucalyptus 'albemol' Grassy Woodland

3.3. Native Vegetation Patterns

The study area is spread across eleven properties, overlapping with three bioregions, five subregions and nine Mitchell Landscapes, reflecting the diversity of the underlying geology and soil properties, geomorphology, and microclimates in the study area. Soil fertility and land use history appear to be the most important factors influencing the distribution of vegetation communities in the study area. The main broad geological components affecting the vegetation are the Tertiary Volcanic basalt flows of the Liverpool Range, and the Jurassic sandstones (DPIE 2005, McRae and Cooper 1985).

Twelve vegetation communities in variable condition states were identified across the study area:

- *Eucalyptus 'albemol'* Grassy Woodland on basalt derived soils (moderate and high condition)
- Derived Native Grassland on basalt and sandstone derived soils (low condition)
- Rusty Fig Rainforest on basalt derived soils in sheltered sites (moderate condition)
- Narrow-leaved Ironbark Open Woodland on sandstone derived soil with basalt influence (moderate condition)
- Inland Grey Box woodland on low sandstone foothills (moderate condition)

- Narrow-leaved Ironbark – Cypress Pine shrubby open forest on sandstone (low, burnt, regenerating and good condition)
- Tumbledown Red Gum on slopes and exposed cliffs (moderate condition)
- Inland Scribbly Gum – Narrow-leaved Stringybark shrubby open forest on sandstone (good condition)
- Yellow Box on black alluvial soils (moderate and good condition)
- River Oak woodland fringing creeks on lower alluvial plains (moderate condition)
- River Red Gum riparian woodland (moderate condition)
- Crops

The following sub-sections includes a description and photograph of the best example of each of these vegetation communities present.

3.3.1. *Eucalyptus 'albemol'* grassy woodland on basalt derived soils

The fertile basalt soils across the majority of the study area at higher elevations support stands of grassy box gum woodland, typically dominated by an intergrade of *Eucalyptus albens* (White Box) and *Eucalyptus moluccana* (Grey Box) known as *Eucalyptus 'albemol'* (McRae and Cooper 1985) (Photograph 17). *Eucalyptus 'albemol'* grassy woodland was likely the predominant vegetation type on these basalt soils pre-European settlement. The remaining areas of *Eucalyptus 'albemol'* grassy woodland are limited in comparison to pre-clearing extent. The vast majority of patches are surrounded by grasslands dominated by either exotic or native pasture grasses. Grazing and camping under the trees by sheep and cattle has resulted in the groundcover under the trees often in poorer condition than the surrounding grassland, and is often dominated by *Urtica incisa*, *Silybum marianum*, *Marrubium vulgare* or bare ground.

These areas have been mapped as 'moderate' in condition due to the high proportion of exotic groundcover species and lack of functional habitat attributes such as tree hollows and fallen logs. A small area of this community is mapped as 'good' condition with a lower proportion of exotic species in the ground layer.

The canopy is typically composed of well-spaced *Eucalyptus 'albemol'* and *Brachychiton populneus* (Kurrajong). A high amount of floristic variation occurs in this community due to grazing and clearing history. For example, *Brachychiton populneus* may be the only remaining tree species present in this community. Where a midstorey is present, it is made up of sparse shrubs and the ground layer is typically dominated by grasses and forbs including *Dichanthium sericeum* (Queensland Blue Grass), *Aristida* species (Wiregrass), *Austrostipa aristiglumis* (Plains Grass), *Austrostipa scabra* (Speargrass) and *Bothriochloa macra* (Red Grass). Commonly recorded exotic pasture species also contribute a high amount of cover to the ground layer including *Lolium perenne* (Perennial Ryegrass), *Phalaris aquatica* (Phalaris), *Eleusine indica* (Crowsfoot Grass), *Dactylis glomerata* (Cocksfoot), *Medicago* species and *Trifolium* species.

Photograph 17 Eucalyptus 'albemol' Grassy Woodland

3.3.2. Derived native grassland on basalt and sandstone derived soils

European settlement of the Coolah district began in the mid-1800s, primarily motivated by pastoral pursuits of sheep and cattle grazing and cropping (Hickson 2005; NPWS 2003). The demand for land for these purposes resulted in widespread clearing of native vegetation (NPWS 2003). The majority of grassy box gum woodland, as well as open forest on sandstone derived soils, has since been converted to derived native grasslands.

Derived native grasslands are native grasslands remaining after the removal or dieback of previous woody canopy vegetation, to a point where woody vegetation has less than 10% cover (Benson 1996; Bell 2021). Two separate communities were mapped based on the broad soil types of basalt or sandstone.

A very high amount of spatial and temporal floristic variation in the cover and abundance of native and exotic groundcovers is observed in both communities, likely influenced by rainfall and seasonality (Burrows 2004), as well as grazing intensity and fire history. Some species were consistently recorded between both communities such as *Austrostipa scabra* (Speargrass), while other species appeared to favour soil types. The derived native grasslands are maintained by sheep and cattle grazing, with a variable amount of exotic species favoured by frequent disturbance and nutrient enrichment from livestock, and the addition of superphosphate fertiliser in some areas applied as aerial topdressing (Photograph 18)

Native species commonly recorded in derived native grasslands on basalt soils include *Austrostipa aristiglumis* (Plains Grass), *Austrostipa verticillata* (Slender Bamboo Grass), *Bothriochloa macra* (Red

Grass), *Dichanthium sericeum* (Queensland Blue Grass), *Acaena ovina*, and *Cheilanthes sieberi* subsp. *sieberi.*

Native species commonly recorded in derived native grasslands on sandstone soils include *Cynodon dactylon* (Couch), *Eragrostis brownii* (Brown's Lovegrass), *Sporobolus elongatus* (Slender Rat's Tail Grass), *Dichondra repens* (Kidney Weed) and *Cymbonotus lawsonianus* (Bear's Ear). There were very few/no observations of *Themeda triandra* (Kangaroo Grass) dominated derived native grasslands, which may represent a community of higher conservation significance (Bell 2021). It is thought that Kangaroo Grass other grazing sensitive species may have once dominated in areas that are now occupied by *Austrostipa aristiglumis* (Lang 2008, Bell 2021).

Exotic species commonly recorded across both derived native grassland communities include *Avena* species (Oats), *Silybum marianum* (Variegated Thistle), *Carthamus lanatus* (Saffron Thistle), *Lolium perenne* (Perennial Ryegrass), *Phalaris aquatica* (Phalaris), *Eleusine indica* (Crowsfoot Grass), *Dactylis glomerata* (Cocksfoot), *Marrubium vulgare* (Horehound), *Trifolium repens* (White Clover), *Medicago* species and *Amaranthus* species. It is likely that some of these species such as *Lolium* species and *Medicago* species have been aerially sown in the past.

Photograph 18 Grassland communities vary according to soil type, grazing management, nutrient input, and microtopography

3.3.3. Rusty Fig Dry Rainforest in sheltered sites on basalt derived soils

On sites sheltered by short steep slopes or rocky outcrops, small, restricted pockets of dry rainforest vegetation occur. Dry rainforest communities are floristically and structurally similar to mesic rainforests, occurring in areas where rainfall is comparatively low and highly seasonal (Curran et al. 2008).

This community is dominated primarily by *Ficus rubiginosa* (Rusty Fig) with less frequent *Angophora floribunda* (Rough-leaved Apple) and *Brachychiton populneus* (Kurrajong) with occasional *Eucalyptus 'albemol'* bordering the community.

The midstorey is generally absent but may include low cover of *Acacia* species or juvenile Kurrajong.

Ground layer species include Calotis lappulacea, Microlaena stipoides var. stipoides, Cheilanthes sieberi subsp. sieberi, Austrostipa scabra subsp. scabra, Cotula australis, Dichondra repens, Sigesbeckia australiensis, Sporobolus creber, Crassula sieberiana, Vittadinia spp., Cymbopogon refractus, Wahlenbergia communis, Arthropodium milleflorum, Desmodium varians, Einadia hastata, Solanum cinereum and Veronica plebeia.

Exotic species are commonly observed in this community, generally where there are higher light levels in gaps or edges of the canopy dripline. Exotic species include *Arctotheca calendula, Anagallis* sp., *Sonchus oleraceus, Lepidium didymum, Solanum nigrum*.

Sheep, cattle and native herbivores graze the understorey, maintaining it in a low-moderate condition.

Photograph 19 Typical structure of Rusty Fig Dry rainforest occurring as isolated trees in sheltered location with simplified mid and ground layers.

3.3.4. Narrow-leaved Ironbark Open Woodland on sandstone derived soil with basalt influence

Open ironbark woodland primarily occurs in a small area at the southern end of the study area (Photograph 20). The community occurs on soils primarily derived from sandstone, with an influence of upslope Tertiary basalt derived soils, creating moderately fertile soils.

These areas contain a canopy composed predominantly of *Eucalyptus crebra* (Narrow-leaved Ironbark), with occasional *Eucalyptus sparsifolia* (Narrow-leaved Stringybark), *Eucalyptus 'albemol'* and *Callitris endlicheri* (Black Cypress Pine). The understorey ranges from grassy in grazed, unburnt areas to shrubby in burnt areas. Grassy areas contain *Cynodon dactylon* (Couch), *Aristida vagans* (Threeawn Speargrass), *Eragrostis brownii* (Brown's Lovegrass), *Panicum* sp., *Sporobolus creber* (Slender Rat's Tail Grass) and *Sporobolus elongatus* (Slender Rat's Tail Grass). Areas with a shrubby understorey contain *Acacia* species (Wattle), *Bursaria spinosa* (Sweet Bursaria), *Cassinia sifton* (Sifton Bush) as well as groundcover species associated with grassier areas and forbs including *Dichondra repens* (Kidney Weed), *Geranium solanderi* var. *solanderi* (Native Geranium), *Hydrocotyle laxiflora* (Stinking Pennywort), *Wahlenbergia communis* (Tufted Bluebell), *Euchiton involucratus* (Star Cudweed), and *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern).

Photograph 20 Narrow-leaved Ironbark Open Woodland

3.3.5. Inland Grey Box woodland on low sandstone foothills

The community is restricted to the southern end of the study area property where it occurs on sandstone derived soils (Photograph 21). It is dominated by *Eucalyptus microcarpa* (Inland Grey Box) with *Eucalyptus* crebra (Narrow-leaved Ironbark) occurring less frequently. A sparse shrub layer is maintained in a moderate condition by heavy sheep grazing and includes *Cassinia sifton* (Sifton Bush) and *Bursaria spinosa* (Sweet Bursaria).

The ground layer includes species typical of a disturbed grassy understorey including *Austrostipa scabra* subsp. *scabra* (Spear Grass), *Calotis cuneifolia* (Purple Burr-daisy), *Eragrostis brownii* (Brown's Lovegrass), *Sporobolus elongatus* (Slender Rat's Tail Grass), *Echinopogon caespitosus* var. *caespitosus (Bushy Hedgehog-grass)*, *Aristida ramosa* (Purple Wiregrass), *Hypochaeris radicata* (Catsear) and *Sorghum halepense* (Johnson Grass).

Photograph 21 Inland Grey Box woodland

3.3.6. Narrow-leaved Ironbark – Cypress Pine shrubby open forest on sandstone

The sandstone derived soils on undulating slopes are largely unutilised by grazing or cropping and contain intact remnant vegetation, with some areas showing evidence of historic clearing with subsequent regrowth. This dry sclerophyll forest community is highly distinguishable from the upslope woodland communities by the lighter coloured sandy soil, tree canopy composed of *Eucalyptus crebra* (Narrow-leaved Ironbark), *Callitris endlicheri* (Black Cypress Pine), and *Eucalyptus rossii* (Scribbly Gum).

The condition and understorey composition of these communities is variable and highly influenced by fire history. While these communities would have historically been subjected to periodic burning to protect agricultural land and provide fresh regrowth for cattle fodder (McRae and Cooper 1985), a large tract of vegetation was burnt in the high intensity uncontrolled Sir Ivan bushfire in 2017 under catastrophic fire danger conditions between the Girragulang Road and Mount Hope clusters. Prolonged drought conditions following the fire has likely contributed to the poor regrowth consisting mostly of a very dense midstorey dominated by *Acacia* species. Areas supporting a higher diversity midstorey species also contain *Bursaria spinosa* (Blackthorn), *Cassinia sifton* (Sifton Bush), *Allocasuarina* sp., *Dampiera lanceolata*, *Stypandra glauca* (Nodding Blue Lily) and *Calytrix tetragona* (Common Fringe-Myrtle). Canopy trees show very low levels of post-fire epicormic regrowth but have not yet re-established the canopy layer (Photograph 22).

Photograph 22 Burnt narrow-leaved Ironbark – Cypress Pine shrubby open forest showing shrubby regrowth and low levels of post-fire epicormic regrowth since 2017

3.3.7. Tumbledown Red Gum grassy woodland

A small patch of this community occurs in a small patch within the Leadville cluster (Photograph 23). The soil is rocky and shallow which is characteristic habitat for *Eucalyptus dealbata* (Tumbledown Red Gum). *Eucalyptus dealbata* (Tumbledown Red Gum) is the dominant canopy tree in this community with *Eucalyptus macrorhyncha* (Red Stringybark) also occurring. *Callitris endlicheri* (Black Cypress), *Brachychiton populneus* (Kurrajong) and *Acacia* species make up a very sparse mid layer. The ground layer is heavily grazed by sheep and cattle and includes *Goodenia heterophylla, Calotis lappulacea, Dichondra repens, Wurmbea dioica, Conyza species, Hypochaeris radicata, Petrorhagia dubia, Gonocarpus teucrioides* and *Arctotheca calendula*.

Photograph 23 Tumbledown Red Gum grassy woodland

3.3.8. Inland Scribbly Gum – Narrow-leaved Stringybark shrubby open forest on sandstone

This community occurs in a small area in the south of the study area on brown sandy-clay soil (Photograph 24). The community is dominated by *Eucalyptus rossii* (Inland Scribbly Gum) and *Eucalyptus sparsifolia* (Narrow-leaved Stringybark) with a shrubby understorey consisting of *Cassinia sifton* (Sifton Bush), *Dodonaea viscosa* subsp. *cuneata* (Wedge-Leaf Hop-Bush), *Hovea apiculata*, *Persoonia linearis* (Narrow-leaved Geebung) and *Stypandra glauca* (Nodding Blue Lily). The patch of vegetation has not recently burnt at high intensity, and is not heavily grazed so this community is considered to be in a 'good' condition state.

Photograph 24 Inland Scribby Gum - Narrow-leaved Stringybark shrubby open forest

3.3.9. Yellow Box woodland on black alluvial soils

This community typically occurs on the banks of creeks where there is an accumulation of recently deposited black alluvial and colluvial sediments derived from basalt and sandstone parent materials producing high to moderate soil fertility and high to moderate water holding capabilities (Photograph 25). Small patches of remnant vegetation exist primarily on the creek banks with communities dominated by *Eucalyptus melliodora* (Yellow Box), *Angophora floribunda* (Rough-barked Apple), *Eucalyptus blakelyi* (Blakely's Red Gum). The land use history is a major determinate of vegetation condition and composition in this community, and the shrub layer is typically very sparse with occasional *Acacia* species and *Brachychiton populneus* (Kurrajong). The ground cover is grassy, consisting of *Chloris truncata* (Windmill Grass), *Austrostipa verticillata* (Slender Bamboo Grass), *Microlaena stipoides* (Weeping Grass) and *Austrostipa scabra* (Speargrass), with a high proportion of forbs such as *Einadia hastata* (Berry Saltbush), *Eremophila debilis* (Winter Apple), *Sigesbeckia australiensis*, *Geranium gardneri* (Rough Crane's-bill) and the sedge *Cyperus gracilis* (Slender Flat-sedge).

Exotic species include *Bidens subalternans* (Greater Beggar's Ticks), *Trifolium arvense* (Haresfoot Clover), *Conyza* sp., *Cenchrus clandestinus* (Kikuyu Grass) and *Chenopodium album* (Fat Hen).

Photograph 25 Yellow Box woodland on rich alluvial soils

3.3.10. River Oak woodland fringing creeks on lower alluvial plains

Occurs as a narrow band of vegetation fringing creeks on lower alluvial plains where there is an accumulation of black alluvial soils (Photograph 26). These sites are occupied by *Casuarina cunninghamii* (River Oak) due to water table conditions, frequent waterlogging of soils, and periodic physical disturbance through flooding (Charmers et al. 2012; Erskine et al. 2013). The community is dominated by *Casuarina cunninghamii* (River Oak) with occasional *Eucalyptus melliodora* (Yellow Box). The shrub layer is very sparse with a high proportion of exotic species in the ground layer, likely due to high disturbance from flood events, pasture improvement, grazing and recruitment from adjacent cropped areas.

Photograph 26 River Oak woodland fringing creeks

3.3.11. River Red Gum riparian woodland

Occurs as a narrow band of vegetation fringing creeks on lower alluvial plains where there is an accumulation of black alluvial soils (Photograph 27). Dominated by *Eucalyptus camaldulensis* (River Red Gum) with occasional juvenile *Casuarina cunninghamii*. *Eucalyptus melliodora* (Yellow Box) may also occur on elevated sites. The shrub layer is very sparse and there is a high proportion of exotic species in the ground layer, likely due to high disturbance from flood events, grazing and recruitment from adjacent cropped areas. The ground layer contains exotics including *Lolium perenne*, *Medicago* sp., *Hydrochaeris radicata*, *Conyza* sp.

Photograph 27 River Red Gum riparian woodland

3.3.12. Cropped areas

Cropped areas cover a high proportion of the study area, mostly occupying alluvial flats or basalt plains. These areas undergo various management treatments that may include application of herbicide and superphosphate fertiliser, tillage and ground disturbance, sowing, grazing and harvesting. Very low cover and abundance of native species may occur sporadically in these areas but due to ongoing crop management, are highly unlikely to persist as a functional native plant community. The main crops utilised in the study area include *Avena sativa* (Oats) and *Hordeum vulgare* (Barley).

Photograph 28 Sown crops within Girragulang Road cluster

3.4. Vegetation Integrity Assessment

Vegetation surveys undertaken within the development site were led by ELA Senior Ecologists and Accredited Assessors Lily Gorrell, Alex Pursche and Dan Watts, with assistance from ELA Ecologists Liam Scanlan and Sophie Montgomery. Surveys were undertaken September 2020, April 2021, May 2021 and June 2021 (Table 7).

A total of 62 full-floristic vegetation integrity plots were surveyed to identify Plant Community Types (PCTs) on the development site and to assess the composition, structure and function components of each vegetation zone in accordance with the BAM.

At each survey site, the following information was collected:

- Site ID
- Name of recorder(s)
- Date
- Plot orientation, slope, and aspect
- Easting and northing at either end of the 50 m transect
- Site photographs
- A plot-based 400 m2 full floristic survey
- A plot and transect survey (20 x 50).

Within the 20 m x 20 m quadrat, the following data was collected at each plot-based full floristic survey site:

- Species name: Scientific name and common name
- Stratum (& layer): in which each species occurs
- Cover: an estimate of the appropriate cover measure for each recorded species: from 1-5% and then to the nearest 5%
- Abundance: A relative measure of the number of individuals or shoots of a species within the plot using the following intervals: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 50, 100, 500, 1000, or specify a number greater than 1000 if required
- Form: (T) Tree; (S) Shrub; (G) Grass and grass like (F) Forb; (E) Fern; (O) other

Within each plot survey, the following information was collected:

- Within a 20 m x 20 m quadrat the number of native species present
- Within a 50 m x 20 m quadrat the number of large trees, tree regeneration, tree stem size class, total length of fallen logs, number of hollow-bearing trees
- Within five 1m x 1m sub-plots litter cover

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

Table 7: Vegetation Integrity Survey surveyors and timing

Plot	PCT	Surveyor 1	Surveyor 2	Date
1	479	Lily Gorrell	Alex Pursche	07-09-20
2	483	Lily Gorrell	Alex Pursche	07-09-20
3	483	Lily Gorrell	Alex Pursche	07-09-20
4	483	Lily Gorrell	Alex Pursche	08-09-20
5	483	Lily Gorrell	Alex Pursche	08-09-20
6	483	Lily Gorrell	Alex Pursche	08-09-20
7	483	Lily Gorrell	Alex Pursche	08-09-20
8	479	Lily Gorrell	Alex Pursche	08-09-20
9	483	Lily Gorrell	Alex Pursche	09-09-20
10	483	Lily Gorrell	Alex Pursche	09-09-20
11	483	Lily Gorrell	Alex Pursche	09-09-20
12	483	Lily Gorrell	Alex Pursche	09-09-02
13	483	Lily Gorrell	Alex Pursche	10-09-20
14	483	Lily Gorrell	Alex Pursche	10-09-20
15	483	Lily Gorrell	Alex Pursche	10-09-20
16	483	Lily Gorrell	Alex Pursche	10-09-20
17	483	Lily Gorrell	Alex Pursche	10-09-20
18	483	Lily Gorrell	Alex Pursche	11-09-20
19	479	Lily Gorrell	Sophie Montgomery	29-04-21
20	478	Lily Gorrell	Sophie Montgomery	29-04-21

Plot	PCT	Surveyor 1	Surveyor 2	Date
21	281	Lily Gorrell	Sophie Montgomery	30-04-21
22	483	Liam Scanlan	--	13-05-21
23	483	Dan Watts	Liam Scanlan	13-05-21
24	84	Liam Scanlan	--	14-05-20
25	281	Liam Scanlan	--	14-05-20
26	281	Liam Scanlan	--	14-05-20
27	483	Dan Watts	Liam Scanlan	13-05-20
28	483	Dan Watts	--	13-05-20
29	281	Dan Watts	Liam Scanlan	14-05-20
30	84	Dan Watts	--	14-05-20
31	281	Dan Watts	--	14-05-20
32	281	Dan Watts	--	14-05-20
33	479	Lily Gorrell	Liam Scanlan	28-06-21
34	479	Lily Gorrell	Liam Scanlan	28-06-21
35	479	Lily Gorrell	Liam Scanlan	28-06-21
36	479	Lily Gorrell	Liam Scanlan	28-06-21
37	479	Lily Gorrell	Liam Scanlan	29-06-21
38	281	Lily Gorrell	Liam Scanlan	29-06-21
39	281	Lily Gorrell	Liam Scanlan	29-06-21
40	479	Lily Gorrell	Liam Scanlan	29-06-21
41	479	Lily Gorrell	Liam Scanlan	29-06-21
42	272	Lily Gorrell	Liam Scanlan	30-06-21
43	272	Lily Gorrell	Liam Scanlan	30-06-21
44	272	Lily Gorrell	Liam Scanlan	30-06-21
45	281	Lily Gorrell	Liam Scanlan	30-06-21
46	483	Lily Gorrell	Liam Scanlan	30-06-21
47	479	Lily Gorrell	Liam Scanlan	30-06-21
48	478	Lily Gorrell	Liam Scanlan	08-09-21
49	479	Lily Gorrell	Liam Scanlan	08-09-21
50	483	Lily Gorrell	Liam Scanlan	09-09-21
51	272	Lily Gorrell	Liam Scanlan	11-09-21
52	272	Lily Gorrell	Liam Scanlan	11-09-21
53	479	Lily Gorrell	Liam Scanlan	13-09-21
54	479	Lily Gorrell	Liam Scanlan	14-09-21
55	479	Lily Gorrell	Liam Scanlan	14-09-21
56	479	Lily Gorrell	Liam Scanlan	14-09-21

Plot	PCT	Surveyor 1	Surveyor 2	Date
57	479	Lily Gorrell	Liam Scanlan	14-09-21
58	616	Lily Gorrell	Liam Scanlan	14-09-21
59	483	Liam Scanlan	Sophie Montgomery	23-09-21
60	483	Liam Scanlan	Sophie Montgomery	23-09-21
61	479	Liam Scanlan	Sophie Montgomery	25-09-21
62	281	Lily Gorrell	--	01-02-22
63	281	Lily Gorrell	--	01-02-22
64	281	Lily Gorrell	--	01-02-22

3.5. Plant Community Types present

In order to determine which PCT aligns best to each vegetation pattern, the following process was undertaken.

- Compile a preliminary PCT list via database searches of VIS and SEED
- Site inspection to collect RDPs, develop PCT shortlist and preliminary vegetation mapping
- Undertake full floristic plots to collect data used in quantitative PCT selection
- Identify additional data sources for PCT selection e.g. soil landscapes mapping
- Quantitatively compare field data to PCT database to find best fit
- Finalise PCT mapping

PCTs identified within the development site are presented in Table 8.

The development site also contains exotic vegetation or crops which does not conform to any native PCT.

In determining the PCT for the development site, various attributes were considered in combination to assign vegetation to the best fit PCT. Attributes included dominant species in each stratum and relative abundance, community composition, soils and landscape position. Reference was made to the PCT descriptions in the BioNet Vegetation Classification and the final scientific determinations for TECs. The best fitting PCT selections are provided in Table 8.

Table 8: Plant Community Types

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Percent cleared
42	River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Inland Riverine Forests	Forested Wetlands	40%
84	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Eastern Riverine Forests	Forested Wetlands	40%
272	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	Western Slopes Grassy Woodlands	Grassy Woodlands	65%

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Percent cleared
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Western Slopes Grassy Woodlands	Grassy Woodlands	67%
461	Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	Western Slopes Grassy Woodlands	Grassy Woodlands	50%
478	Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion	Western Slopes Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	29%
479	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Western Slopes Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	40%
483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Western Slopes Grassy Woodlands	Grassy Woodlands	90%
616	Grey Myrtle - Rusty Fig dry rainforest in sandstone gorges of the upper Hunter Valley	Dry Rainforests	Rainforests	0%

Table 9: Justification of selected Plant Community Types

Vegetation community	Selected PCT ID	Selected PCT Name	Other options	Justification for PCT selection
River Red Gum Riparian Woodland	42	River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	2, 5, 7, 8, 9, 10, 11, 36, 78, 112, 233, 249, 362	Filtered IBRA regions to Brigalow Belt South, NSW South Western Slopes and Sydney Basin. Filtered Vegetation Class to Inland Riverine Forests. Filtered communities containing Eucalyptus camaldulensis. PCT 42 was chosen for landscape position and simple floristic and structural characteristics.
River Oak woodland fringing creeks on lower alluvial plains	84	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	36, 78, 85	Filtered IBRA regions to Brigalow Belt South, NSW South Western Slopes and Sydney Basin. Filtered PCTs containing *Casuarina cunninghamii* and *Eucalyptus melliodora*. Filtered vegetation formations to Forested Wetlands. 36 and 78 are characterised by *Eucalyptus camaldulensis* (River Red Gum) which is absent in this community. 84 also contains *Eucalyptus camaldulensis* (River Red Gum), but also contains *Eucalyptus melliodora* and *Angophora floribunda* which likely would have been a component prior to clearing. 85 was excluded as it would be almost exclusively dominated by River Oak.
Derived Native Grassland on sandstone	272	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	--	Occurs adjacent to intact PCT 272 and on the same soils and landscape position. 272 was chosen as the original PCT the derived grassland has developed from.
Inland Grey Box woodland on low sandstone foothills	272	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	80, 81	Filtered IBRA regions to Brigalow Belt South, NSW South Western Slopes and Sydney Basin. Filtered to Grassy woodland vegetation formation and Western Slopes Grassy Woodlands. Filtered *Eucalyptus microcarpa* in upper strata and *Cassinia laevis* in mid strata. 80 and 81 are similar but in Floodplain Transition Woodlands vegetation class which does not fit the landscape position that this community is found. 272 is best fit considering vegetation class, vegetation formation, dominant species present

Vegetation community	Selected PCT ID	Selected PCT Name	Other options	Justification for PCT selection
Yellow Box on lower slopes with black alluvial soils	281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	--	Filtered IBRA regions to Brigalow Belt South, NSW South Western Slopes and Sydney Basin. Filtered PCTs containing Eucalyptus melliodora, Eucalyptus blakelyi and Casuarina cunninghamii
Tumbledown Red Gum on slopes with shallow rocky soils	461	Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	--	This community does not occur within the proposed impact footprint and no full floristic plots were undertaken. 461 description states "Mid-high to low open woodland to woodland dominated by Tumbledown Gum (*Eucalyptus dealbata*) often with no other tree species." which is accurate for this community.
Inland Scribbly Gum – Narrow-leaved Stringybark shrubby open forest on sandstone	478	Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion	612, 863, 1666	Filtered IBRA regions to Brigalow Belt South, NSW South Western Slopes and Sydney Basin. Filtered PCTs containing Eucalyptus rossii and Eucalyptus sparsifolia. 612 is a very tall moist shrubland/heathland which does not match this community. 863 contains Grey Gum (Eucalyptus punctata) and Narrow-leaved Stringybark which dos does not match this community. 1666 contains Eucalyptus crebra and Fringe Myrtle which does not match this community. 478 was the best match considering species composition and vegetation structure
Narrow-leaved Ironbark Open Woodland on sandstone derived soil with basalt influence	479	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	--	Filtered IBRA regions to Brigalow Belt South, NSW South Western Slopes and Sydney Basin. Filtered PCT names containing "Narrow-leaved Ironbark" as this community is solely dominated by *Eucalyptus crebra*. Filtered Dry Sclerophyll Forests (Shrubby sub-formation). Removed "Yetman Dry Sclerophyll Forests" vegetation class from search. Filtered PCTs containing *Bursaria spinosa* and *Phyllanthus hirtellus* which are the two most dominant shrubs in this community.
Narrow-leaved Ironbark – Callitris shrubby open forest on sandstone	479	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	--	Filtered IBRA regions to Brigalow Belt South, NSW South Western Slopes and Sydney Basin. Filtered PCT names containing "Narrow-leaved Ironbark" as this community is solely dominated by *Eucalyptus crebra*. Filtered Dry Sclerophyll Forests (Shrubby sub-formation). Removed "Yetman Dry Sclerophyll Forests" vegetation

Vegetation community	Selected PCT ID	Selected PCT Name	Other options	Justification for PCT selection
				class from search. Filtered PCTs containing *Bursaria spinosa* and *Phyllanthus hirtellus* which are the two most dominant shrubs in this community.
Eucalyptus 'albemol' Grassy Woodland on basalt derived soils	483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	484, 617	Searched for PCTs containing *Eucalyptus 'albemol'*. PCT 483, 484 and 617 are the only PCTs *with E. 'albemol'*. Excluding "Western Slopes Grasslands" from the search removes PCT 484. PCT 617 has a shrubby understorey which does not match with this community. PCT 483 is the best fit considering species composition and community structure
Derived Native Grassland on basalt	483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	484	This community fits PCT 484 (Derived tall spear grass grassland on mainly basalt hills of the Liverpool Plains, Liverpool Range and in the upper Hunter Valley (Merriwa district), however was not used in accordance with BAM 2020 Section 4.2 subset 3 "Assessors must not identify native vegetation as a derived PCT in the BioNet Vegetation Classification. Assessors must identify the original PCT from which the derived PCT has developed." Therefore 483 was chosen as the original PCT the derived grassland has developed from.
Rusty Fig Rainforest on basalt derived soils in sheltered sites	616	Grey Myrtle - Rusty Fig dry rainforest in sandstone gorges of the upper Hunter Valley	547	Filtered PCTs containing *Ficus rubiginosa* and *Angophora floribunda* in the Brigalow Belt South, Sydney Basic and NSW South Western Slopes IBRA regions, with Rainforest vegetation formation. PCT 547 is described as occurring on rocky and scree areas, and 616 is described as occurring in sandstone gorges. 616 is a better fit for landscape position and floristic composition.
Crops	n/a	n/a	n/a	Dominated by exotic species, managed as crop with frequent removal of foliage and ground disturbance, likely broad-scale applications of herbicide, fertiliser and exotic pasture sowing.

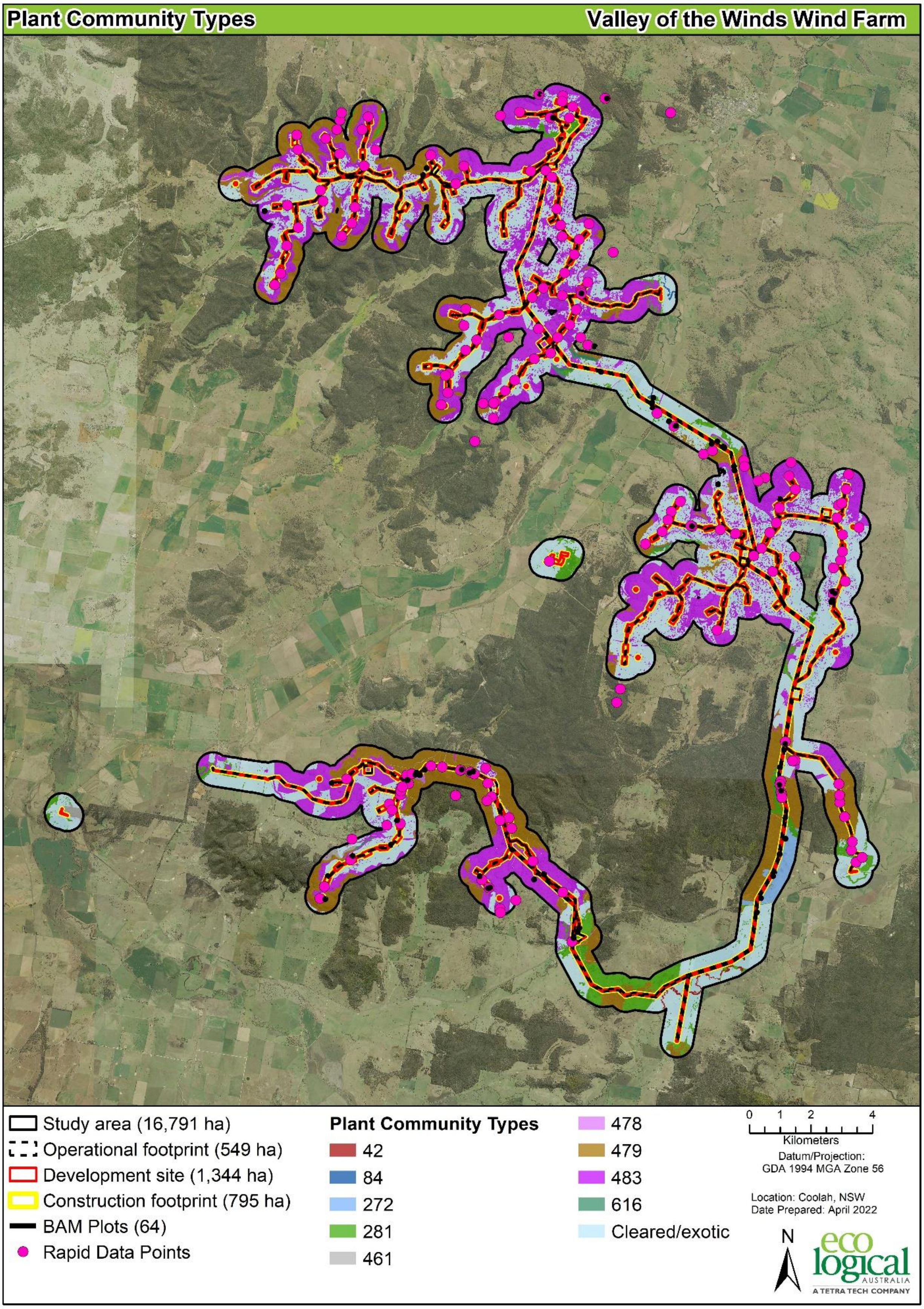


Figure 12 Plant Community Types

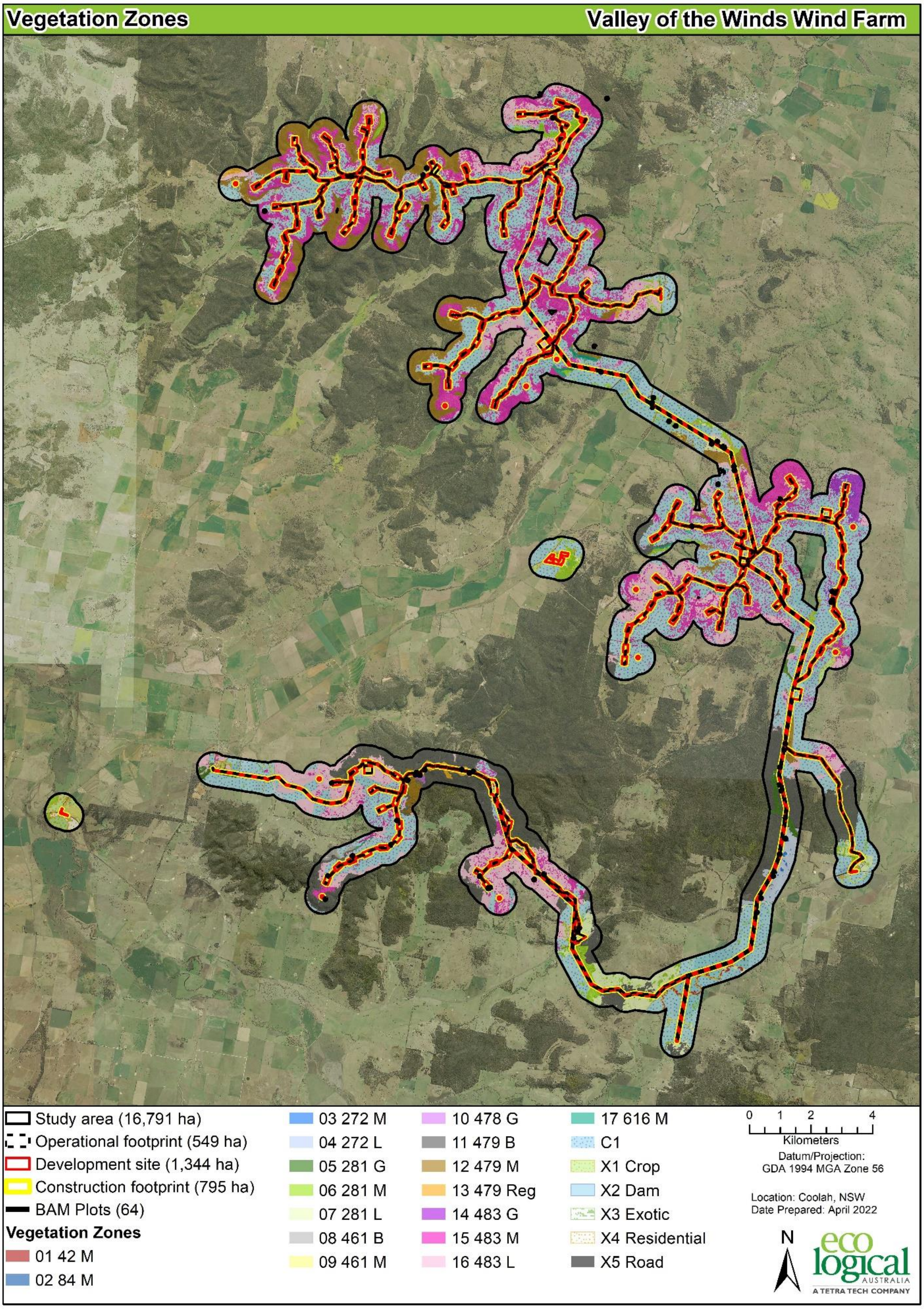


Figure 13 Vegetation zones and VI plot locations

3.6. Threatened ecological communities

Assessment of each PCT was undertaken to determine if any of the vegetation communities present were consistent with Threatened Ecological Communities (TEC's) listed under the BC Act and/or the EPBC Act.

Assessment of the assemblage of species in each vegetation type was considered against potential TECs and their relevant Final Determination (BC Act) or Listing Advice (EPBC Act).

3.6.1. BC Act TECs

To determine a candidate list of potential BC Act TECs, a spatial search was conducted using the species siting search in BioNet, and considering any potential TECs that were predicted in the BAM Credit Calculator (BAMCC). Based on this review, 15 candidate TECs were identified as potentially occurring. Of these 15 TEC's, many are associated with the Hunter Valley and coastal areas, which does not include any portion of the study area. As such the following nine TECs were ruled out from the assessment due to geographical limitations of the occurrence of the TEC:

- Central Hunter Grey Box—Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions
- Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions
- Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions
- Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion
- Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions
- Hunter Valley Weeping Myall Woodland in the Sydney Basin Bioregion
- Pilliga Outwash Ephemeral Wetlands in the Brigalow Belt South Bioregion
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
- Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Similarly, a further four TECs have been ruled out of the assessment, as there are no vegetation communities (Section 3.3) within the study area that contains the appropriate assemblage of species:

- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions
- Carex Sedgeland of the New England Tableland, Nandewar, Brigalow Belt South and NSW North Coast Bioregions
- Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions
- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions

Based on the location and assemblage of species, two potential TECs occur within the study area:

- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (BC Act Inland Grey Box Woodland)

- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverine Bioregions (BC Act Box Gum Woodland)

3.6.1.1. BC Act Inland Grey Box Woodland TEC

Assessment of the final determination for Inland Grey Box Woodland identified that this TEC occurs in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions only. The final determination identified that similar TECs occur in the Sydney Basin Bioregion – including Box Gum Woodland.

The majority of occurrences of *E. microcarpa* within the study area are within PCT 272, and occur on low lying areas in the southern portion of the study area (particularly along the transmission line route), and are mostly located within the Sydney Basin Bioregion. This occurrence is outside of the spatial extent of the TEC identified in the Final Determination. There is a small portion of this TEC identified within the Brigalow Belt South Bioregion, present as scattered paddock trees in PCT272.

As such this TEC has been identified within the study area and the extent is shown on Figure 14.

3.6.1.2. BC Act Box Gum Woodland TEC

Assessment for the final determination for Box Gum Woodland identified that this TEC occurs in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverine Bioregions. As such all regions of the study area are considered for this TEC.

Grassy Woodland PCTs that contain an appropriate assemblage of species for this TEC, that also occur in the study area includes PCT 281 and 483. In this assessment, intergrades between *E. albens* and *E. mollucana* that are prevalent throughout PCT483 are considered to be included within this TEC. PCT281 is a *E. melliodora* dominated grassy woodland, and is also consistent with the Box Gum Woodland TEC. There is no minimum threshold for the condition state of this TEC, and so areas of low condition grassland are also included in this TEC.

Based on the species present within each PCT, all occurrence of PCTs 281 and 483 are consistent with Box Gum Woodland.

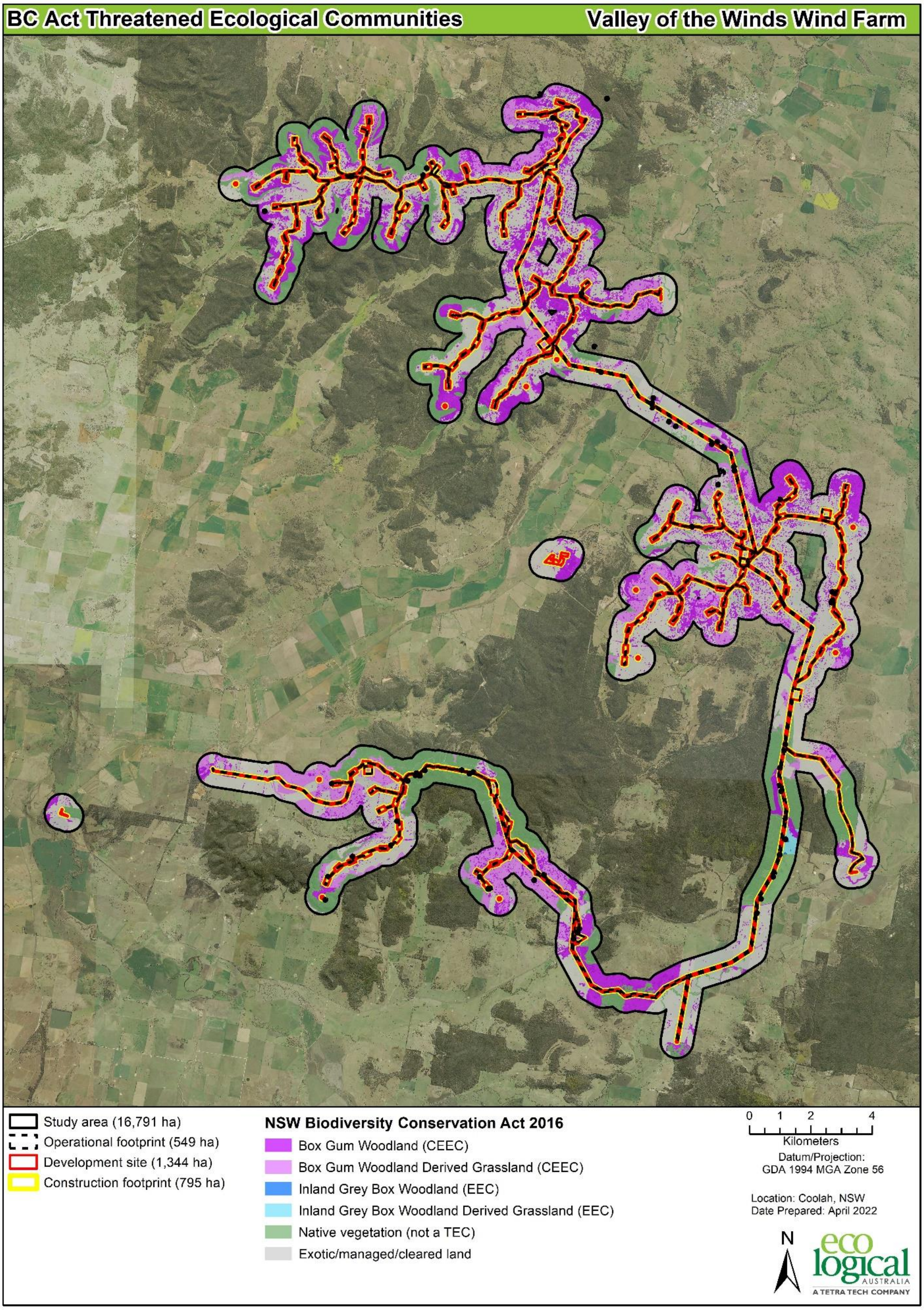


Figure 14 BC Act Threatened Ecological Communities

3.6.2. EPBC Act TECs

To determine a list of candidate TECs under the EPBC Act, assessment of the Listing Criteria was undertaken for two potential TECs within the study area:

- Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia (EPBC Act Inland Grey Box Woodland)
- White box - yellow box - Blakely's red gum grassy woodlands and derived native grasslands (EPBC Act Box Gum Woodland)

3.6.2.1. EPBC Act Inland Grey Box Woodland TEC

The guide to identifying *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia* (Commonwealth of Australia), identifies that this TEC occurs in the Brigalow Belt South, Darling Riverine Plain, NSW South Western Slopes, Cobar Peneplain and Riverina bioregions within NSW, as identified in the map below (Figure 15).

As previously identified in Section 3.6.1.1, and shown on Figure 14, the majority of occurrences of this vegetation community are within the Sydney Basin Bioregion, which is outside the extent of the ecological community. Areas within the Brigalow Belt South Bioregion have been assessed against the listing advice for this community.

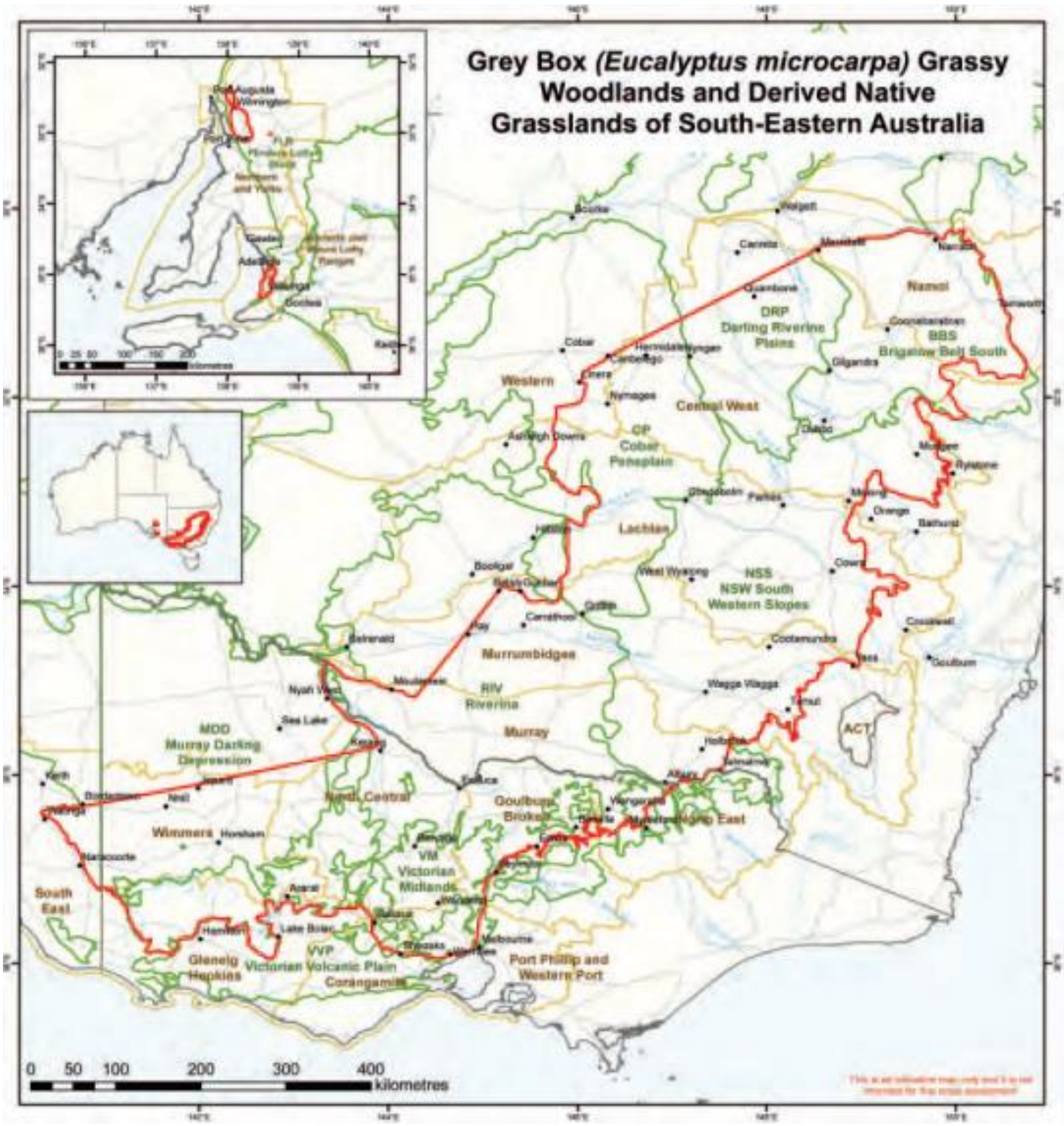


Figure 15 EPBC Act Inland Grey Box Woodland extent (Commonwealth of Australia, 2012)

3.6.2.2. EPBC Act Box Gum Woodland

EPBC Act Box Gum Woodland occurs across wide range of bioregions (Figure 16), of which includes the entire study area.

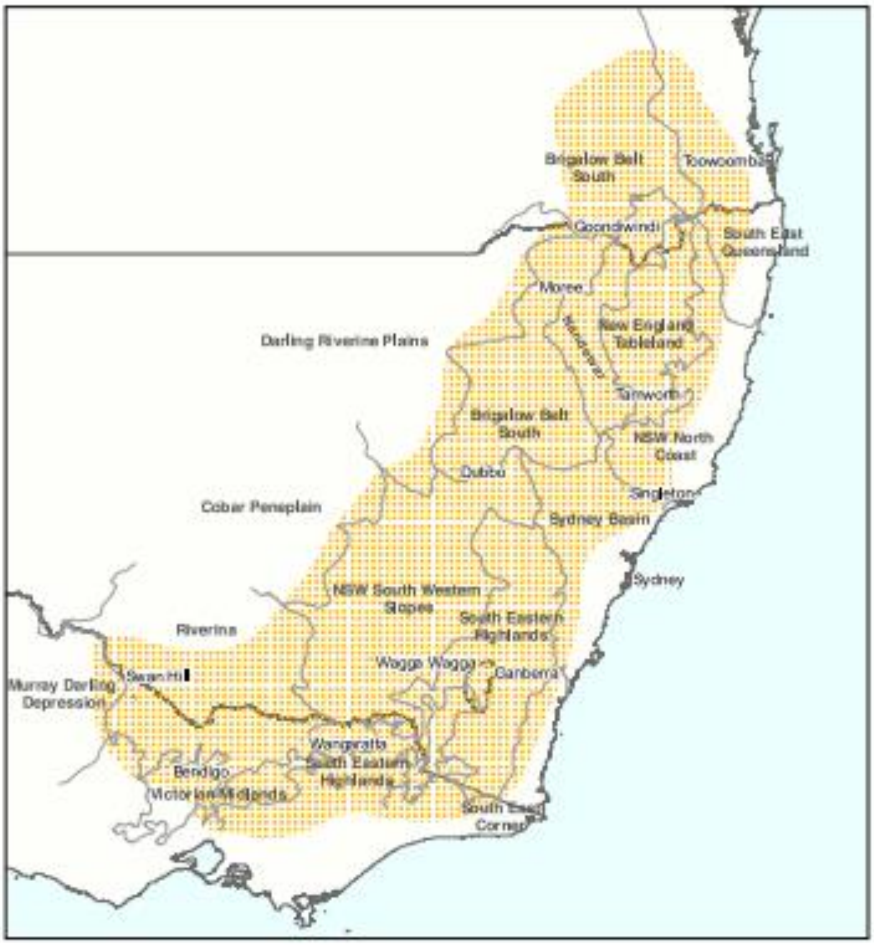
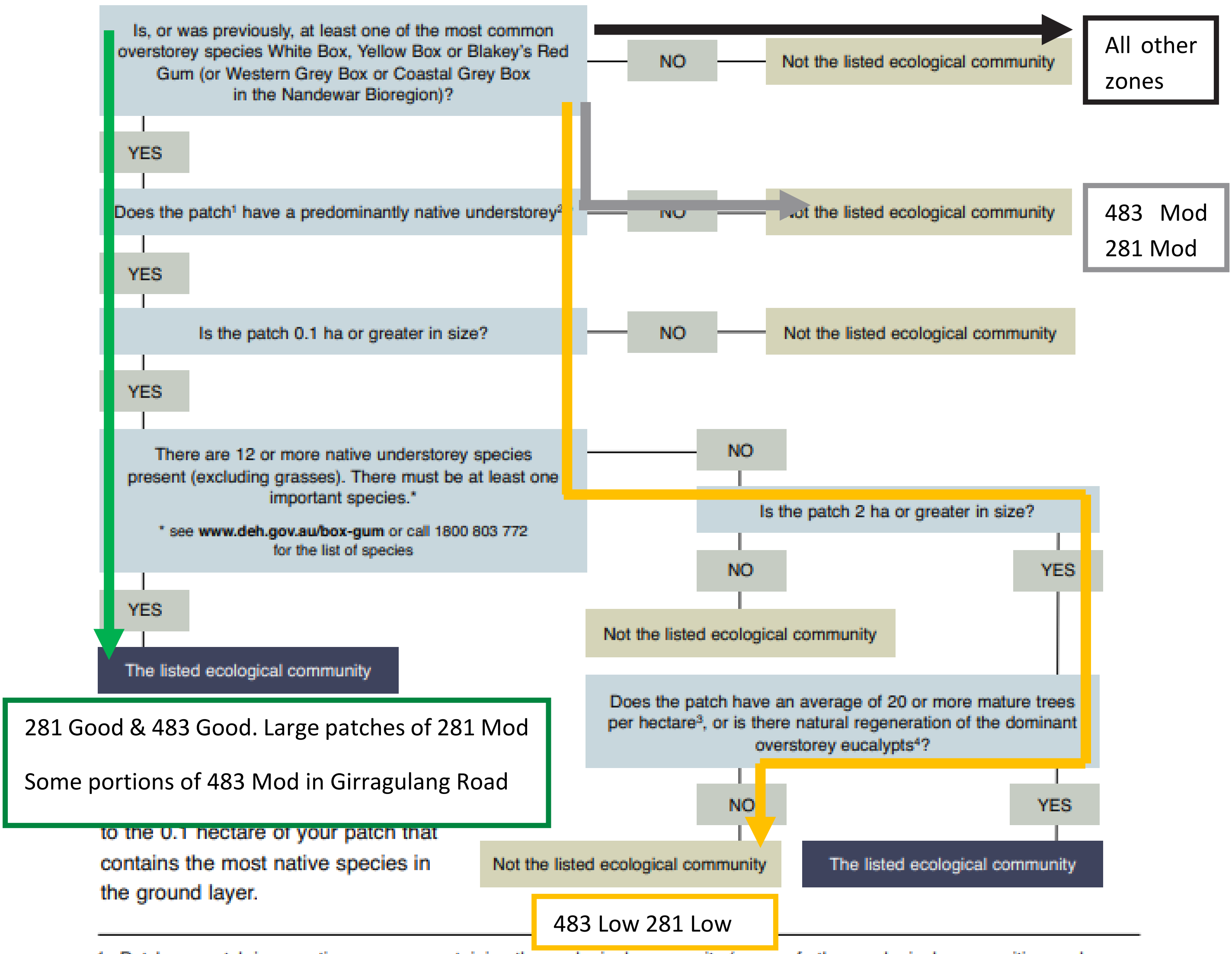


Figure 16 EPBC Act Box Gum Woodland range (Commonwealth of Australia, 2006)

An assessment of the species composition and patch size was undertaken using floristic data collected at BAM Plot locations. The assessment followed the flowchart below (Figure 17), and the findings of all plot assessments is provided in Appendix A. For the assessment of groundcover, the perennial ground layer was calculated as a percentage of living material being perennial and native/exotic. The number of non-grass species was then calculated for those plots that contained a perennial groundcover. The findings of the assessment are detailed in Appendix A.

Of the 61 data plot locations, 7 were identified as containing the listed ecological community. Based on the assessment, all occurrences of 281 (in good condition), 483 (in good condition), larger patches of 281 (in moderate condition), and portions of 483 (in moderate condition) connected to those patches described above, are the EPBC Act CEEC.

Determining if your land has an area of the listed ecological community



[1] Patch – a patch is a continuous area containing the ecological community (areas of other ecological communities such as woodlands dominated by other species are not included in a patch). In determining patch size it is important to know what is, and is not, included within any individual patch. The patch is the larger of:
- an area that contains five or more trees in which no tree is greater than 75 m from another tree, or
- the area over which the understorey is predominantly native.

Patches must be assessed at a scale of 0.1 ha (1000m²) or greater.

[2] A predominantly native ground layer is one where at least 50 per cent of the perennial vegetation cover in the ground layer is made up of native species. The best time of the year to determine this is late autumn when the annual species have died back and have not yet started to regrow. (At other times of the year, you can determine whether something is perennial or not is if it is difficult to pull out of the soil. Annual species pull out very easily.)

[3] Mature trees are trees with a circumference of at least 125 cm at 130 cm above the ground.

[4] Natural regeneration of the dominant overstorey eucalypts when there are mature trees plus regenerating trees of at least 15 cm circumference at 130 cm above the ground.

Figure 17 EPBC Act Box Gum Woodland decision criteria (Commonwealth of Australia, 2006)

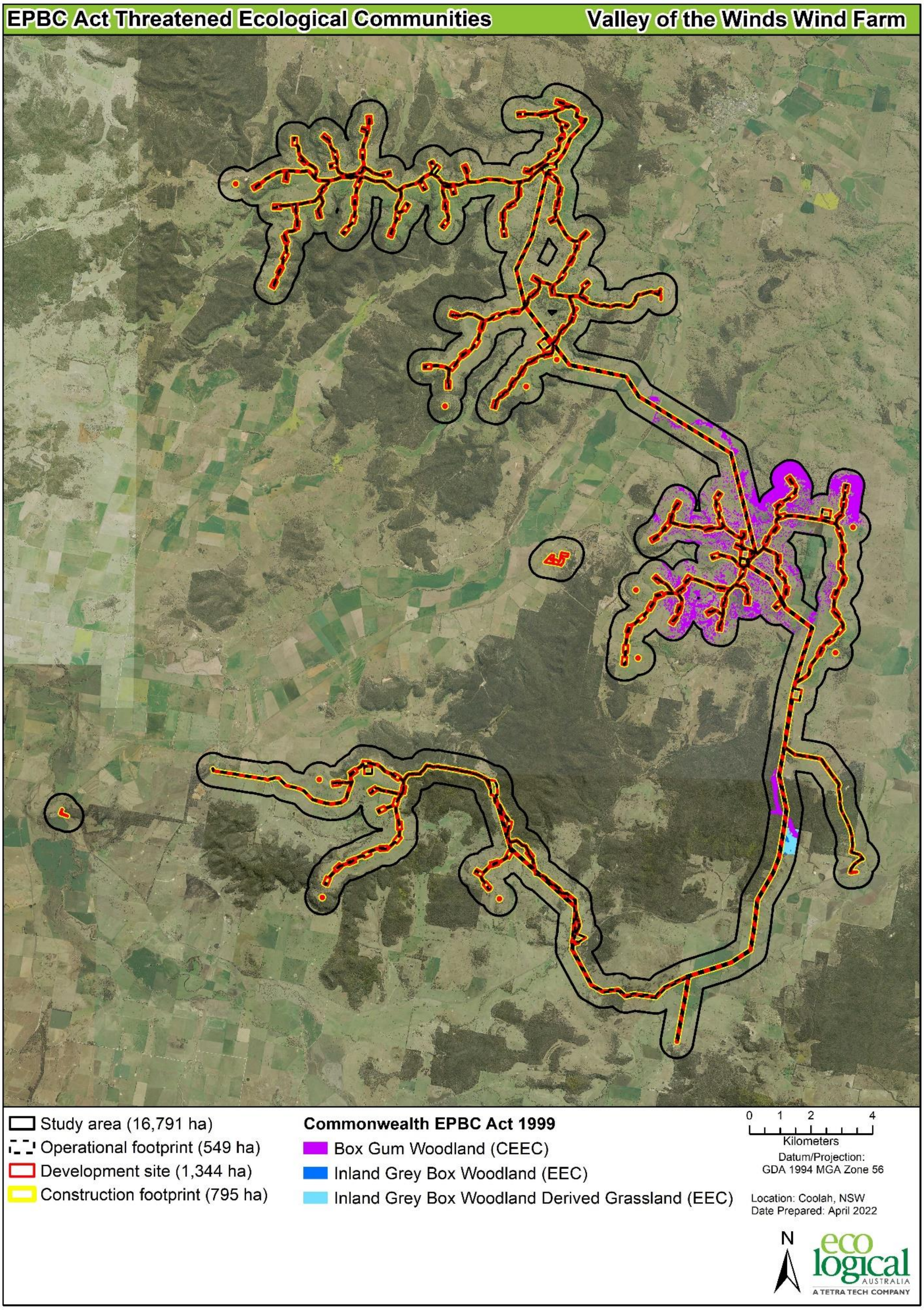


Figure 18 EPBC Act TECs

3.6.3. TEC summary

Based on the assessment of each PCT/Vegetation community, the following TECs have been identified in the study area:

Table 10 TEC summary

PCT Number	PCT Name	BC Act	EPBC Act
42	River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Not listed	Not listed
84	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Not listed	Not listed
272	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	Inland Grey Box Woodland (EEC) – portions thereof	Inland Grey Box Woodland (EEC) – portions thereof
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Box Gum Woodland (CEEC)	Box Gum Woodland (CEEC) - portions thereof
461	Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	Not listed	Not listed
478	Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion	Not listed	Not listed
479	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Not listed	Not listed
483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Box Gum Woodland (CEEC)	Box Gum Woodland (CEEC) - portions thereof
616	Grey Myrtle - Rusty Fig dry rainforest in sandstone gorges of the upper Hunter Valley, mainly Sydney Basin Bioregion	Not listed	Not listed

3.7. Vegetation integrity assessment

3.7.1. Vegetation zones

A total of 15 vegetation zones were identified on the development site based on the broad condition state of each PCT. A total of 64 vegetation integrity survey plots were collected on the development site consistent with the BAM (Table 11). Vegetation plots for each zone were replicated between the same zone in different bioregional calculations. Similarly, floristic data for areas without survey access (assumed areas) were combined in the credit calculations for those vegetation zones that did contain floristic data. Where no data was available for a zone, all floristic plots have been assumed at benchmark, subject to further investigation.

Descriptions of vegetation zones are provided in Appendix E and a summary of the area of each vegetation zone impacted is shown in Table 11 below. Details of all floristic and vegetation integrity data are provided in Appendix C and Appendix D.

Table 11: Vegetation zones and vegetation integrity survey plots collected

Vegetation Zone	PCT	PCT Name	Condition	Patch Size	Brigalow Belt South (Ha impacted)		NSW South Western Slopes (Ha impacted)		Sydney Basin (Ha impacted)		Area impacted (ha) (TOTAL)	VI Plots required (MAX)	VI Plots collected
					Assessed	Assumed	Assessed	Assumed	Assessed	Assumed			
01 42 M	42	River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Moderate	>100	0	0	0	0	0.06	0.6	0.66	1	0
02 84 M	84	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Moderate	>100	1.14	0	0	0	0	0	1.14	1	2
03 272 M	272	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	Moderate	>100	0.28	0	0	0	0.04	0	0.32	1	2
04 272 L	272	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	Low	>100	3.31	0	0	0	9.05	0	12.36	3	3
05 281 G	281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Good	>100	3.31	0	0	0.96	0	0	4.27	2	3
06 281 M	281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Moderate	>100	15.51	0	0	0.3	2.62	10.38	28.81	3	3
07 281 L	281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Low	>100	4.46	0	0	0	7.58	8.70	20.74	3	3
08 461 B	461	Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	Burnt	>100	0	0	0	0	0	0	0	0	0
09 461 M	461	Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	Moderate	>100	0	0	0	0	0	0	0	0	0
10 478 G	478	Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion	Good	>100	0	0	0.11	0	0	0	0.11	1	2
11 479 B	479	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow	Burnt	>100	17.18	0	1.23	0	7.99	9.33	35.73	3	4

Vegetation Zone	PCT	PCT Name	Condition	Patch Size	Brigalow Belt South (Ha impacted)		NSW South Western Slopes (Ha impacted)		Sydney Basin (Ha impacted)		Area impacted (ha) (TOTAL)	VI Plots required (MAX)	VI Plots collected
					Assessed	Assumed	Assessed	Assumed	Assessed	Assumed			
		Belt South Bioregion and Sydney Basin Bioregion											
12 479 M	479	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Moderate	>100	6.84	0	0.55	0.0	0	0	7.39	3	9
13 479 Reg	479	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Regenerating	>100	0	0	3.48	0	5.10	0	8.58	3	4
14 483 G	483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Good	>100	1.67	0	0	0	0	0	1.66	1	2
15 483 M	483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Moderate	>100	176.61	0.24	2.12	0	21.05	0	199.6	6	12
16 483 L	483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Low	>100	85.24	0	26.14	4.84	56.61	0.20	173.02	5	5
17 616 M	616	Grey Myrtle - Rusty Fig dry rainforest in sandstone gorges of the upper Hunter Valley, mainly Sydney Basin Bioregion	Moderate	>100	0	0	0	0	0	0	0	0	1
			Total		**315.77**	**0.24**	**33.63**	**6.10**	**110.09**	**29.21**	**494.80**	**36**	**55**

3.7.2. Patch size

Patch size was calculated using available vegetation mapping for all patches of intact native vegetation on and adjoining the development site. Patch size was assigned to one of four classes (<5 ha, 5-24 ha, 25-100 ha or ≥100 ha). A patch size 101 ha was determined for the development site.

3.7.3. Assessing vegetation integrity

A vegetation integrity assessment using the BAM Calculator (BAMC) was undertaken and the results are outlined in Table 12 to Table 14.

Table 12: Vegetation integrity scores – Brigalow Belt South Bioregion

Veg Zone	PCT ID	Condition	Composition Condition Score	Structure Condition Score	Function Condition Score	Presence of Hollow bearing trees	Current vegetation integrity score
01 42 M	42	Moderate	n/a	n/a	n/a	n/a	n/a
02 84 M	84	Moderate	10.5	33.3	47.6	Yes	25.5
03 272 M	272	Moderate	55.4	54.7	66	Yes	58.5
04 272 L	272	Low	15.7	66.3	15	No	25
05 281 G	281	Good	82.1	64.1	85.5	Yes	76.6
06 281 M	281	Moderate	70.5	91	80.6	Yes	80.3
07 281 L	281	Low	30.8	66.4	1.5	No	14.6
08 461 B	461	Burnt	n/a	n/a	n/a	n/a	n/a
09 461 M	461	Moderate	n/a	n/a	n/a	n/a	n/a
10 478 G	478	Good	n/a	n/a	n/a	n/a	n/a
11 479 B	479	Burnt	78.7	40.1	70	No	60.4
12 479 M	479	Moderate	65.7	51.4	91.4	Yes	67.6
13 479 Reg	479	Regen	n/a	n/a	n/a	n/a	n/a
14 483 G	483	Good	63.6	91.6	59	Yes	70
15 483 M	483	Moderate	40	29.3	28	Yes	32
16 483 L	483	Low	27	19.1	16.3	No	20.3
17 616 M	616	Moderate	n/a	n/a	n/a	n/a	n/a

Table 13: Vegetation integrity scores – NSW South Western Slopes Bioregion

Veg Zone	PCT ID	Condition	Composition Condition Score	Structure Condition Score	Function Condition Score	Presence of Hollow bearing trees	Current vegetation integrity score
01 42 M	42	Moderate	n/a	n/a	n/a	n/a	n/a
02 84 M	84	Moderate	n/a	n/a	n/a	n/a	n/a
03 272 M	272	Moderate	n/a	n/a	n/a	n/a	n/a
04 272 L	272	Low	n/a	n/a	n/a	n/a	n/a
05 281 G	281	Good	91.1	89.4	84.6	Yes	88.3
06 281 M	281	Moderate	73.1	95.3	68.4	Yes	78.1
07 281 L	281	Low	n/a	n/a	n/a	n/a	n/a
08 461 B	461	Burnt	n/a	n/a	n/a	n/a	n/a
09 461 M	461	Moderate	n/a	n/a	n/a	n/a	n/a
10 478 G	478	Good	77.2	37.3	99.8	Yes	66
11 479 B	479	Burnt	86.9	33.9	70	No	59.1
12 479 M	479	Moderate	72.2	68.2	91.4	Yes	76.7
13 479 Reg	479	Regen	61.9	32.5	15.4	No	31.4
14 483 G	483	Good	n/a	n/a	n/a	n/a	n/a
15 483 M	483	Moderate	47.8	39	14.8	Yes	30.3
16 483 L	483	Low	39.4	35.3	7.6	No	21.9
17 616 M	616	Moderate	n/a	n/a	n/a	n/a	n/a

Table 14: Vegetation integrity scores – Sydney Basin Bioregion

Veg Zone	PCT ID	Condition	Composition Condition Score	Structure Condition Score	Function Condition Score	Presence of Hollow bearing trees	Current vegetation integrity score
01 42 M	42	Moderate	100*	100*	100*	Yes*	100*
02 84 M	84	Moderate	n/a	n/a	n/a	n/a	n/a
03 272 M	272	Moderate	43,2	55	65.9	Yes	53.9
04 272 L	272	Low	12.5	60.8	13.7	No	21.9
05 281 G	281	Good	n/a	n/a	n/a	n/a	n/a
06 281 M	281	Moderate	57.6	85.5	73.1	Yes	71.1
07 281 L	281	Low	25.5	60.4	0.2	No	6.6
08 461 B	461	Burnt	n/a	n/a	n/a	n/a	n/a
09 461 M	461	Moderate	n/a	n/a	n/a	n/a	n/a
10 478 G	478	Good	n/a	n/a	n/a	n/a	n/a
11 479 B	479	Burnt	57.8	26	70.2	No	47.3
12 479 M	479	Moderate	n/a	n/a	n/a	n/a	n/a
13 479 Reg	479	Regen	40.2	58.6	15.6	No	33.3
14 483 G	483	Good	n/a	n/a	n/a	n/a	n/a
15 483 M	483	Moderate	31.5	27.8	18.5	Yes	25.3
16 483 L	483	Low	22.1	17.9	13.7	No	17.6
17 616 M	616	Moderate	n/a	n/a	n/a	n/a	n/a

* PCT assumed at benchmark due to access constraints

3.8. Use of local data and calculation notes

No local data has been used to modify benchmarks in this assessment.

Due to lack of access, vegetation integrity for vegetation zones in PCT42 have been assumed at benchmark condition.

Where appropriate, vegetation integrity plots collected in the same vegetation zone, but across different bioregions, has been pooled across that vegetation zone and repeated in each calculation.

4. Threatened species

4.1. Ecosystem credit species

Ecosystem credit species predicted to occur within the development site are generated by the BAMC following the input of VI data and the PCTs identified within Chapter 3. No predicted species have been removed from the assessment.

Ecosystem credit species predicted to occur at the development site, their associated habitat constraints, geographic limitations and sensitivity to gain class is included in 0.

4.2. Species credit species

4.2.1. Step 1 Identify threatened species for assessment.

Species credit species that require further assessment on the development site (i.e. candidate species), their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Appendix H.

Across the three bioregions, a total of 41 species were identified as candidate species, including:

- 30 candidate species within the Brigalow Belt South Bioregion
- 27 candidate species within the Sydney Basin Bioregion
- 34 candidate species within the NSW South West Slopes Bioregion

In accordance with s5.2.1 of the BAM (DPIE, 2020), the following species have been removed from the assessment as they do not meet all of the criteria identified in 5.2.1(2 a- f):

- *Delma impar* is removed, as the distribution of the species does not include the IBRA subregion within which the subject land is mostly located (being Kerrabee, Liverpool Range, or Pilliga IBRA subregion; BAM 5.2.1.2.a). This species is associated with Inland Slopes IBRA subregion, however the nearest record within this subregion is 390km south of the study area nearby to Tumut, NSW and is unlikely to occur within degraded habitats present.
- Brush-tailed Phascogale, as the distribution of the species does not include the IBRA subregion within which the subject land is mostly located (being Kerrabee, Liverpool Range, Inland ranges, or Pilliga IBRA subregion; BAM 5.2.1.2.a)

All other species were carried further to the habitat assessment

4.2.2. Step 2: Assess the habitat constraints and vagrant species on the subject land

Habitat assessment was undertaken across the study area to determine the types of threatened species habitats that may be present and require assessment. The habitat assessment used multiple sources and lines of evidence drawn from:

- Habitat assessment points across the wind farm
- Hollow-bearing tree survey
- Floristic data (Section 3.4) within each vegetation zone
- Desktop and ground-truthed cliffline mapping

- Important area mapping

Methods and results for each information source are provided below.

4.2.2.1. Habitat assessment

Within the study area, habitat assessment was undertaken within each vegetation zone and identified:

- Vegetation condition (high, medium, or low)
- Vegetation formation
- Evidence of stock disturbance (yes/no)
- Evidence of feral animal disturbance (yes/no)
- Evidence of human disturbance (yes/no)
- Evidence of erosion (yes/no)
- Fire history
- Description of fruit or nectar resources
- Water resource (dam, drainage line, lake, ponding, pool, river, other)

The results of the habitat assessment are summarised below in Table 15.

Table 15 Fauna habitats within each vegetation zone

Vegetation Zone	Condition	Formation	Disturbance					Resources		Notes
			Stock	Feral animal	Humans	Erosion	Fire	Fruit/nectar	Water	
01 42 M	Moderate	Forested Wetlands	Cattle grazing	Unknown	Unknown	Unknown	Unknown	Flowering *E. camaldulensis*	Ponded water along Talbragar River	Assessment conducted from Blue Springs Road
02 84 M	Moderate	Forested Wetlands	Cattle grazing	Feral pigs	Slashed, firewood collection, nutrient enhancement, cropping.	None identified	No evidence of fire	Mistletoe on Casuarina. Shrub layer absent.	No permanent water present	Isolated paddock trees along drainage with exotic understorey. Limited fauna habitats.
03 272 M	Moderate	Grassy Woodlands	Sheep and cattle grazing	Feral pigs	Slashed, firewood collection, nutrient enhancement, cropping.	None identified	Limited evidence of fire from 2017	Flowering *E. macrocarpa*. No shrub layer.	None present	Isolated paddock trees in predominately exotic paddock. Poor fauna habitats.
04 272 L	Low	Poor condition native/exotic grassland	Sheep and cattle grazing	Feral pigs	Slashed, firewood collection, nutrient enhancement, cropping.	None identified	No evidence of fire	None present	Dams in paddocks	Absence of resource and frequent disturbance. Little to no fauna habitat value.
05 281 G	Good	Grassy Woodlands	--	Feral pigs and goats.	Firewood collection	None identified	Limited evidence of fire from 2017	Flowering *E. melliodora* & *A. floribunda*, mistletoe, established shrub layer.	Ponded water along unnamed 2nd order stream	Established canopy and shrub layer with intermittent water present. Highest quality habitat identified within the development site.
06 281 M	Moderate	Grassy Woodlands	Cattle grazing	Feral pigs	Slashed, firewood collection, nutrient enhancement..	None identified	Limited evidence of fire from 2017	Flowering *E. melliodora* & *A. floribunda*	Dams in paddocks	Isolated paddock trees in predominately exotic paddock. Poor fauna habitats.
07 281 L	Low	Poor condition native/exotic grassland	Sheep and cattle grazing	Feral pigs and goats	Slashed, firewood collection, nutrient enhancement, cropping.	None identified	No evidence of fire	None present	Dams in paddocks	Absence of resource and frequent disturbance. Little to no fauna habitat value.
08 461 B	Burnt	Grassy Woodlands	Sheep and cattle grazing	Goats	Firewood collection	None identified	Limited evidence of fire from 2017	Flowering *E. dealbata*	None present	Isolated paddock trees in predominately exotic paddock. Poor fauna habitats.
09 461 M	Moderate	Grassy Woodlands	--	--	Firewood Collection	None identified	None identified	Flowering E. dealbata	None present	Roadside vegetation near rest stop. Limited fauna habitats.
10 478 G	Good	Dry Sclerophyll Forests (Shrubby sub-formation)	--	Feral pigs and goats	Firewood collection	None identified	Limited evidence of fire from 2017	Flowering *E. crebra* & *E. sparsifolia*, established shrub layer.	None present	Established canopy and shrub layer. Moderate fauna habitat.
11 479 B	Burnt	Dry Sclerophyll Forests (Shrubby sub-formation)	--	Feral pigs and goats	Firewood collection	None identified	Extensive damage from fire in 2017	Canopy destroyed, excessively dense Acacia shrub layer	None present	Canopy destroyed and dead, with dense mid-storey. Poor fauna habitat due to acacia monoculture.
12 479 M	Moderate	Dry Sclerophyll Forests (Shrubby sub-formation)	Sheep and cattle grazing	Feral pigs and goats	Firewood collection	None identified	Limited evidence of fire from 2017 in Leadville and Girragulang Road clusters	Flowering *E. crebra*	None present	Isolated paddock trees in predominately exotic paddock. Poor fauna habitats.
13 479 Reg	Regenerating	Dry Sclerophyll Forests (Shrubby sub-formation)	--	Feral pigs and goats	Bulldozed prior to 1990, now regenerating shrub layer.	None identified	Extensive damage from fire in 2017	Canopy absent, excessively dense Acacia shrub layer	None present	Canopy removed, with dense mid-storey. Poor fauna habitat due to acacia monoculture.
14 483 G	Good	Grassy Woodlands	Sheep and cattle grazing	Feral pigs and goats	Slashed, firewood collection, nutrient enhancement, cropping.	None identified	Limited evidence of fire from 2017	*Flowering E. albemol* & *A. floribunda*. Shrub layer absent.	Dams in paddocks	Canopy trees with no shrub layer. Native ground layer. Moderate fauna habitat.
15 483 M	Moderate	Grassy Woodlands	Sheep and cattle grazing	Feral pigs and goats	Slashed, firewood collection, nutrient enhancement, cropping.	None identified	Limited evidence of fire from 2017 in Leadville and Girragulang Road clusters	Flowering *E. albemol* & *A. floribunda*. Shrub layer absent.	Dams in paddocks	Isolated paddock trees in predominately exotic paddock. Poor fauna habitats.
16 483 L	Low	Poor condition native/exotic grassland	Sheep and cattle grazing	Feral pigs and goats	Slashed periodically, firewood collection, nutrient enhancement, cropping.	None identified	No evidence of fire	None present	Dams in paddocks	Absence of resource and frequent disturbance. Little to no fauna habitat value.
17 616 M	Moderate	Rainforests	Sheep and cattle grazing	Feral pigs and goats	--.	None identified	No evidence of fire	Ficus rubiginosa	None present	Ficus islands on exposed sandstone. Poor fauna habitats.

4.2.2.2. Hollow-bearing tree survey

This habitat assessment was also supplemented with a complete traverse of the accessible areas of subject land during winter and spring 2021 assessing for the presence of hollow-bearing trees. The hollow-bearing tree survey was intended to inform the creation of any species polygons that may be required for candidate species. At each potential hollow-bearing tree, the following information was captured:

- Tree species (or stag)
- Diameter at breast height (DBH)
- Number of hollows from 5 size classes (<50mm, 50-100mm, 100-200mm, 200-300mm, and >300mm)
- Notes

Trees that were suspected as only having small (<50mm) hollows have not been marked, as nearly all remnant trees have some form of hollow resource of this size.

Across the study area more than 745 hollow-bearing trees were marked and have been shown on Figure 19.

4.2.2.3. Cliffline mapping

Cliffline mapping was undertaken initially using LPI topographic data which identifies cliffline and cave features. This dataset was then reviewed through field inspections and any areas that contained additional clifflines were added to the spatial layer.

Generally, there are very few suitable cave features within the landscape for cave-roosting bats. The best examples of cliffline habitats are to the west of the Leadville Cluster (Photograph 29 and Photograph 30).

Photograph 29 Cliffline habitats west of Leadville cluster

Photograph 30 Cliffline habitats north of Leadville cluster

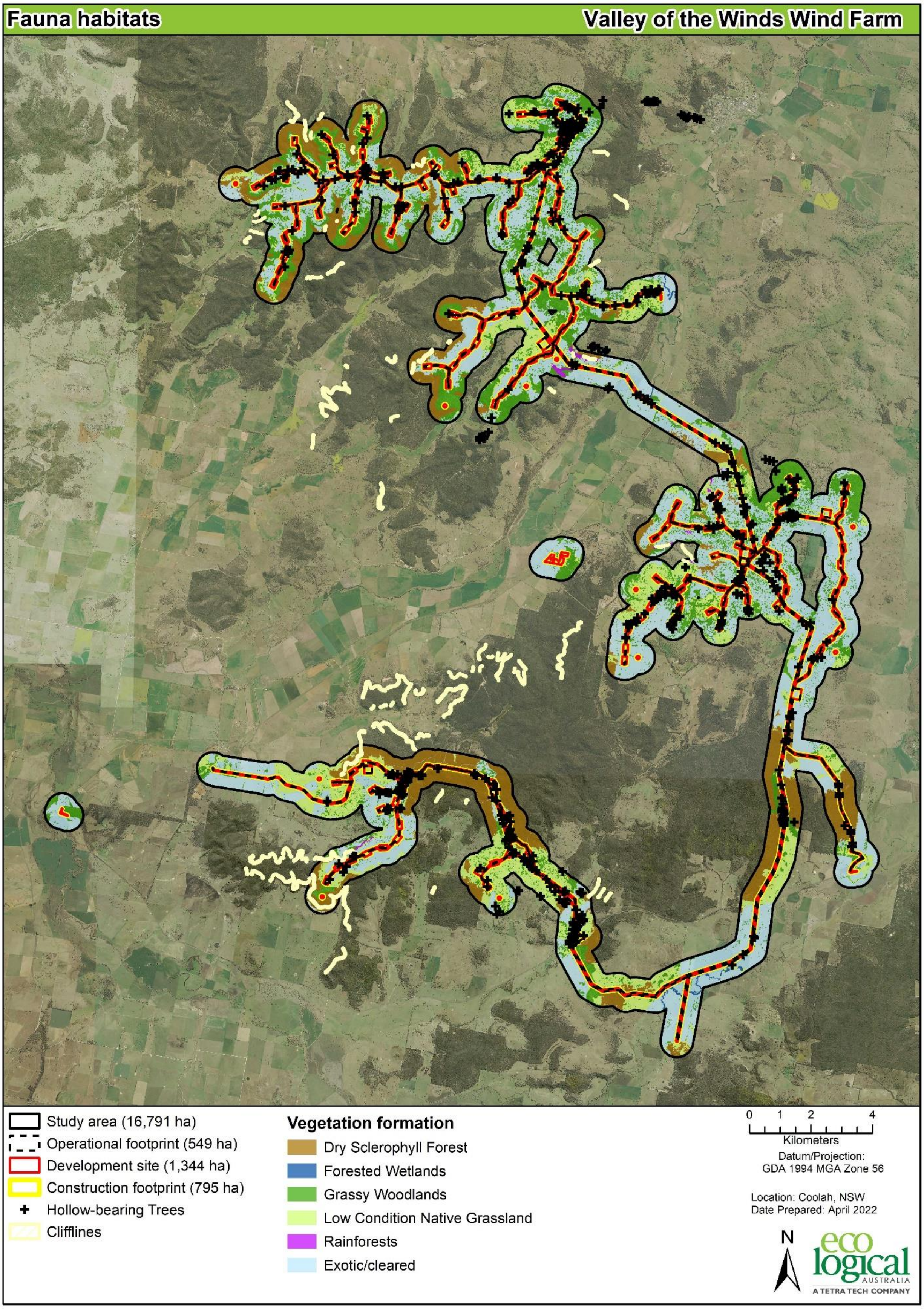


Figure 19 Fauna habitats

4.2.2.4. Important area mapping

Important area mapping was reviewed for two candidate threatened species which require assessment using this method: Regent Honeyeater and Swift Parrot. Important area mapping was reviewed through the BAMCC on 18 October 2021 for each species. Whilst these interfaces do not allow download of the entire spatial file for each species, it was determined that no areas of the study area would impact on any important area mapping for either Regent Honeyeater (Figure 20) or Swift Parrot (Figure 21).

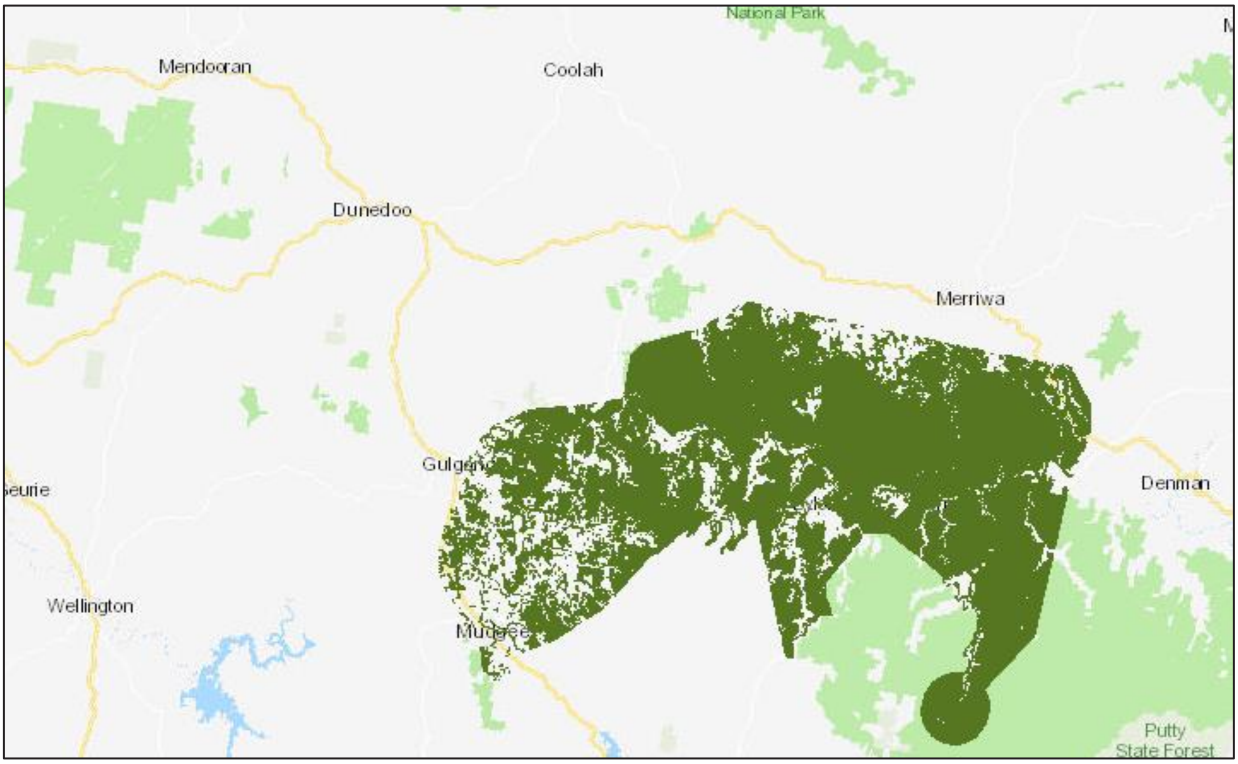


Figure 20 Regent Honeyeater important area mapping (dark green) nearest to the development site

Figure 21 Swift Parrot important area mapping (purple) nearest to the development site

Based on the fauna habitat assessment, a further detailed assessment of suitability of habitats based on geographic and habitat constraints of each species in each bioregion. The condition and degradation of habitats (if applicable) was also applied at this stage to include/exclude candidate species. The assessment of species in each IBRA region is provided below in Table 16 to Table 18.

Table 16 Candidate species assessment (Brigalow Belt South Bioregion)

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
Anthochaera phrygia	Regent Honeyeater (breeding)	Other As per mapped areas	No – the nearest mapped important area is south of Turill, NSW.	--	No – species excluded from further assessment
Aprasia parapulchella	Pink-tailed Legless Lizard	Rocky areas Or within 50m of rocky areas	None – the development site does not include rocky areas or within 50m of rocky areas.	None	No – species excluded from further assessment
Burhinus grallarius	Bush Stone-curlew	Fallen/standing dead timber including logs	Yes – although infrequent there are falling and standing dead timber present within the subject land	--	Yes
Cercartetus nanus	Eastern pygmy-possum	--	Yes – potential habitat along Cainbil Creek and surrounds in good condition vegetation.	--	Yes
Chalinolobus dwyeri	Large-eared Pied Bat	Cliffs Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels	Yes, while the subject land does not contain cliffs that will be directly impacted, there are areas of land within 2km of cliffs.	--	Yes
Commersonia procumbens	Commersonia procumbens	Other Pilliga sandstone	Yes, the subject land contains Pilliga sandstone geology (Figure 9).	--	Yes
Dichanthium setosum	Bluegrass	--	There are habitats present for this species within the study area	--	Yes

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	Other Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	Yes, there are living and dead mature trees within 1km of dams.	--	No – the assessment of habitat features did not identify any eyries or stick nests suitable for breeding habitat. Furthermore, this species was not identified in any field surveys.
Hamirostra melanosternon	Black-breasted Buzzard (Breeding)	Waterbodies Land within 40 m of riparian woodland on inland watercourses or waterholes containing dead or dying eucalypts	No, other than small farm dams there are no larger waterbodies or riparian woodlands within the study area	--	No – species excluded from further assessment
Hieraaetus morphnoides	Little Eagle (Breeding)	Other Nest trees - live (occassionally dead) large old trees within vegetation)	No, there are no nest trees identified.	--	No – the assessment of habitat features did not identify any eyries or stick nests suitable for breeding habitat. Furthermore, this species was not identified in any field surveys.
Hoplocephalus bitorquatus	Pale-headed Snake	--	n/a	--	No – the species is only associated with PCT 84, which occurs as scattered *C. cunninghamii* in exotic paddocks. This habitat is considered too degraded for this species.
Lathamus discolor	Swift Parrot	Other As per mapped areas	No – the nearest mapped important area is near Pokolbin, NSW	--	No – species excluded from further assessment

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
Lophochroa leadbeateri	*Major Mitchell's Cockatoo (Breeding)*	Hollow bearing trees Living or dead tree with hollows greater than 10cm diameter	Yes, hollow-bearing trees are present	--	Yes
Lophoictinia isura	Square-tailed Kite (Breeding)	Other Nest trees	No – no nest trees were identified	--	No – the assessment of habitat features did not identify any eyries or stick nests suitable for breeding habitat. Furthermore, this species was not identified in any field surveys.
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	Caves Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave " observation type code "E nest-roost " with numbers of individuals >500	No – there are no caves, tunnels, mines, culverts present.	--	No – species excluded from further assessment
Monotaxis macrophylla	Large-leafed Monotaxis	--	n/a	--	Yes
Ninox connivens	Barking Owl (Breeding)	Hollow bearing trees Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground	Yes, there are hollow-bearing trees present	--	Yes
Ninox strenua	Powerful Owl	Hollow bearing trees	Yes, there are hollow-bearing trees present	--	Yes

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
	(Breeding)	Living or dead trees with hollow greater than 20cm diameter			
Petaurus norfolcensis	Squirrel Glider	--	n/a	--	Yes
Petrogale penicillata	Brush-tailed Rock-wallaby	N/A|Other Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines	n/a	--	Yes
Phascolarctos cinereus	Koala (Breeding)	Other Areas identified via survey as important habitat (see comments))	Koala feed trees present in PCT281, and PCT483.	--	Yes
Polytelis swainsonii	Superb parrot (Breeding)	Hollow bearing trees Living or dead E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta with hollows greater than 5cm diameter greater than 4m above ground or trees with a DBH of greater than 30cm	Yes, hollow bearing trees are present	--	Yes
Pomaderris queenslandica	Scant Pomaderris	--	n/a	--	Yes
Prasophyllum sp. Wybong	Prasophyllum sp. Wybong	--	n/a	--	Yes
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	Other Breeding camps	No – there are no breeding camps present.	--	No – species excluded from further assessment
Swainsona sericea	Silky swainson-pea	--	n/a	--	Yes

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
Tylophora linearis	Tylophora linearis	--	n/a	--	Yes
Tyto novaehollandiae	Masked Owl (Breeding)	Hollow bearing trees Living or dead trees with hollows greater than 20cm diameter	Yes, there are hollow-bearing trees present	--	Yes
Vespadelus troughtoni	Eastern Cave Bat	Caves Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds."	Yes, there are caves and rocky areas present.	--	Yes

Table 17 Candidate species assessment (NSW South-western Slopes Bioregion)

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
Acacia ausfieldii	Ausfield's Wattle	Other Footslopes and low rises on sandstone	Yes, the subject land contains low rises on soils derived from sandstone.	--	Yes
Anthochaera phrygia	Regent Honeyeater (breeding)	Other As per mapped areas	No – the nearest mapped important area is south of Turill, NSW.	--	No – species excluded from further assessment
Aprasia parapulchella	Pink-tailed Legless Lizard	Rocky areas Or within 50m of rocky areas	There are no rocky areas or areas within 50m of rocky areas within the development site.	None	No – species excluded from further assessment
Burhinus grallarius	Bush Stone-curlew	Fallen/standing dead timber including logs	Yes – although infrequent there are falling and standing dead timber present within the subject land	--	Yes
Callocephalon fimbriatum	Gang-gang Cockatoo (Breeding)	Hollow bearing trees Eucalypt tree species with hollows greater than 9 cm diameter	Yes – there are hollow-bearing trees present.	--	Yes
Chalinolobus dwyeri	Large-eared Pied Bat	Cliffs Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels	Yes, while the subject land does not contain cliffs that will be directly impacted, there are areas of land within 2km of cliffs.	--	Yes
Delma impar	Striped Legless Lizard	REMOVED PRIOR			
Dichanthium setosum	Bluegrass	--	n/a	--	Yes

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
Euphrasia arguta	Euphrasia arguta	Other	None present.	n/a	No – species excluded due to degraded habitats.
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	Other Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	Yes, there are living and dead mature trees within 1km of dams.	--	No – the assessment of habitat features did not identify any eyries or stick nests suitable for breeding habitat. Furthermore, this species was not identified in any field surveys.
Hieraaetus morphnoides	Little Eagle (Breeding)	Other Nest trees - live (occassionally dead) large old trees within vegetation)	No, there are no nest trees identified.	--	No – the assessment of habitat features did not identify any eyries or stick nests suitable for breeding habitat. Furthermore, this species was not identified in any field surveys.
Lathamus discolor	Swift Parrot	Other As per mapped areas	No – the nearest mapped important area is near Pokolbin, NSW	--	No – species excluded from further assessment
Litoria booroolongensis	Booroolong Frog	n/a	No – there are n suitable habitats for this species within the SWS portion of the development site	--	No – species excluded from further assessment.
Lophoictinia isura	Square-tailed Kite (Breeding)	Other Nest trees	No – no nest trees were identified	--	No – the assessment of habitat features did not identify any eyries or stick nests suitable for breeding habitat. Furthermore, this species was not identified in any field surveys.

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	Caves Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave " observation type code "E nest-roost " with numbers of individuals >500	No – there are no caves, tunnels, mines, culverts present.	--	No – species excluded from further assessment
Ninox connivens	Barking Owl (Breeding)	Hollow bearing trees Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground	Yes, there are hollow-bearing trees present	--	Yes
Ninox strenua	Powerful Owl (Breeding)	Hollow bearing trees Living or dead trees with hollow greater than 20cm diameter	Yes, there are hollow-bearing trees present within scattered paddock trees. This is atypical habitats for this species and unlikely to occur.	--	No – species excluded from assessment
Persoonia marginata	Clandulla Geebung	--	n/a	--	Yes
Petaurus norfolcensis	Squirrel Glider	--	n/a	--	Yes
Petrogale penicillata	Brush-tailed Rock-wallaby	N/A|Other Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines	n/a	--	Yes
Phascogale tapoatafa	Brush-tailed Phascogale	REMOVED PRIOR			

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
Phascolarctos cinereus	Koala (Breeding)	Other Areas identified via survey as important habitat (see comments))		--	Yes
Polytelis swainsonii	Superb parrot (Breeding)	Hollow bearing trees Living or dead E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta with hollows greater than 5cm diameter greater than 4m above ground or trees with a DBH of greater than 30cm	Yes, hollow bearing trees are present	--	Yes
Prasophyllum petilum	Tarengo Leek Orchid	--	n/a	East of Binalong, south and east of Boorowa	No – excluded on geographic limitations.
Prasophyllum sp. Wybong	Prasophyllum sp. Wybong	--	n/a	--	Yes
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	Other Breeding camps	No – there are no breeding camps present.	--	No – species excluded from further assessment
Swainsona sericea	Silky swainson-pea	--	n/a	--	Yes
Tylophora linearis	Tylophora linearis	--	n/a	--	Yes
Tyto novaehollandiae	Masked Owl (Breeding)	Hollow bearing trees Living or dead trees with hollows greater than 20cm diameter	Yes, there are hollow-bearing trees present	--	Yes

Table 18 Candidate species assessment (Sydney Basin Bioregion)

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
Acacia ausfieldii	Ausfield's Wattle	Other Footslopes and low rises on sandstone	Yes, the subject land contains low rises on soils derived from sandstone.	--	Yes
Anthochaera phrygia	Regent Honeyeater (breeding)	Other As per mapped areas	No – the nearest mapped important area is south of Turill, NSW.	--	No – species excluded from further assessment
Aprasia parapulchella	Pink-tailed Legless Lizard	Rocky areas Or within 50m of rocky areas	No – there are no rocky areas or within 50m of rocky areas present	None	No – species excluded from further assessment due to lack of habitats within subject site.
Burhinus grallarius	Bush Stone-curlew	Fallen/standing dead timber including logs	Yes – although infrequent there are falling and standing dead timber present within the subject land	--	Yes
Callocephalon fimbriatum	Gang-gang Cockatoo (Breeding)	Hollow bearing trees Eucalypt tree species with hollows greater than 9 cm diameter	Yes – there are hollow-bearing trees present.	--	Yes
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	Hollow bearing trees Living or dead tree with hollows greater than 15cm diameter and greater than 8m above ground	Yes – there are hollow-bearing trees present	--	Yes
Cercartetus nanus	Eastern Pygmy-possum	--	n/a		No – this species is predicted in PCT281 only and habitats present within the development site are too degraded

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
Chalinolobus dwyeri	Large-eared Pied Bat	Cliffs Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels	Yes, while the subject land does not contain cliffs that will be directly impacted, there are areas of land within 2km of cliffs.	--	Yes
Commersonia procumbens	Commersonia procumbens	Other Pilliga sandstone	Yes, the subject land contains Pilliga sandstone geology (Figure 9).	--	Yes
Cynanchum elegans	White-flowered Wax Plant	--	n/a	--	Yes
Delma impar	Striped Legless Lizard	REMOVED PRIOR			
Eucalyptus camaldulensis - endangered population	Eucalyptus camaldulensis population in the Hunter catchment	Other Floodplains of watercourses, including rivers, creeks, intermittent streams or billabongs	Yes, along the Talbragar River in the southern portion of the study area	Hunter catchment as per the Determination	No – the subject land does not include any areas of the Hunter Catchment.
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	Other Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	Yes, there are living and dead mature trees within 1km of dams.	--	No – the assessment of habitat features did not identify any eyries or stick nests suitable for breeding habitat. Furthermore, this species was not identified in any field surveys.

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
Hieraaetus morphnoides	Little Eagle (Breeding)	Other Nest trees - live (occassionally dead) large old trees within vegetation)	No, there are no nest trees identified.	--	No – the assessment of habitat features did not identify any eyries or stick nests suitable for breeding habitat. Furthermore, this species was not identified in any field surveys.
Hoplocephalus bitorquatus	Pale-headed Snake	--	n/a	--	Yes
Hoplocephalus stephensii	Stephens' Banded Snake	Hollow bearing trees Or within 500 m of this habitat|Other Within 500 m of aboreal vine tangles|Fallen/standing dead timber including logs Or within 500 m of this habitat	There are no arboreal vine thickets present or other suitable rainforest/wet sclerophyll forest vegetation types.	--	No – species excluded from further assessment
Lathamus discolor	Swift Parrot	Other As per mapped areas	No – the nearest mapped important area is near Pokolbin, NSW	--	No – species excluded from further assessment
Lophoictinia isura	Square-tailed Kite (Breeding)	Other Nest trees	No – no nest trees were identified	--	No – the assessment of habitat features did not identify any eyries or stick nests suitable for breeding habitat. Furthermore, this species was not identified in any field surveys.

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
Miniopterus australis	Little Bent-winged Bat (Breeding)	Caves Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave' observation type code 'E nest-roost' with numbers of individuals >500 or from the scientific literature	No – there are no caves, tunnels, mines, culverts present.	--	No – species excluded from further species credit assessment
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	Caves Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave " observation type code "E nest-roost " with numbers of individuals >500	No – there are no caves, tunnels, mines, culverts present.	--	No – species excluded from further assessment
Monotaxis macrophylla	Large-leafed Monotaxis	--	n/a	--	Yes

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
Ninox connivens	Barking Owl (Breeding)	Hollow bearing trees Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground	Yes, there are hollow-bearing trees present	--	Yes
Ninox strenua	Powerful Owl (Breeding)	Hollow bearing trees Living or dead trees with hollow greater than 20cm diameter	Yes, there are hollow-bearing trees present	--	No – this species is unlikely to inhabit scattered paddock trees present in the development site.
Petauroides volans	Greater Glider	Hollow bearing trees Null|N/A	Yes	--	Yes
Petaurus norfolcensis	Squirrel Glider	--	n/a	--	Yes
Petrogale penicillata	Brush-tailed Rock-wallaby	N/A|Other Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines	n/a	--	Yes
Phascogale tapoatafa	Brush-tailed Phascogale	REMOVED PRIOR			
Phascolarctos cinereus	Koala (Breeding)	Other Areas identified via survey as important habitat (see comments))		--	Yes
Prasophyllum petilum	Tarengo Leek Orchid	--	n/a	East of Binalong, south and east of Boorowa	No – excluded on geographic limitations.
Prasophyllum sp. Wybong	Prasophyllum sp. Wybong	--	n/a	--	Yes
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	Other Breeding camps	No – there are no breeding camps present.	--	No – species excluded from further assessment

Species name	Common name	BAMCC Habitat feature	Habitats present?	Geographic limitations	Further assessment undertaken?
Tylophora linearis	Tylophora linearis	--	n/a	--	Yes
Tyto novaehollandiae	Masked Owl (Breeding)	Hollow bearing trees Living or dead trees with hollows greater than 20cm diameter	Yes, there are hollow-bearing trees present	--	Yes
Vespadelus troughtoni	Eastern Cave Bat	Caves Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds."	Yes, there are caves and rocky areas present.	--	Yes

4.2.3. Step 3: Candidate species requiring further assessment

Based on the assessment at 4.1 and 4.2 above, a threatened species survey plan was undertaken to establish the presence of species credit species (and their habitats). The threatened species survey strategy involved the following activities:

- Targeted threatened flora surveys in Summer and spring
- Targeted Microchiropteran bat surveys using harp traps and songmeters in summer
- Diurnal avifauna surveys
- Targeted arboreal mammal surveys in spring, summer, and autumn using call playback, IR cameras, spotlighting.
- Targeted forest owl surveys in winter using call playback, spotlighting, and songmeters.
- Targeted Koala surveys using the Spot Assessment Technique (SAT) in suitable vegetation.
- Targeted terrestrial mammal surveys using Elliot traps.

Group	Credit type	Species Name	Common Name	BC Act	EPBC Act	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Assessment undertaken?
Flora	Species	*Acacia ausfeldii*	Ausfeld's Wattle	Vulnerable	Not listed	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	Yes. Threatened flora searches in appropriate habitats.
Fauna	Dual	*Anthochaera phrygia*	Regent Honeyeater	Critically Endangered	Critically Endangered	Important area map												Not required, study area does not contain any mapped important areas.
Fauna	Species	*Aprasia parapulchella*	Pink-tailed Legless Lizard	Vulnerable	Vulnerable	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No	Yes, systematic searches in appropriate habitats. Species excluded following habitat and targeted surveys.
Fauna	Species	*Burhinus grallarius*	Bush Stone-curlew	Vulnerable	Not listed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes, spotlighting across the study area.
Fauna	Dual	*Callocephalon fimbriatum*	Gang-gang Cockatoo	Vulnerable	Not listed	Yes	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes, diurnal bird surveys undertaken for all avifauna.
Fauna	Species	*Cercartetus nanus*	Eastern Pygmy Possum	Vulnerable	Not listed	Yes	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes, targeted Elliot trapping and IR camera survey undertaken in areas of suitable habitats.
Fauna	Species	*Chalinolobus dwyeri*	Large-eared Pied Bat	Vulnerable	Vulnerable	Yes	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes, targeted ultrasonic and harp trap survey undertaken in areas of suitable habitats.
Flora	Species	*Commersonia procumbens*	Commersonia procumbens	Vulnerable	Vulnerable	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes. Threatened flora searches in appropriate habitats.
Flora	Species	*Cynanchum elegans*	White-flowered Wax Plant	Endangered	Endangered	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes. Threatened flora searches in appropriate habitats.
Fauna	Species	*Delma impar*	Striped Legless Lizard	Vulnerable	Vulnerable	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No, species excluded as described above.
Flora	Species	*Dichanthium setosum*	Bluegrass	Vulnerable	Vulnerable	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes. Threatened flora searches in appropriate habitats.
Flora	Population	*Eucalyptus camaldulensis - endangered population*	Eucalyptus camaldulensis - endangered population			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not required, the study area does not include any of the Hunter River Catchment
Flora	Species	*Euphrasia arguta*	Euphrasia arguta	Critically Endangered	Critically Endangered	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes	Yes	No, species excluded as described above.
Fauna	Dual	*Haliaeetus leucogaster*	White-bellied Sea Eagle	Vulnerable	Not listed	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No, species excluded as described above.
Fauna	Dual	*Hieraaetus morphnoides*	Little Eagle	Vulnerable	Not listed	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	No, species excluded as described above.
Fauna	Species	*Hoplocephalus bitorquatus*	Pale-headed Snake	Vulnerable	Not listed	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes	Yes	No. Assumed present in PCT42 only, in areas not yet assessable by the project.
Fauna	Species	*Hoplocephalus stephensii*	Stephens' Banded Snake	Vulnerable	Not listed	Yes	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	No, species excluded as described above.
Fauna	Dual	*Lathamus discolor*	Swift Parrot	Endangered	Critically Endangered	Important area map												Not required, study area does not contain any mapped important areas.

Group	Credit type	Species Name	Common Name	BC Act	EPBC Act	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Assessment undertaken?
Fauna	Species	*Litoria booroolongensis*	Booroolong Frog	Endangered	Endangered	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No, species excluded as described above.
Fauna	Dual	*Lophochroa leadbeateri*	Major Mitchell's Cockatoo	Vulnerable	Not listed	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Fauna	Dual	*Lophoictinia isura*	Square-tailed Kite	Vulnerable	Not listed	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No, species excluded as described above.
Fauna	Dual	*Miniopterus australis*	Little Bent-wing Bat	Vulnerable	Not listed	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	Yes
Fauna	Dual	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	Vulnerable	Not listed	Yes	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Flora	Species	*Monotaxis macrophylla*	Large-leafed Monotaxis	Endangered	Not listed	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Fauna	Dual	*Ninox connivens*	Barking Owl	Vulnerable	Not listed	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fauna	Dual	*Ninox strenua*	Powerful Owl	Vulnerable	Not listed	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	Yes
Flora	Species	*Persoonia marginata*	Clandulla Geebung	Vulnerable	Vulnerable	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes
Fauna	EPBC	*Petaurus volans*	Greater Glider	Not listed	Vulnerable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fauna	Species	*Petaurus norfolcensis*	Squirrel Glider	Vulnerable	Not listed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fauna	Species	*Petrogale penicillata*	Brush-tailed Rock Wallaby	Vulnerable	Vulnerable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fauna	Species	*Phascogale tapoatafa*	Brush-tailed Phascogale	Vulnerable	Not listed	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	No, species excluded as described above.
Fauna	Dual	*Phascolarctos cinereus*	Koala	Vulnerable	Vulnerable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fauna	Dual	*Polytelis swainsonii*	Superb Parrot	Vulnerable	Vulnerable	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No	Yes
Flora	Species	*Prasophyllum petilum*	Tarengo Leek Orchid	Endangered	Endangered	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No, species excluded as described above.
Flora	Species	*Prasophyllum sp. Wybong*	Prasophyllum sp. Wybong	Not listed	Critically Endangered	No	No	No	No	No	No	No	No	Yes	Yes	No	No	Yes
Fauna	Dual	*Pteropus poliocephalus*	Grey-headed Flyng Fox	Vulnerable	Vulnerable	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No, species excluded as described above.
Flora	Species	*Swainsona sericea*	Silky Swainson-pea	Vulnerable	Not listed	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No	Yes
Flora	Species	*Tylophora linearis*	Tylophora linearis	Vulnerable	Endangered	Yes	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
Fauna	Dual	*Tyto novaehollandiae*	Masked Owl	Vulnerable	Not listed	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	Yes
Fauna	Species	*Vespadelus troughtoni*	Eastern Cave Bat	Vulnerable	Not listed	Yes	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes

4.2.4. Targeted transects for threatened flora

Targeted surveys in February involved targeted searches of suitable habitats for the appropriate threatened species across the windfarm as shown on Figure 22. These surveys were undertaken prior to any formal development footprint for the project, and so targeted the most likely area to detect threatened species.

The exact dates and staff undertaking threatened flora surveys is described in Table 19.

Table 19: Targeted threatened flora survey dates

Date	Surveyors	Effort
15 - 19 February 2021	Lily Gorrell, Liam Scanlan	90 hours
28 - 30 April 2021	Lily Gorrell, Sophie Montgomery	54 hours
10 - 14 May 2021	Alex Pursche, Dan Watts, Liam Scanlan, Sophie Montgomery	180 hours
31-May-21	Alex Pursche, Sophie Montgomery	18 hours
6 - 15 September 2021	Lily Gorrell, Liam Scanlan	180 hours
21 - 24 September 2021	Sophie Montgomery, Liam Scanlan	72 hours

At the completion of threatened species surveys, *Dichanthium setosum* (Bluegrass), which is listed under the BC Act as Vulnerable and EPBC Act as Vulnerable, was identified in one location. The occurrence of this species is a novel find in the Coolah region, as this is at the far south-western extent of the species distribution. The location of this find was outside the survey area. A sample of the species was sent to the National Herbarium of NSW for confirmation. Following receipt of confirmation of the specimen, a subsequent survey was undertaken in more marginal habitats for this species in April and May 2021 (Figure 22). At completion of these additional surveys, the species was identified in one additional location along a creekline nearby to the Mount Hope – Girragulang Road connector transmission line. The location of all identified samples of *D. setosum* is shown on Figure 24. All of these locations are outside of the construction footprint and the species is not expected to be impacted by the project.

Threatened flora surveys in September were conducted over 14 survey days, assessing areas of suitable habitat. During these surveys, a 100m grid approach was undertaken in accordance with Surveying threatened plants and their habitats (DPIE, 2017). The location of surveys is shown on Figure 23.

No additional threatened flora species were identified.

Photograph 31 ***Dichathium setosum***

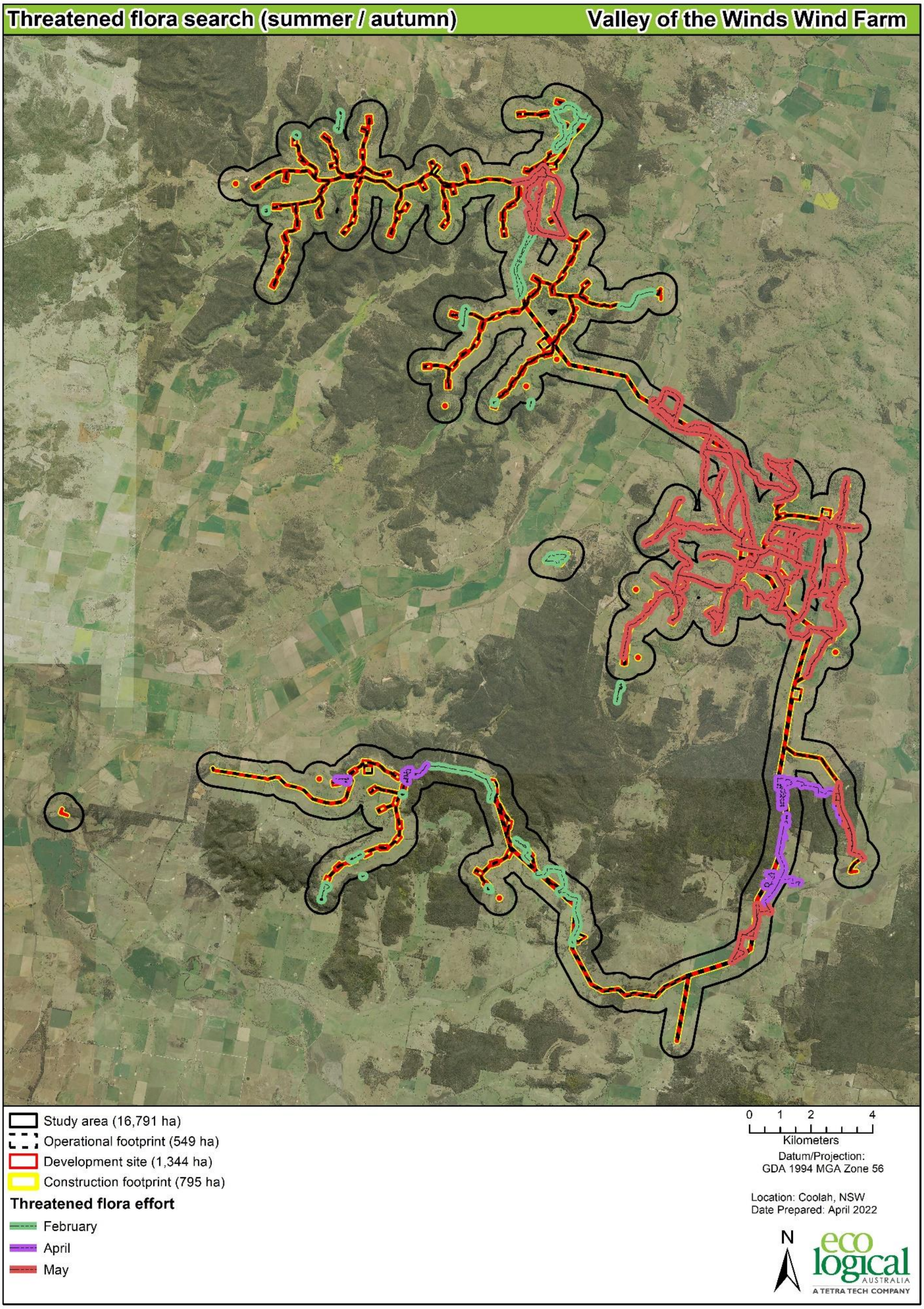


Figure 22 Threatened flora survey effort (summer/autumn)

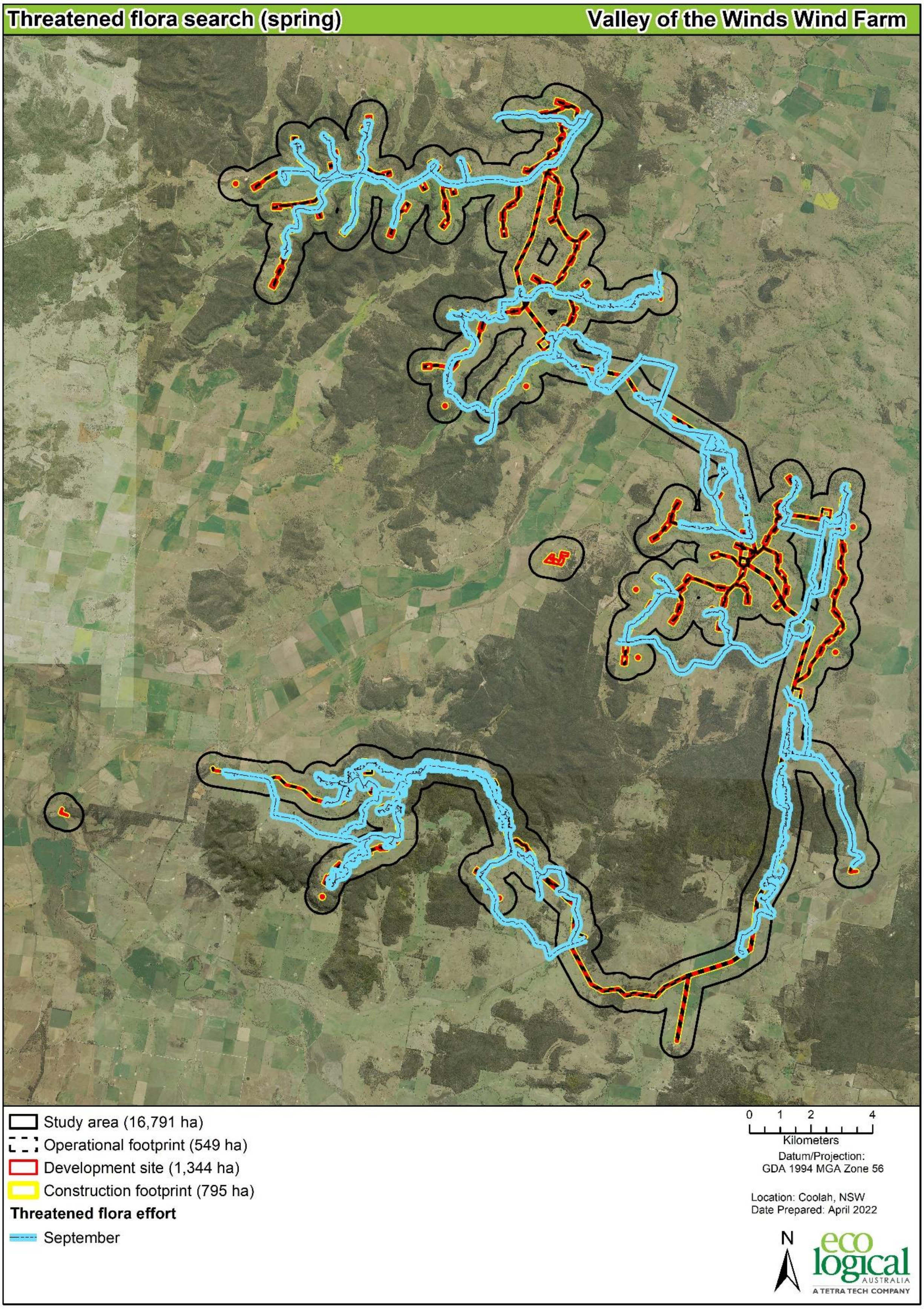


Figure 23 Threatened flora surveys (spring)

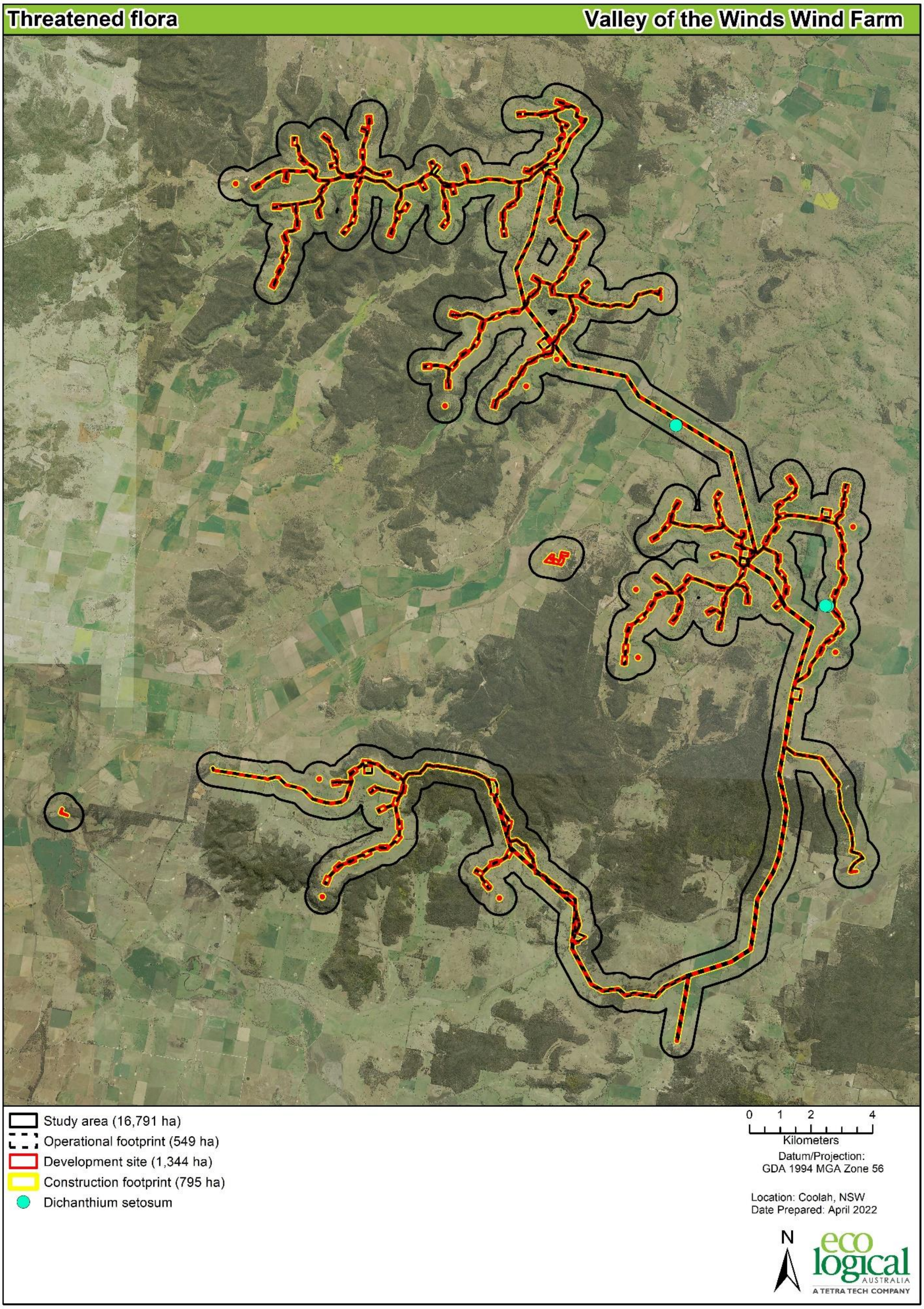


Figure 24 Threatened flora

4.2.5. Targeted threatened fauna surveys

Targeted threatened fauna surveys included the following targeted surveys:

- Targeted Microchiropteran bat surveys using harp traps and songmeters in summer
- Diurnal avifauna surveys
- Targeted arboreal mammal surveys in spring, summer, and autumn using call playback, IR cameras, spotlighting.
- Targeted forest owl surveys in winter using call playback, spotlighting, and songmeters.
- Targeted Koala surveys using the Spot Assessment Technique (SAT) in suitable vegetation

The effort and detailed methods for each targeted survey are described below.

4.2.6. Microchiropteran bat surveys

4.2.6.1. Methods

Microchiropteran bat surveys were undertaken to target candidate threatened species identified in Section 4.2.3.

Bat surveys were undertaken by using both harp traps and songmeters (Songmeter Mini) across the study area, with priority given to those areas that contain potential bat roosting and breeding habitats. Surveys were conducted between December 2020 and February 2021, with a focus over the potential breeding timing for locally known threatened bats.

Harp traps were placed in natural flyways in the landscape, making use of overhanging branches, cliff edges, and forest trails. Harp traps were checked daily at dawn, and approximately 1 hour after dark. All harp traps were left in situ for a period of 4 nights each. Harp trapping was only conducted at Leadville and Mount Hope, as these wind farm clusters contained clifflines and other suitable habitat for breeding Microchiropteran bats.

Songmeter minis were also used to assess bat species by continuously recording ultrasonic data from sunset to sunrise. Songmeters were left in situ for a minimum of 4 nights, and up to 30 nights. Songmeters were used across all three wind farm clusters.

A total of 64 harp trap nights, and 613 songmeter nights were undertaken across the project. The location of all threatened Microchiropteran bat surveys is shown on Figure 25. Detail of horizontal bat surveys including locations and dates are provided in Table 20.

All songmeter data was sent to Greg Ford at Balance! Environmental for analysis.

Photograph 32 Harp trap installation under overhanging *E. albemol*

Photograph 33 Songmeter mini fixed to *A. floribunda*

Table 20 Bat survey effort details

Method	Unit ID	Wind farm cluster	Date Set	Date Collect	Number of night	Staff
Harp trap	New_Harp 1	Leadville	30 November 2020	4 December 2020	4	Alex Pursche, Tom Schmidt
Harp trap	New_Harp 3	Leadville	30 November 2020	4 December 2020	4	Alex Pursche, Tom Schmidt
Harp trap	New_Harp 4	Leadville	30 November 2020	4 December 2020	4	Alex Pursche, Tom Schmidt
Harp trap	New_Harp 7	Leadville	30 November 2020	4 December 2020	4	Alex Pursche, Tom Schmidt
Harp trap	New_harp 4	Mount Hope	18 January 2021	22 January 2021	4	Alex Pursche, Mike Lawrie
Harp trap	New_harp 8	Mount Hope	18 January 2021	22 January 2021	4	Alex Pursche, Mike Lawrie
Harp trap	New_harp 6	Mount Hope	18 January 2021	22 January 2021	4	Alex Pursche, Mike Lawrie
Harp trap	New_harp 2	Mount Hope	18 January 2021	22 January 2021	4	Alex Pursche, Mike Lawrie
Harp trap	New_harp 5	Mount Hope	18 January 2021	22 January 2021	4	Alex Pursche, Mike Lawrie
Harp trap	New_harp 7	Mount Hope	18 January 2021	22 January 2021	4	Alex Pursche, Mike Lawrie
Harp trap	Mud_harp 3	Mount Hope	18 January 2021	22 January 2021	4	Tom Kelly, Bec Croake
Harp trap	Mud_harp 4	Mount Hope	18 January 2021	22 January 2021	4	Tom Kelly, Bec Croake
Harp trap	Mud_harp 2	Mount Hope	18 January 2021	22 January 2021	4	Tom Kelly, Bec Croake
Harp trap	Mud_harp 5	Mount Hope	18 January 2021	22 January 2021	4	Tom Kelly, Bec Croake
Harp trap	Mud_harp 6	Mount Hope	18 January 2021	22 January 2021	4	Tom Kelly, Bec Croake
Harp trap	Mud_harp 1	Mount Hope	18 January 2021	22 January 2021	4	Tom Kelly, Bec Croake
		Subtotal harp trap nights	64			
Songmeter	SM_Bustard	Leadville	30 November 2020	4 December 2020	4	Alex Pursche, Tom Schmidt
Songmeter	SM_Lionfish	Leadville	30 November 2020	4 December 2020	4	Alex Pursche, Tom Schmidt
Songmeter	SM_Lotus	Leadville	30 November 2020	4 December 2020	4	Alex Pursche, Tom Schmidt
Songmeter	SM_Firetail	Leadville	30 November 2020	4 December 2020	4	Alex Pursche, Tom Schmidt

Method	Unit ID	Wind farm cluster	Date Set	Date Collect	Number of night	Staff
Songmeter	SM_Bustard	Mount Hope	21 December 2020	20 January 2021	30	Alex Pursche, Sophie Montgomery
Songmeter	SM_Lionfish	Mount Hope	21 December 2020	20 January 2021	30	Alex Pursche, Sophie Montgomery
Songmeter	SM_Lotus	Mount Hope	21 December 2020	20 January 2021	30	Alex Pursche, Sophie Montgomery
Songmeter	SM_Firetail	Mount Hope	21 December 2020	20 January 2021	30	Alex Pursche, Sophie Montgomery
Songmeter	SM_Toadfish	Mount Hope	21 December 2020	20 January 2021	30	Alex Pursche, Sophie Montgomery
Songmeter	SM_Spicebush	Mount Hope	21 December 2020	20 January 2021	30	Alex Pursche, Sophie Montgomery
Songmeter	SM_Bustard	Mount Hope	21 December 2020	20 January 2021	30	Alex Pursche, Sophie Montgomery
Songmeter	SM_Lionfish	Mount Hope	21 December 2020	20 January 2021	30	Alex Pursche, Sophie Montgomery
Songmeter	SM_Spicebush	Mount Hope	21 December 2020	20 January 2021	30	Alex Pursche, Sophie Montgomery
Songmeter	SM_Firetail	Mount Hope	21 December 2020	20 January 2021	30	Alex Pursche, Sophie Montgomery
Songmeter	SM_Wolverine	Mount Hope	21 January 2021	17 February 2021	27	Mike Lawrie, Tom Kelly
Songmeter	SM_Wedgie	Mount Hope	21 January 2021	17 February 2021	27	Mike Lawrie, Tom Kelly
Songmeter	SM_Lotus	Mount Hope	21 January 2021	17 February 2021	27	Mike Lawrie, Tom Kelly
Songmeter	SM_Toadfish	Girragulang Road	21 January 2021	17 February 2021	27	Mike Lawrie, Tom Kelly
Songmeter	SM_Wombat	Girragulang Road	21 January 2021	17 February 2021	27	Mike Lawrie, Tom Kelly
Songmeter	SM_Helioporus	Girragulang Road	21 January 2021	17 February 2021	27	Mike Lawrie, Tom Kelly
Songmeter	SM_Hibbertia	Girragulang Road	21 January 2021	17 February 2021	27	Mike Lawrie, Tom Kelly

Method	Unit ID	Wind farm cluster	Date Set	Date Collect	Number of night	Staff
Songmeter	SM_Flannyflower	Girragulang Road	21 January 2021	17 February 2021	27	Mike Lawrie, Tom Kelly
Songmeter	SM_Bustard	Girragulang Road	21 January 2021	17 February 2021	27	Mike Lawrie, Tom Kelly
Songmeter	SM_Lionfish	Girragulang Road	21 January 2021	17 February 2021	27	Mike Lawrie, Tom Kelly
Songmeter	SM_Spicebush	Girragulang Road	21 January 2021	17 February 2021	27	Mike Lawrie, Tom Kelly
		Subtotal songmeter nights		613 nights		

4.2.6.2. Results

Harp traps yielded poor results across the survey. This is due to the large expanses between habitat patches, and generally poor condition of native vegetation present. Over the 64 trap nights, only fifteen (15) bats were captured comprising of the following five species:

- *Nyctophilus geoffroyi*
- *Ozimops planiceps*
- *Vespadelus vulturnus*
- *Nyctophilus gouldii*
- *Chalinolobus gouldii*

None of these species are threatened under the BC Act or EPBC Act.

Songmeter data was moderately more useful, with analysis identifying the following 18 species of Microchiropteran bat:

- *Austronomus australis*
- *Chalinolobus dwyeri*
- *Chalinolobus gouldii*
- *Chalinolobus morio*
- *Falsistrellus tasmaniensis*
- *Miniopterus orianae*
- *Nyctophilus sp.*
- *Ozimops petersi*
- *Ozimops planiceps*
- *Ozimops ridei*
- *Rhinolophus megaphyllus*
- *Saccolaimus flaviventris*
- *Scoteanax rueppellii*
- *Scotorepens balstoni*
- *Scotorepens orion*
- *Vespadelus darlingtoni*

- *Vespadelus regulus*
- *Vespadelus vulturnus*

Of these species three are listed under the BC Act as vulnerable:

- *Chalinolobus dwyeri*
- *Miniopterus orianae oceansis*
- *Saccolaimus flaviventris*

The location of threatened species identified during the field surveys is shown on Figure 26. Detailed analysis of the songmeter calls is provided in Appendix J.

4.2.7. Avifauna surveys

4.2.7.1. Methods

Avifauna surveys were conducted as part of a general census of avifauna species across the study area, as well as targeted threatened species surveys and bird utilisation surveys. Generally, each bird survey was conducted by a single observer over a 20 minute period identifying any birds heard or observed within a 2ha search.

Within each season, surveys were conducted across the project. Initial baseline surveys were randomly assigned across the wind farm, capturing data throughout all three clusters. During this baseline survey period from 26 August 2020 to 14 May 2021, a total of 158 bird surveys were undertaken by ELA staff.

In winter 2021, a second survey was undertaken to measure bird utilisation and target winter migrant bird species from 21 June to 16 August 2021. Across the study area, 37 fixed point locations were established (Mount Hope = 13, Girragulang Road = 12, Leadville = 12). Fixed points were located across each wind farm cluster to provide a reasonable subsampling of ridges and hills, whilst providing spatial independence from each survey site. Each fixed survey point was surveyed four times each, twice in the morning (generally within 2 hours of dawn) and twice in the afternoon. These 148 fixed site surveys were supplemented by 28 additional opportunistic survey sites to provide a total of 176 surveys across the study area.

Further details about the bird surveys and methodology are provided in Section 6.2. The location of bird surveys is shown on Figure 25.

4.2.7.2. Results

A total of 82 species of bird were identified across the avifauna surveys. Eight threatened avifauna species were identified during surveys as described in Table 21. No species credit, or ecosystem/species credit species were identified during surveys.

A detailed description of bird activity and utilisation is provided further below in Section 6.2.

Table 21 BC Act and EPBC Act listed species detected during bird utilisation surveys.

Species	Common	BC Act	EPBC Act
Falco subniger	Black Falcon	Vulnerable	Not listed
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable	Not listed
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Vulnerable	Not listed
Glossopsitta pusilla	Little Lorikeet	Vulnerable	Not listed
Chthonicola sagittata	Speckled Warbler	Vulnerable	Not listed
Circus assimilis	Spotted Harrier	Vulnerable	Not listed
Daphoenositta chrysoptera	Varied Sittella	Vulnerable	Not listed
Hirundapus caudacutus	White-throated Needletail	Not listed	Vulnerable, Marine, Migratory

4.2.8. Arboreal and terrestrial mammal surveys

4.2.8.1. Methods

Arboreal and terrestrial mammal surveys involved baited remote cameras and spotlighting across the study area, supplemented by diurnal surveys and habitat searches.

Remote cameras were fixed on trees with bait stationed positioned approximately 2 m from the camera. Cameras were baited using a bait ball of oats, honey, and peanut butter. Cameras were set to record continuously during the survey period with a 5 image burst for each detection.

All images were analysed manually by ELA ecologists. The location of remote cameras is shown on Figure 25 and the unit ID, number of days in situ, and number of images is detailed in Table 22. An example of an arboreal orientation of a remote camera is shown on Photograph 38. A total of 57 deployments over 1,318 days total effort was undertaken across the study area.

Sample images of some of the fauna identified are shown on Photograph 34 to Photograph 37.

Photograph 34 Red-necked Wallaby

Photograph 35 Feral Pig

Photograph 36 Squirrel Glider

Photograph 37 Wild Dog pup

Photograph 38 Arboreal camera setup

Table 22 Infrared Camera survey effort summary

Wind farm cluster	Unit ID	Date Set	Date Collect	Days
Mount Hope	06_BRWN_09	22-Jun-21	14-Jul-21	22
Mount Hope	01_4630	22-Jun-21	14-Jul-21	22
Mount Hope	19_Hunt31	23-Jun-21	12-Jul-21	19
Mount Hope	03_4750	23-Jun-21	12-Jul-21	19
Mount Hope	23_New_41	23-Jun-21	12-Jul-21	19
Mount Hope	10_Hunt_05	23-Jun-21	12-Jul-21	19
Mount Hope	02_8579	22-Jun-21	14-Jul-21	22
Mount Hope	14_Hunt_37	22-Jun-21	14-Jul-21	22
Mount Hope	22_Hunt_19	23-Jun-21	12-Jul-21	19
Mount Hope	04_IR_9003	23-Jun-21	12-Jul-21	19
Girragulang Road	12_Hunt_08	23-Jun-21	14-Jul-21	21
Girragulang Road	13_Hunt_17	26-Jun-21	14-Jul-21	18
Girragulang Road	18_Hunt_23	27-Jun-21	14-Jul-21	17
Girragulang Road	09_Hunt_04	27-Jun-21	14-Jul-21	17
Girragulang Road	Hunt_43	27-Jun-21	14-Jul-21	17
Leadville	17_IR_22	30-Jun-21	13-Jul-21	13
Leadville	06_Brwn_07	30-Jun-21	13-Jul-21	13

Wind farm cluster	Unit ID	Date Set	Date Collect	Days
Leadville	21_Hunt_16	30-Jun-21	13-Jul-21	13
TXL	11_Hunt_07	28-Jun-21	14-Jul-21	16
TXL	4749	28-Jun-21	14-Jul-21	16
TXL	15_Hunt_12	28-Jun-21	14-Jul-21	16
TXL	20_Hunt_39	28-Jun-21	14-Jul-21	16
Leadville	31_9003	29-Jun-21	14-Jul-21	15
Leadville	08_BRWN_99	30-Jun-21	14-Jul-21	14
Mount Hope	37_Hunt_03	22-Dec-20	20-Jan-21	29
Leadville	33_Hunt_03	30-Nov-20	4-Dec-20	4
Girragulang Road	Camera_08	21-Jan-21	17-Feb-21	27
Mount Hope	36_Hunt_02	22-Dec-20	20-Jan-21	29
Leadville	32_Hunt_02	30-Nov-20	4-Dec-20	4
Girragulang Road	Camera_02	21-Jan-21	16-Feb-21	26
Girragulang Road	Camera_03	20-Jan-21	16-Feb-21	27
Leadville	35_Hunt_08	30-Nov-20	4-Dec-20	4
Leadville	34_Hunt_07	30-Nov-20	4-Dec-20	4
Mount Hope	Camera_88	22-Dec-20	21-Jan-21	30
Mount Hope	39_Hunt_08	21-Dec-20	20-Jan-21	30
Girragulang Road	Camera_10	21-Jan-21	17-Feb-21	27
Mount Hope	38_Hunt_07	22-Dec-20	20-Jan-21	29
Girragulang Road	Camera_09	20-Jan-21	16-Feb-21	27
Mount Hope	40_Hunt_09	22-Dec-20	20-Jan-21	29
Girragulang Road	IR_12	21-Jan-21	17-Feb-21	27
Mount Hope	Camera_10	22-Dec-20	20-Jan-21	29
Girragulang Road	Camera_11	20-Jan-21	16-Feb-21	27
Mount Hope	Camera_11	22-Dec-20	20-Jan-21	29
Mount Hope	Camera_12	22-Dec-20	20-Jan-21	29
Mount Hope	Camera_13	22-Dec-20	20-Jan-21	29
Girragulang Road	Camera_88	20-Jan-21	16-Feb-21	27
Mount Hope	IR_99	21-Jan-21	17-Feb-21	27
Mount Hope	Camera_008	21-Jan-21	17-Feb-21	27
TXL	07_BRWN_12	4-Aug-21	10-Sep-21	37
TXL	29_1746	4-Aug-21	10-Sep-21	37
TXL	24_Hunt_08	4-Aug-21	10-Sep-21	37
TXL	25_HUNT_19	4-Aug-21	10-Sep-21	37
TXL	30_8579	4-Aug-21	10-Sep-21	37

Wind farm cluster	Unit ID	Date Set	Date Collect	Days
TXL	26_Hunt_23	4-Aug-21	10-Sep-21	37
TXL	28_Hunt41	4-Aug-21	10-Sep-21	37
TXL	27_Hunt_31	4-Aug-21	10-Sep-21	37
Girragulang Road	16_Hunt_15	23-Jun-21	14-Jul-21	21

Elliot trapping was conducted in better components of PCT281 to specifically target terrestrial mammals, including Eastern Pygmy Possum. Elliot traps were set along two drainage lines, Cainbil Creek, and an unnamed 1st order creek, nearby to the proposed transmission route. Traps were placed in the most likely habitats for this species, where ground cover included a mix of native tussocks and grasses, as well as nearby food and shelter resources as shown in Figure 25. At each of the two sites, 25 ground Elliot A traps were baited with oats, honey, peanut butter mix, and set in likely locations approximately 10m apart. Traps were checked each evening and each morning within 2 hours of sun rise/set.

Table 23 Elliot trapping survey summary

Target area	Dates	Staff	Number of trap nights
TXL	31 January – 4 March	Alex Pursche, Lachlan Metzler	100
TXL	31 January – 4 March	Alex Pursche, Lachlan Metzler	100

Spotlighting was conducted over 43 events over 29 nights, predominately from a vehicle moving slowly in first gear. Spotlighting was undertaken using a handheld led spotlight (Olight M3X) which is capable of picking up eyeshine for up to 1km. This style of light is most suitable in the open vegetation across the study area. Across the study area 465.4 km of spotlighting was undertaken across all seasons. The exact dates and staff of surveys are shown in Table 24.

Table 24 Spotlighting survey summary

Wind farm cluster	Date	Staff	Distance (km)
Leadville	30-Nov-20	Tom Schmidt, Alex Pursche	20.2
Leadville	1-Dec-20	Tom Schmidt, Alex Pursche	17.0
Leadville	2-Dec-20	Tom Schmidt, Alex Pursche	16.9
Leadville	3-Dec-20	Tom Schmidt, Alex Pursche	17.9
Mount Hope	18-Jan-21	Alex Pursche, Mike Lawrie	16.2
Mount Hope	18-Jan-21	Tom Kelly, Bec Croake	18.4
Mount Hope	19-Jan-21	Alex Pursche, Tom Kelly	18.4
Mount Hope	19-Jan-21	Mike Lawrie, Bec Croake	16.2
Mount Hope	20-Jan-21	Mike Lawrie, Tom Kelly	16.2
Mount Hope	20-Jan-21	Alex Pursche, Bec Croake	18.4
Mount Hope	21-Jan-21	Tom Kelly, Bec Croake	16.2
Mount Hope	21-Jan-21	Alex Pursche, Mike Lawrie	18.4
Girragulang Road	15-Feb-21	Sophie Montgomery, Alex Pursche	24.6

Wind farm cluster	Date	Staff	Distance (km)
Girragulang Road	16-Feb-21	Sophie Montgomery, Alex Pursche	24.0
Girragulang Road	17-Feb-21	Sophie Montgomery, Alex Pursche	13.6
Girragulang Road	18-Feb-21	Sophie Montgomery, Alex Pursche	13.1
Mount Hope	21-Jun-21	Alex Pursche, Dan McKenzie	20.5
Mount Hope	22-Jun-21	Alex Pursche, Alice Si	17.3
Mount Hope	22-Jun-21	Dan McKenzie, Tom Kelly	0.3
Mount Hope	22-Jun-21	Dan McKenzie, Tom Kelly	0.4
Mount Hope	22-Jun-21	Dan McKenzie, Tom Kelly	1.1
Mount Hope	22-Jun-21	Dan McKenzie, Tom Kelly	0.6
Girragulang Road	25-Jun-21	Alex Pursche, Alice Si	13.8
Girragulang Road	26-Jun-21	Alex Pursche, Alice Si	15.4
Girragulang Road	28-Jun-21	Dan McKenzie, Alice Si	12.2
Girragulang Road	29-Jun-21	Alex Pursche, Sophie Montgomery	7.1
Leadville	29-Jun-21	Dan McKenzie, Alice Si	0.6
Leadville	29-Jun-21	Dan McKenzie, Alice Si	3.6
Leadville	30-Jun-21	Sophie Montgomery, Dan McKenzie	7.5
Leadville	30-Jun-21	Sophie Montgomery, Dan McKenzie	7.5
TXL	2-Aug-21	Alex Pursche, Liam Scanlan	8.6
TXL	3-Aug-21	Alex Pursche, Liam Scanlan	6.7
Leadville	3-Aug-21	Sophie Montgomery, Janene Devereaux	10.0
Leadville	4-Aug-21	Sophie Montgomery, Janene Devereaux	10.0
TXL	10-Sep-21	Alex Pursche, Dan McKenzie	8.7
TXL	10-Sep-21	Alex Pursche, Dan McKenzie	3.2
TXL	11-Sep-21	Alex Pursche, Sophie Montgomery	6.9
TXL	11-Sep-21	Alex Pursche, Sophie Montgomery	7.1
Leadville	4-Aug-21	Janene Deveraux, Sophie Montgomery	10.5
TXL	31-Jan-22	Alex Pursche, Lachlan Metzler	2
TXL	1-Feb-22	Alex Pursche, Lachlan Metzler	2
TXL	2-Feb-22	Alex Pursche, Lachlan Metzler	2
TXL	3-Feb-22	Alex Pursche, Lachlan Metzler	2

4.2.8.2. Results

Spotlighting surveys identified common species from a heavily modified agricultural environment. Throughout all three wind farm clusters and the transmission line, the most common species encountered were exotic pests including Red Fox, Feral Pig, European Rabbit, and Brown Hare, which were all recorded on nearly every survey. Intermittently, arboreal fauna including Common Brush-tailed Possum and Common Ringtail Possum were also identified. Nocturnal avifauna that was identified included Barn Owl, Tawny Frogmouth, and Southern Boobook. Little Red Flying Foxes were identified on two evenings at Mount Hope, feeding on flowering *A. floribunda* during January 2021.

During spotlighting within the transmission line easement near Uarbry, a large, white-breasted Tyto owl was observed within an unburnt patch of PCT281. The observation was brief, and the individual bird was not observed again in an hour of searching. Following conclusion of the survey, it is likely that the individual was a Masked Owl, due to the size and habitat (shrubby open woodland with numerous large trees and hollows). This individual was observed approximately 250m east of the transmission line.

No other threatened species were identified during spotlighting surveys.

Elliot trapping only captured one individual *Antechinus flavipes*, and no other species were captured.

Remote camera surveys identified 29 species. By far the most common species identified were Feral Pigs, Black Rats, and Foxes. Squirrel Glider which is listed as Vulnerable under the BC Act was identified at three locations as shown on Figure 26. On each occasion, this species was identified in only one image, suggesting the population is either very small, or the cameras were set at the periphery of the species habitats.

The complete list of species identified on remote cameras is provided in Table 25.

Table 25 Remote camera survey results

Common	Scientific	Exotic	BC Act	EPBC Act
Yellow-footed Antechinus	Antechinus flavipes		Not listed	Not listed
Wedge-tailed Eagle	*Aquila audax*		Not listed	Not listed
Cattle	*Bos sp.*	Yes	Not listed	Not listed
Wild Dog	Canus lupis familiaris	Yes	Not listed	Not listed
Feral Goats	Capra hircus	Yes	Not listed	Not listed
Australian Raven	*Corvus coronoides*		Not listed	Not listed
Pied Butcherbird	*Cracticus nigrogularis*		Not listed	Not listed
Grey Butcherbird	*Cracticus torquatus*		Not listed	Not listed
Galah	Eolophus roseicapilla		Not listed	Not listed
Feral Cat	*Felis catus*	Yes	Not listed	Not listed
Australian Magpie	*Gymnorhina tibicen*		Not listed	Not listed
Brown Hare	Lepus capensis		Not listed	Not listed
Eastern Grey Kangaroo	*Macropus giganteus*		Not listed	Not listed
Common Wallaroo	*Macropus robustus*		Not listed	Not listed
Red-necked Wallaby	*Macropus rufogriseus*		Not listed	Not listed
Noisy Miner	*Manorina melanocephala*		Not listed	Not listed
House Mouse	Mus musculus	Yes	Not listed	Not listed
European Rabbit	*Oryctolagus cuniculus*	Yes	Not listed	Not listed
Sheep	*Ovis sp.*	Yes	Not listed	Not listed
Squirrel Glider	*Petaurus norfolcensis*		V	

Common	Scientific	Exotic	BC Act	EPBC Act
Eastern Bearded Dragon	Pogona barbata		Not listed	Not listed
Black Rat	*Rattus rattus*	Yes	Not listed	Not listed
Pied Currawong	*Strepera graculina*		Not listed	Not listed
Feral Pig	*Sus scrofa*	Yes	Not listed	Not listed
Short-beaked Echidna	*Tachyglossus aculeatus*		Not listed	Not listed
Common Brushtail Possum	*Trichosurus vulpecula*		Not listed	Not listed
Wombat	*Vombatus ursinus*		Not listed	Not listed
Red Fox	*Vulpes vulpes*	Yes	Not listed	Not listed
Swamp Wallaby	*Wallabia bicolor*		Not listed	Not listed

4.2.9. Forest owl surveys

4.2.9.1. Methods

Forest owl surveys were conducted for Barking Owl, Masked Owl, and Powerful Owl in winter 2021 using call playback (34 person hours) and songmeters (167 nights). This survey effort was supplemented by extensive spotlighting surveys (465.4 km), as described above.

Call playback sequence included calls of all three species, with periods of 2-5 mins of continuous calls broadcast at ~ 110% of natural volume interspersed with periods (2-5 mins) of silence to listen between each species. Simultaneously, spotlighting searches on foot were conducted to search for owls. Spotlighting was conducted along transects through potential habitat areas to provide a total survey of approximately 30 minutes with two observers at each location.

Across the wind farm and transmission line 17 sites were surveyed on two occasions each (total 34 surveys) at the locations shown in Figure 25.

Table 26 Call playback survey summary

Wind farm cluster	Date	Staff
Mount Hope	21-Jun-21	Dan McKenzie, Alex Pursche
Mount Hope	21-Jun-21	Dan McKenzie, Alex Pursche
Mount Hope	22-Jun-21	Dan McKenzie, Tom Kelly
Mount Hope	22-Jun-21	Dan McKenzie, Tom Kelly
Mount Hope	22-Jun-21	Alex Pursche, Alice Si
Girragulang Road	22-Jun-21	Alex Pursche, Alice Si
Girragulang Road	23-Jun-21	Alex Pursche, Alice Si
Girragulang Road	23-Jun-21	Alex Pursche, Alice Si
Girragulang Road	23-Jun-21	Tom Kelly, Alice Si
Girragulang Road	23-Jun-21	Tom Kelly, Alice Si
Girragulang Road	25-Jun-21	Alex Pursche, Alice Si
Girragulang Road	25-Jun-21	Alex Pursche, Alice Si
Girragulang Road	26-Jun-21	Alex Pursche, Alice Si

Wind farm cluster	Date	Staff
Leadville	26-Jun-21	Alex Pursche, Alice Si
Leadville	28-Jun-21	Dan McKenzie, Alice Si
Leadville	28-Jun-21	Dan McKenzie, Alice Si
Leadville	28-Jun-21	Alex Pursche, Sophie Montgomery
Leadville	29-Jun-21	Dan McKenzie, Alice Si
Leadville	29-Jun-21	Dan McKenzie, Alice Si
Leadville	29-Jun-21	Alex Pursche, Sophie Montgomery
Leadville	29-Jun-21	Alex Pursche, Sophie Montgomery
Leadville	30-Jun-21	Sophie Montgomery, Dan McKenzie, Finley Woodforth
TXL	30-Jun-21	Sophie Montgomery, Dan McKenzie, Finley Woodforth
TXL	02-Aug-21	Alex Pursche, Liam Scanlan
Leadville	02-Aug-21	Alex Pursche, Liam Scanlan
Leadville	03-Aug-21	Sophie Montgomery, Janene Devereaux
TXL	03-Aug-21	Sophie Montgomery, Janene Devereaux
TXL	03-Aug-21	Alex Pursche, Liam Scanlan
TXL	03-Aug-21	Alex Pursche, Liam Scanlan
Leadville	03-Aug-21	Alex Pursche, Liam Scanlan
Leadville	04-Aug-21	Sophie Montgomery, Janene Devereaux
TXL	04-Aug-21	Sophie Montgomery, Janene Devereaux
TXL	10-Sep-21	Alex Pursche, Dan McKenzie

Eleven songmeters were set out to supplement call playback and spotlighting surveys (as described above). Each songmeter was fixed to a tree in large patches of woodland or forest vegetation, and set record audio data from sunset to sunrise. Songmeters were generally set out for between 14 and 16 days, with a total survey effort of 167 nights across the wind farm (Table 27).

Table 27 Songmeter audio data summary

Unit ID	Set date	Collection date	Days in situ
Firetail	20210623	20210707	14
Lotus	20210623	20210709	16
Lionfish	20210622	20210707	15
Spicebush	20210622	20210708	16
Wombat	20210622	20210707	15
Bustard	20210622	20210708	16
Flannyflower	20210625	20210710	15
Wedgie	20210626	20210711	15
Toadfish	20210629	20210714	16
Hibbertia	20210629	20210713	15

Unit ID	Set date	Collection date	Days in situ
Heleioporus	20210630	20210713	14

All songmeter data was analysed using clustering software (Wildlife Acoustics Kaleidoscope Pro v5.4.2) to assist the analysis of acoustic recordings for detection of Masked Owl and Barking Owl only. Powerful Owl was not undertaken in this analysis, as the open farmland habitats are unsuitable for the species. This software efficiently locates targeted signatures based on user defined parameters, allowing time to be spent examining potential vocalisations of target species rather than sifting through sound generated by other sources. The data was analysed by ELA senior ecologist May-le Ng, who is experienced in acoustic analysis, owl surveys and familiar with the vocalisations of the target species.

The search parameters used to search for the call signatures of each species are included in Table 28. These values are based on reference calls known to belong to each species from a variety of habitats and locations within the species' range to account for call types and variations (Appendix K).

Table 28: Signal parameters for Masked Owl and Barking Owl

Parameter	Masked Owl	Barking Owl
Minimum Frequency (Hz)	1,500	0
Maximum Frequency (Hz)	5,512	2,000
Minimum Length of Detection (s)	0.65	0.3
Maximum Length of Detection (s)	2	0.577
Maximum inter-syllable gap (s)	0.35	0.115
Cluster analysis settings (Default except):	FFT Window 21.33ms max clusters = 2,000	FFT Window 21.33ms max clusters = 2,000
Computer resources	1/9	1/9

Recording data was combined with the reference call dataset and the search parameters were applied within Kaleidoscope Pro. The software builds groups of similar signals (clusters), with the most common signal type matching the search parameters grouped into the first cluster. Clusters are only built if there are enough similar signals to form a cluster so the addition of reference data assists in building clusters that are relevant to the target species, which are sometimes rare in the landscape and therefore may otherwise be missed if there aren't enough signals to form a cluster. It is noted that call playback, a technique where reference calls are broadcast into the environment via a speaker to initiate a response from the target species, was used at some recorder stations during field surveys and captured within the recording data. The call playback can therefore also be detected during the analysis.

Analysis for the target species occurred separately as each species requires a different set of signal parameters. Analysis for each recorder station continued until the presence of the target species was confirmed via call detections, or the end of recordings was reached. Analysis of data for a recorder station ceased for a given target species once that species was detected within recordings from that station.

For efficiency, examination of results focussed on clusters that contained reference calls. We assume that clusters without reference calls are unlikely to contain calls of the target species because a cluster is a group of similar signals and calls from target species should be similar enough that they are clustered with reference calls.

To note, analysis of acoustic recordings can identify the presence of a species near an acoustic recorder station. The absence of calls or other recognisable sounds emitted by a species within the recordings does not confirm the absence of the species from the study area.

Masked owl vocalisations can be described as screeches and chatters. Plate 1 provides a visual representation (spectrogram) of example Masked Owl calls.

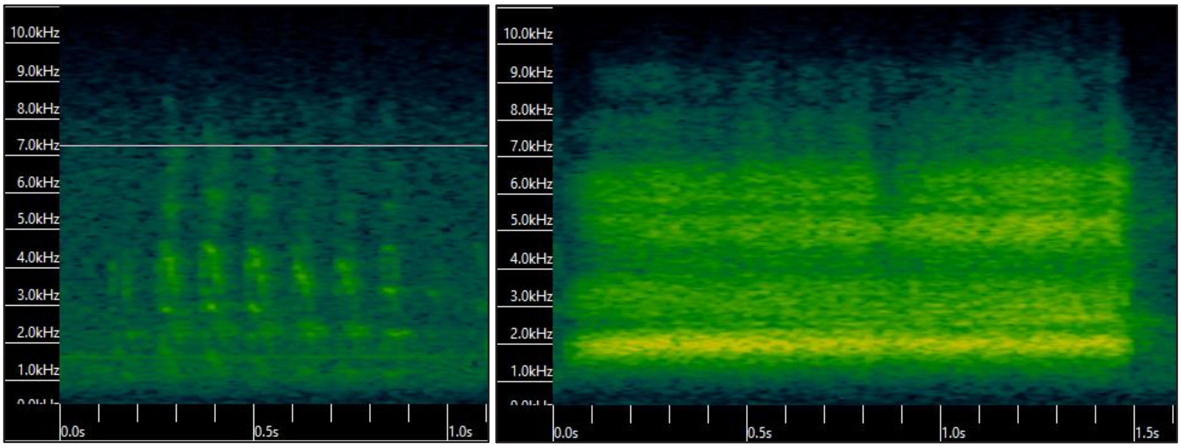


Plate 1: Spectrogram of Tyto novaehollandiae chatter (left) and screech (right) examples (Bird Observers Club of Australia, 2007) viewed in Kaleidoscope Pro v5.4.2 (Wildlife Acoustics)

Barking Owl vocalisations can be described as a quick, dog-like bark, a tremulous scream or trilling. **Plate 2** provides a visual representation (spectrogram) of example Barking Owl calls.

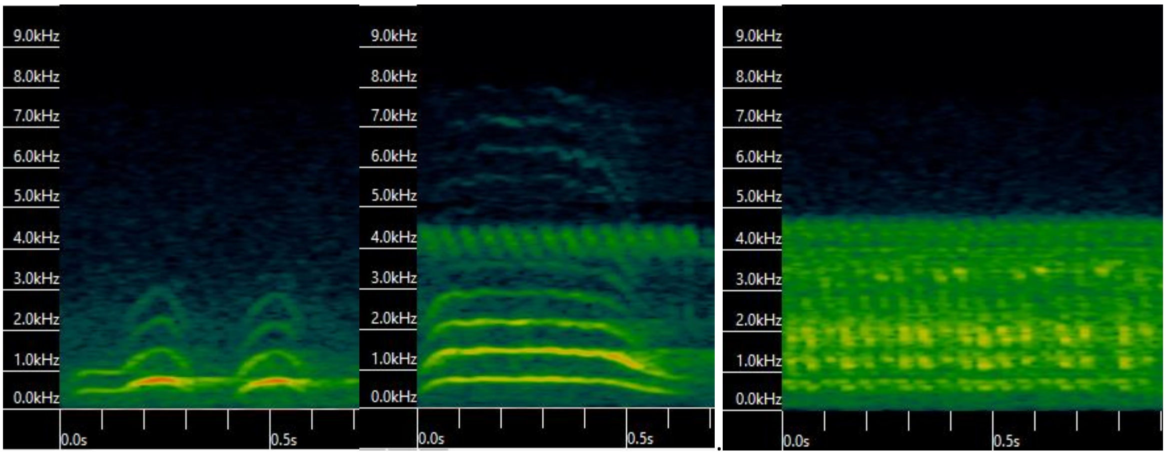


Plate 2: Spectrogram of *Ninox connivens* call (left), scream (centre), trill (right) examples (Bird Observers Club of Australia, 2007) viewed in Kaleidoscope Pro v5.4.2 (Wildlife Acoustics)

4.2.9.2. Results

Call playback at 34 event sites did not prompt any response from Masked Owl, Barking Owl, or Powerful Owl. Commonly encountered species included Barn Owl, Southern Boobook, and domestic dogs.

Over 2,438 hours (over 101 days) of songmeter recording data was collected across the study area by 11 acoustic sound recorders between 19 January and 14 July 2021, inclusive. Table 29 summarises the data collected at each recorder station and across the project.

Table 29: Summary of recorded data

Site	Number of files	Total length of recording
BUSTARD	248	10 days 4 hours 21 mins
FIRETAIL	211	8 days 11 hours 52 mins
FLANNYFLOWER	224	9 days 5 hours 27 mins
HELEIOPORUS	198	8 days 1 hours 28 mins
HIBBERTIA	198	8 days 1 hours 43 mins
LIONFISH	245	9 days 14 hours 34 mins
LOTUS	236	9 days 15 hours 38 mins
SPICEBUSH	245	10 days 0 hours 21 mins
TOADFISH	229	9 days 6 hours 38 mins
WEDGIE	230	9 days 10 hours 11 mins
WOMBAT	234	9 days 14 hours 28 mins
All	**2,498**	**101 days 14 hours 46 mins**

When all recordings, including reference calls, were scanned using the parameters in Table 28, 143,738 signals were detected. When the cluster analysis was run, 74,873 of those signals were used to form 104 clusters. Of these, 63 clusters contained reference calls (36,301 target signals). Of the target signals, 26,800 signals were manually checked for Masked Owl calls. Commonly encountered sounds within the target signals included those emitted by Barn Owl, Feral Pig, Common Brushtail Possum, Red Fox, Eastern Grey Kangaroo, Cow, Sheep and Sulphur-Crested Cockatoo. Call playback for Masked Owl was detected at LOTUS, SPICEBUSH AND HELEIOPORUS, providing confidence that detection of Masked Owl would occur if they are present within the recording dataset. Masked Owl was not detected.

When all recordings, including reference calls, were scanned using the parameters in Table 28, 162,938 signals were detected. When the cluster analysis was run, 121,462 of those signals were used to form 331 clusters. Of these, 187 clusters contained reference calls (35,034 target signals, further refined to 27,258 target signals once Barking Owl was confirmed at a site and the remainder of that site data was removed from analysis). Of the target signals, 20,044 signals were manually checked for Barking Owl calls. Commonly encountered sounds within the target signals included those emitted by Dog, Cow, Torresian Crow, Australian Magpie, Eastern Grey Kangaroo and various pigeon species. Dogs were prevalent in the recordings at WEDGIE, SPICEBUSH, TOADFISH, HIBBERTIA, HELEIOPORUS and FLANNYFLOWER. Call playback for Barking Owl was detected at LOTUS and SPICEBUSH, providing confidence that detection of Barking Owl would occur if they are present within the recording dataset. Barking Owl was detected at three songmeters within the Mount Hope cluster, at the location shown on (Figure 26).

4.2.10. Koala surveys

26 Koala Spot Assessment Technique (Phillips and Callaghan 2011) surveys were completed in June 2021 targeting areas that represent the highest quality and most connected habitat across the wind farm. For each SAT survey, a central tree was selected. A search of the ground within 1 m of the base of the centre tree and the nearest 29 trees (>10cm DBH) was undertaken for Koala faecal pellets. Approximately 2 person minutes of search effort was undertaken at each tree. A total of 780 trees were inspected as detailed in Appendix L.

No evidence of Koala was recorded and no further analysis has been undertaken.

4.2.11. Reptile surveys

Active searches were undertaken for reptiles in all areas of potential rocky habitat at suitable locations in September 2021. Potential habitat was rocky outcrops that contain loosely embedded rock (i.e. rocks that could be turned to search). A total of approximately 50 rocks were turned at each location (if available) across the study area. Other outcrops within the development site only contain larger, deeply embedded boulders and were not considered suitable habitat.

No threatened reptiles were recorded during the targeted survey.

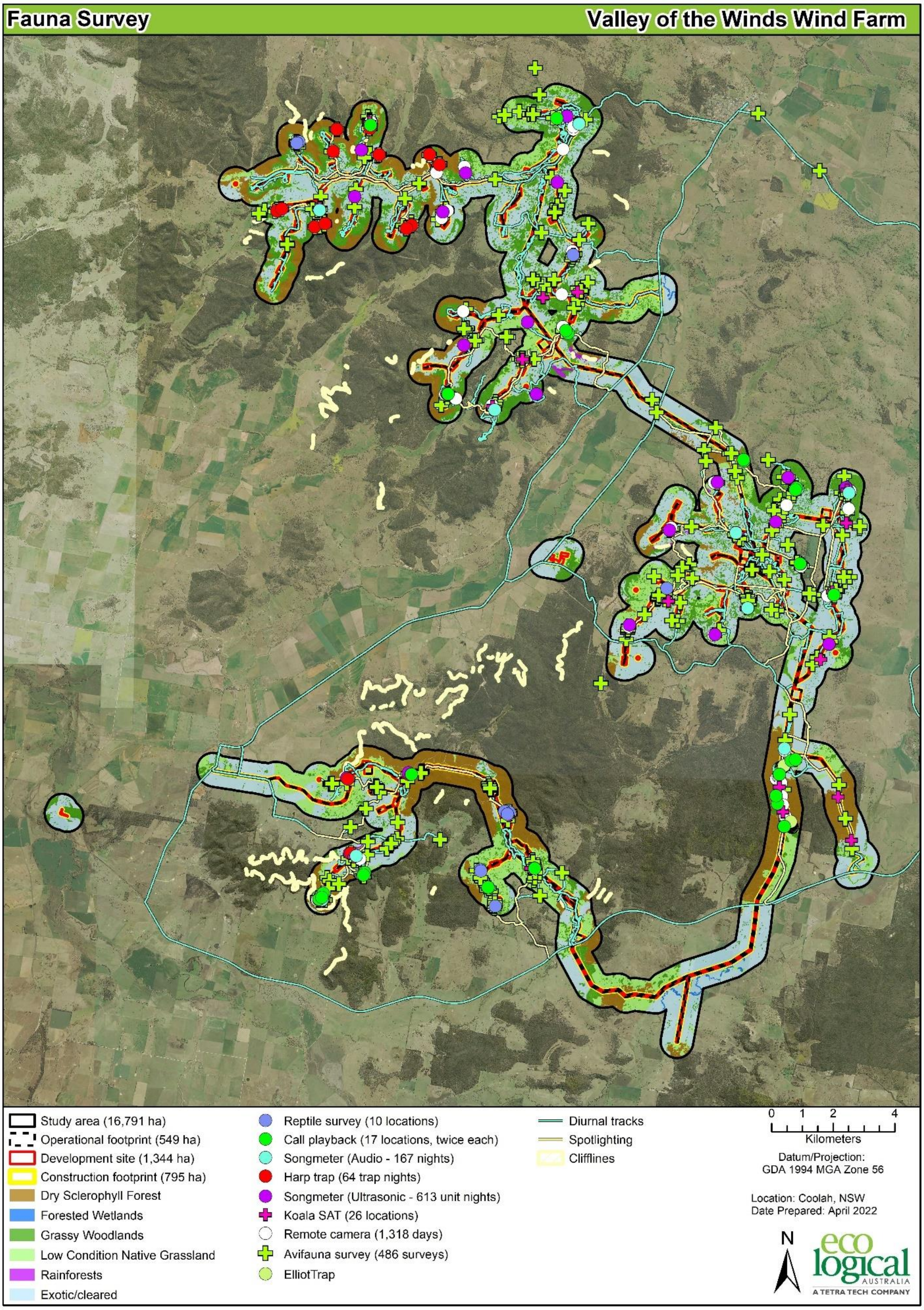


Figure 25 Fauna survey effort

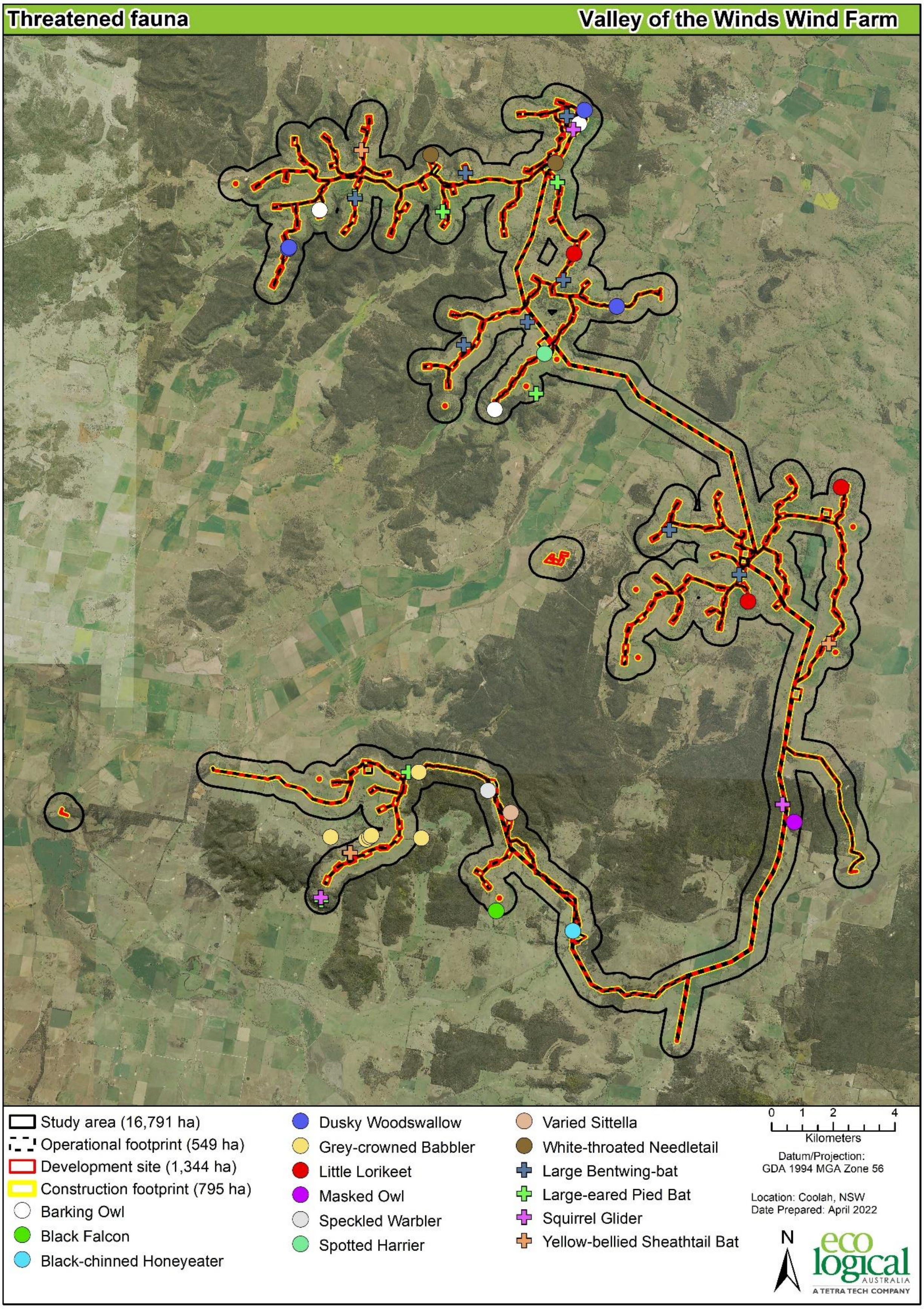


Figure 26 Threatened fauna

4.3. Species credit summary

Following completion of targeted surveys, the species credit species that are present on the development site are outlined in Table 30 and shown on Figure 27 to Figure 32.

Table 30: Species credit species included in the assessment

Species	Common Name	Species polygon mapping method	Number of individuals / Habitat (ha) in study area	Biodiversity Risk Weighting
Dichanthium setosum	Bluegrass	30m buffer from all known occurrences	3 patches of approximately 6 tussocks occupying 0.84 ha	2
Chalinolobus dwyeri	Large-eared Pied Bat	Breeding habitat is 100m from cliffs and escarpments, total species polygon includes 2km from cliffs and escarpments.	256 ha potential breeding habitat along clifflines 4,155 ha of foraging habitats	3
Miniopterus orianae	Large Bentwing-bat	Breeding habitat is 100m from cliffs and escarpments with caves	256 ha of potential habitat along clifflines	3
Tyto novahollandiae	Masked Owl	A 100m buffer has been applied to potential nest trees which includes trees with hollows >400mm and more than 3m from the ground.	3.13 ha (one potential breeding tree)	2
Ninox connivens	Barking Owl	100m buffer around potential nest trees (being trees with hollows >200mm and >4m above the ground). This has been calculated within the Mount Hope Cluster only	49.12 ha	2
Petaurus norfolcensis	Squirrel Glider	All habitat is mapped as being woodland or forest in moderate to good condition, with an intact acacia understorey or variety of winter-flowering eucalypts, connected to those locations the species was detected. This includes areas of PCT281 along the transmission line, areas of PCT479 moderate and burnt in the transmission line and Leadville clusters, and PCT281 and PCT479 in the Mount Hope cluster.	2,864 ha	2

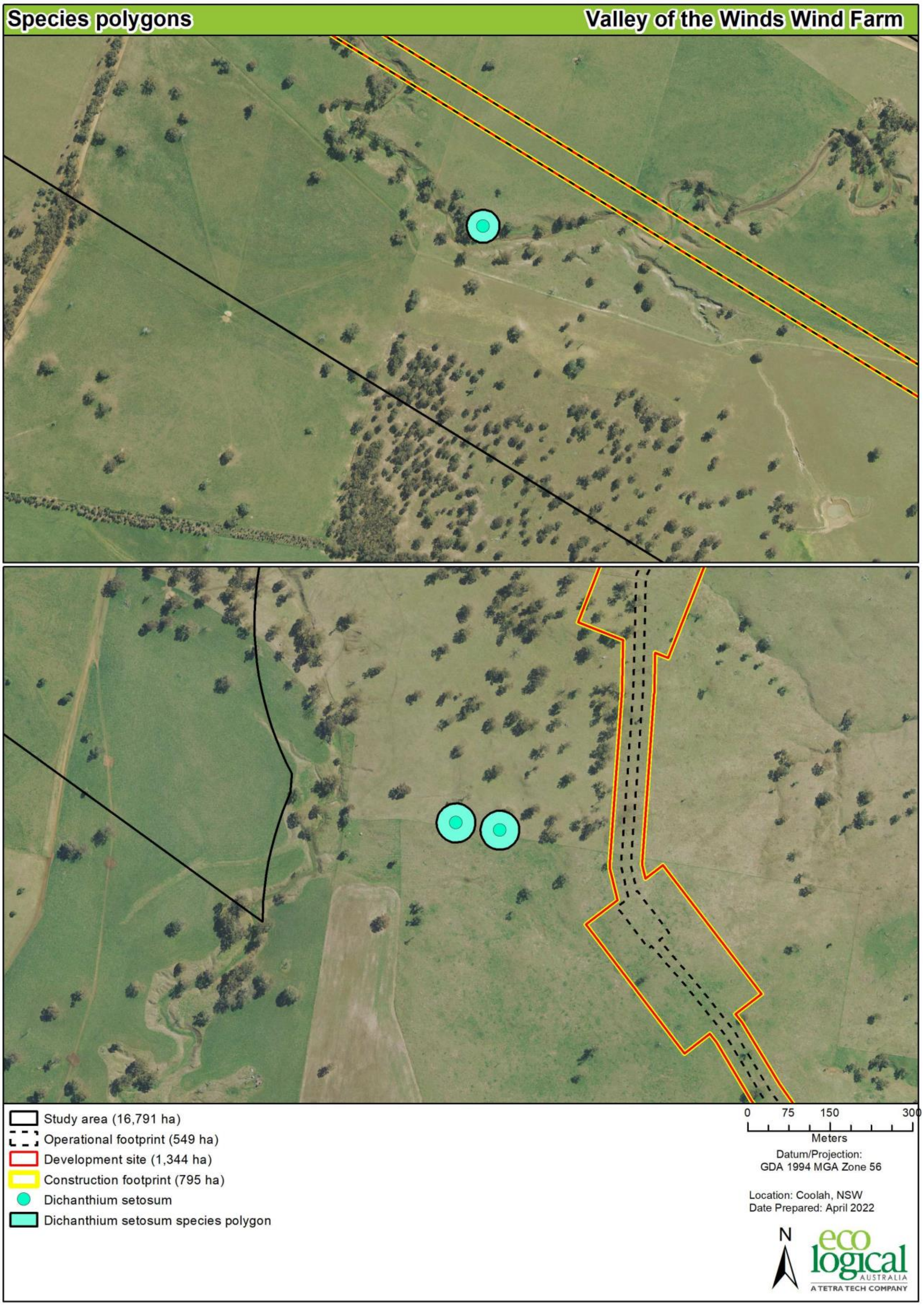


Figure 27 *Dichanthium setosum* species polygon

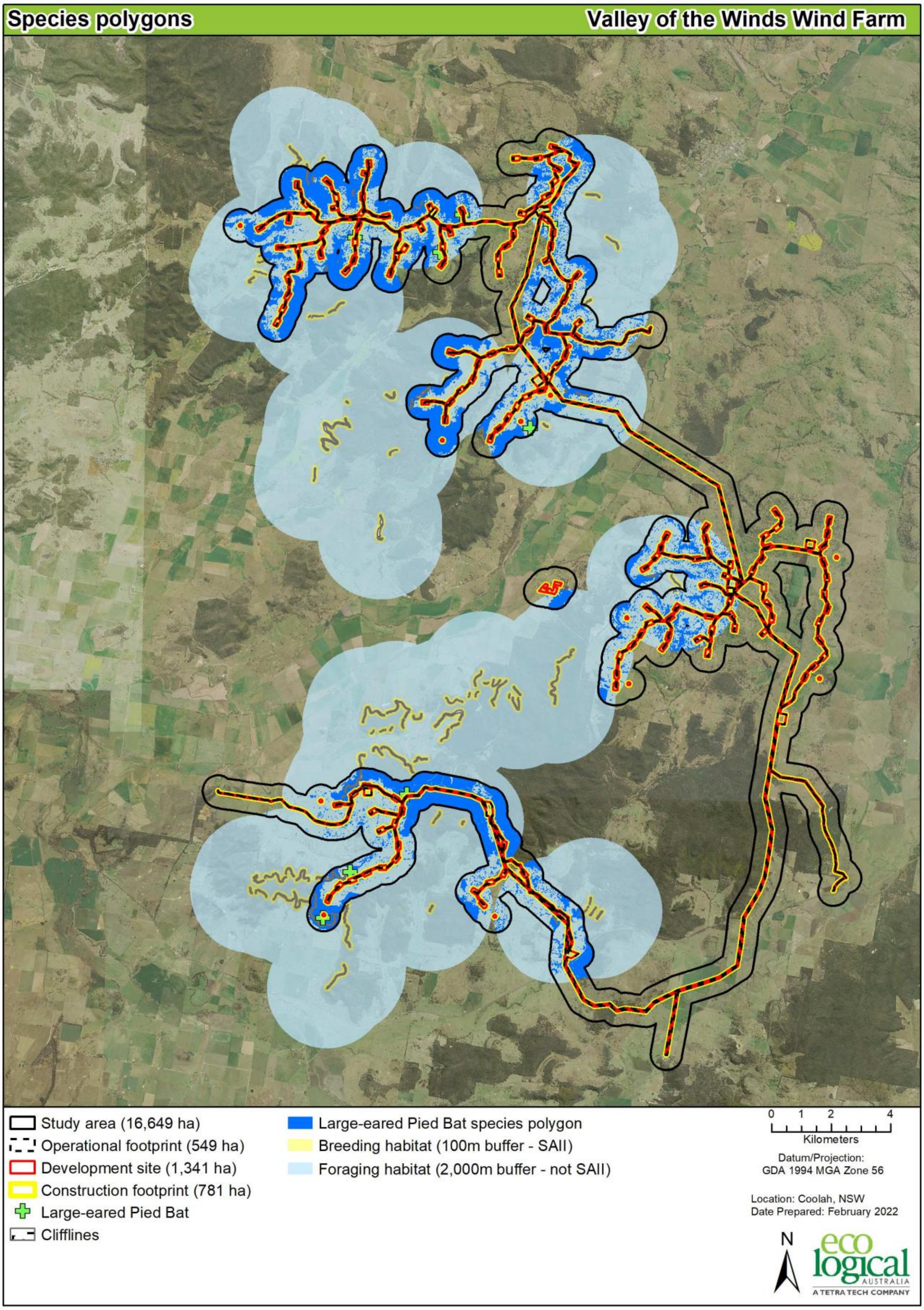


Figure 28 Large-eared Pied Bat species polygon

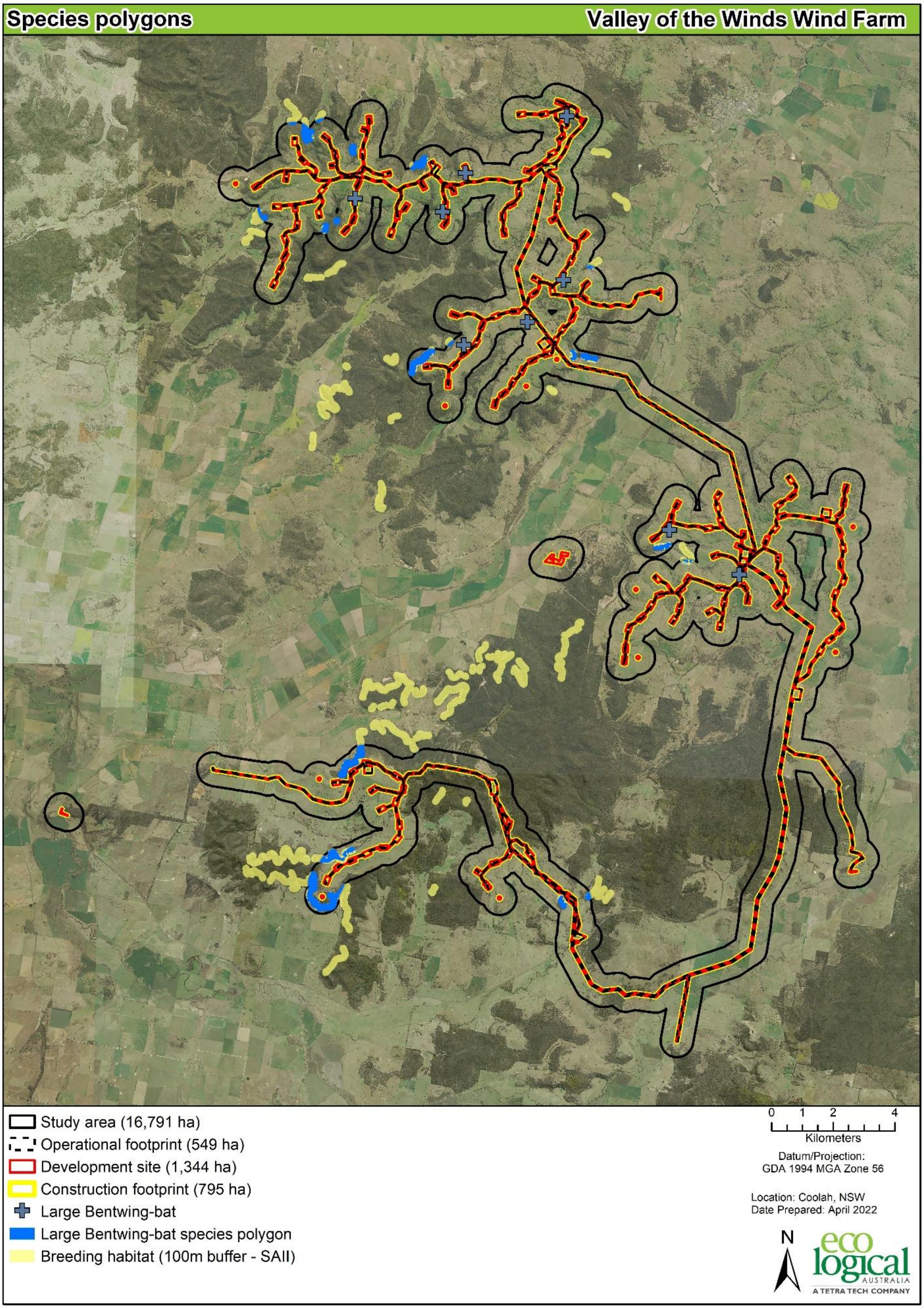


Figure 29 Large Bentwing-bat species polygon

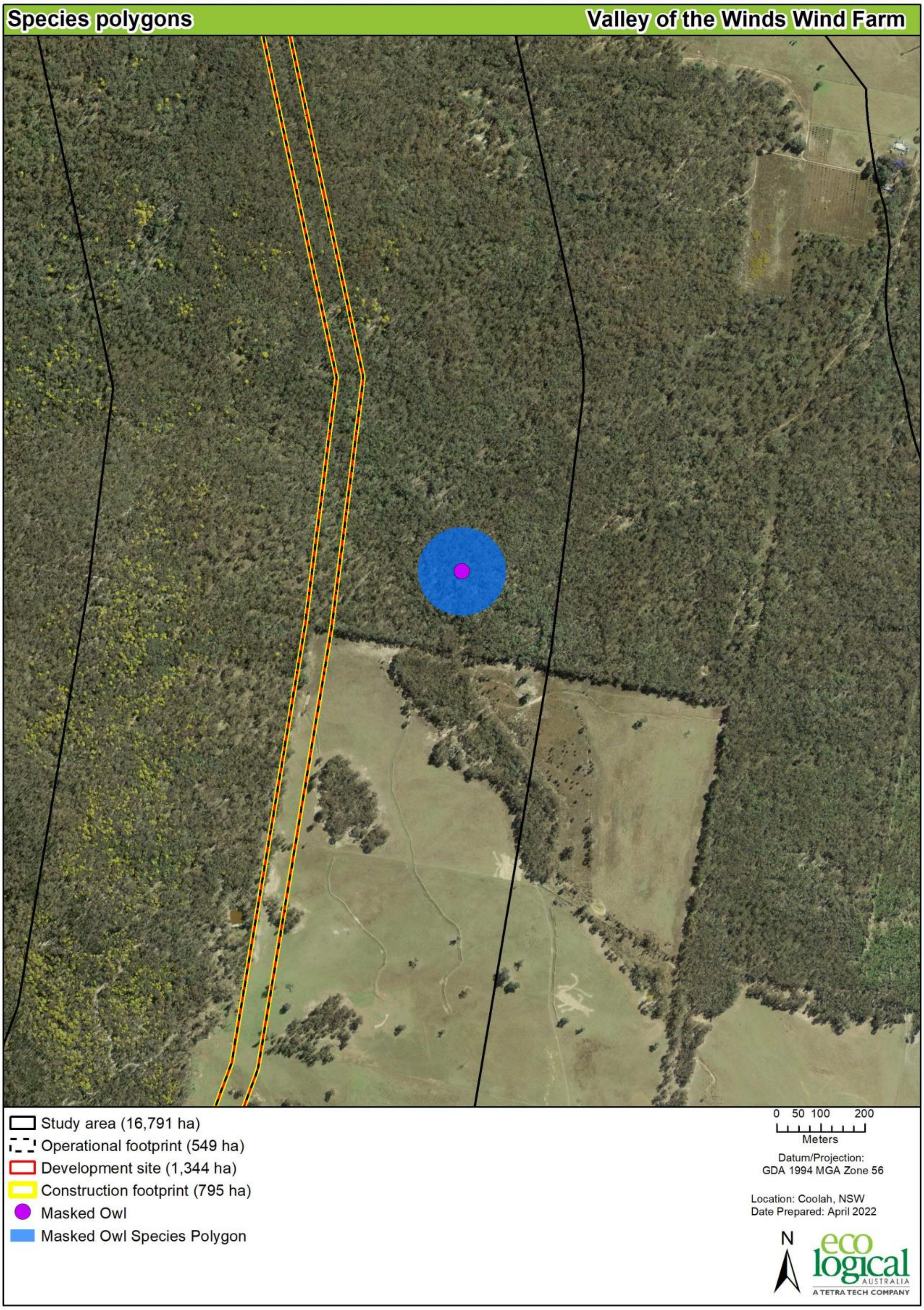


Figure 30 Masked Owl species polygon

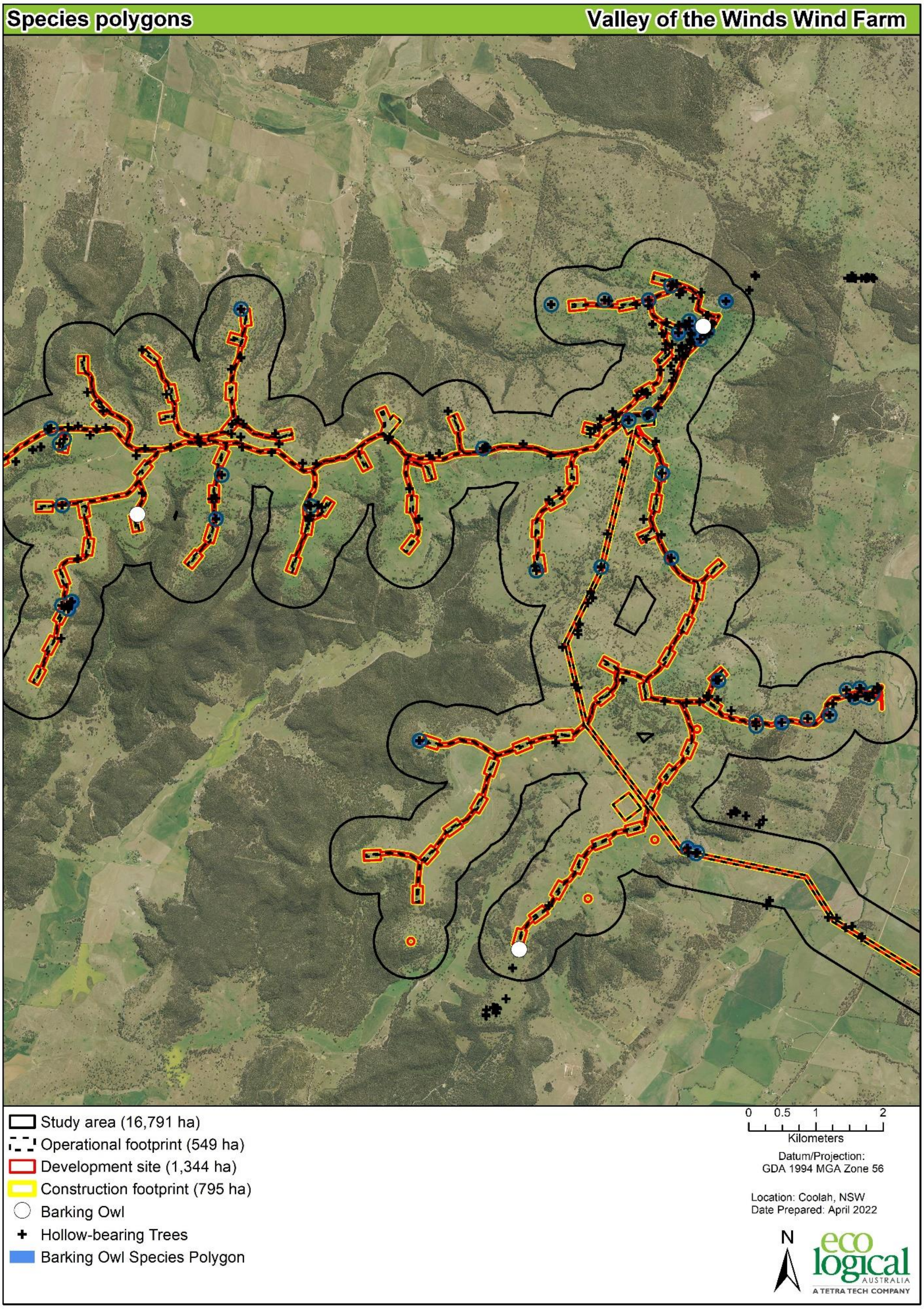


Figure 31 Barking Owl species polygon

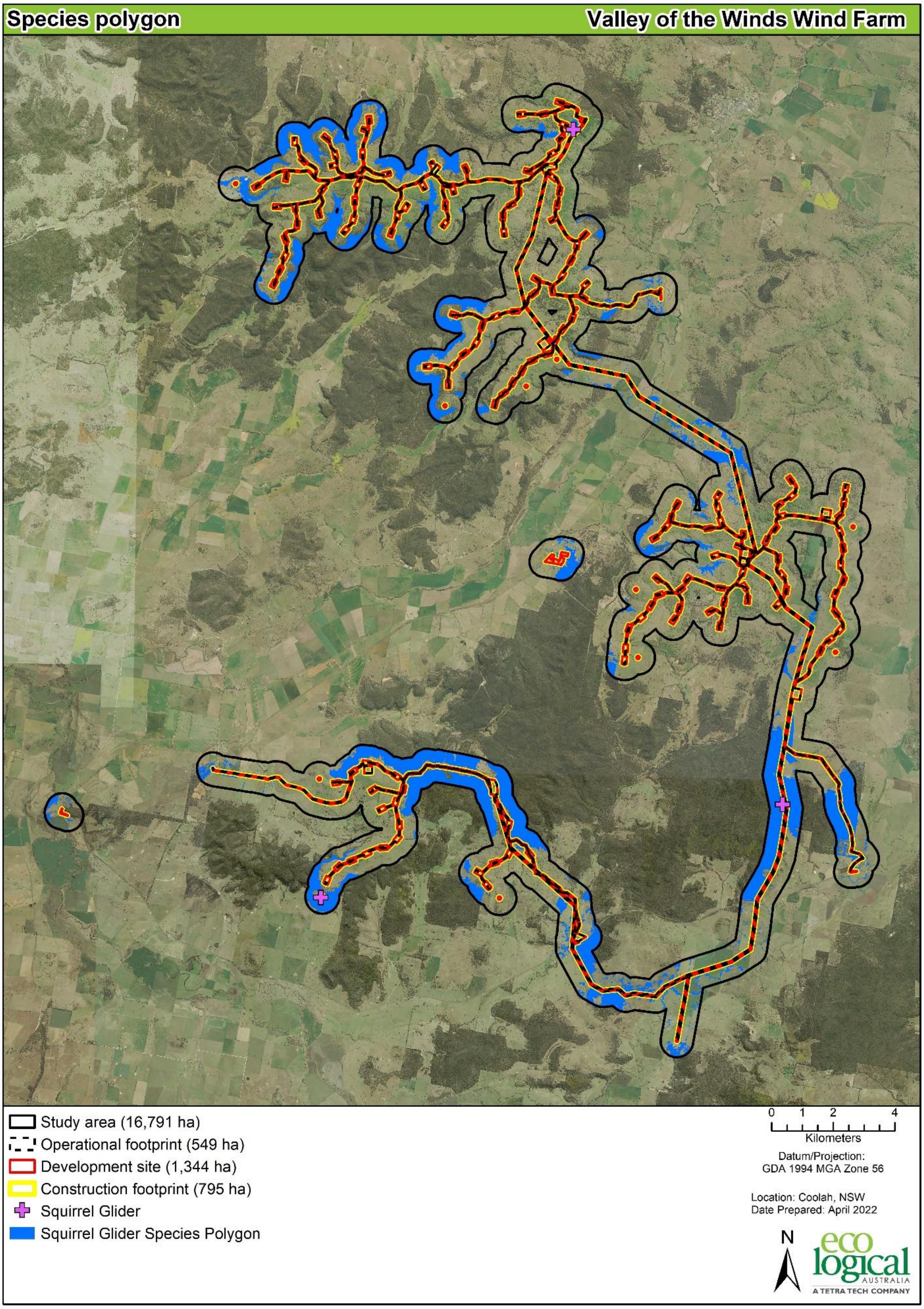


Figure 32 Squirrel Glider species polygon

4.4. Expert reports

No expert reports have been used in the preparation of this BDAR.

5. Prescribed impacts

5.1. Identification of prescribed additional biodiversity impact entities

Prescribed additional biodiversity impacts (prescribed impacts) must be assessed as part of the Biodiversity Offsets Scheme (BOS), as per clause 6.1 of the BC Regulation. Such prescribed impacts (including direct and indirect impacts) are impacts:

- on the habitat of threatened entities including:
  - karst, caves, crevices, cliffs, rocks and other geological features of significance, or
  - human-made structures, or
  - non-native vegetation
- on areas connecting threatened species habitat, such as movement corridors
- that affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence from underground mining)
- on threatened and protected animals from turbine strikes from a wind farm
- on threatened species or fauna that are part of a TEC from vehicle strikes.

A review of the likely prescribed impacts of the Project have been undertaken as described in Table 31 below.

Table 31 Prescribed impact review

Prescribed impact	Requirement for consideration	Response
Karst, caves, crevices, cliffs, rocks and other geological features of significance.	If karst, caves, crevices, cliffs, rocks or other geological features of significance are on the site, the assessor must: • prepare a list of threatened entities that use or are likely to use these habitat features on the subject land and within the surrounding assessment area • describe how these features provide habitat for, or are used by, each threatened entity (based on published literature and other reliable sources).	There are no Karst or other areas of geological significance within the development site. All areas of caves, crevices, cliffs, and rocks, and their appropriate buffer zones, have been avoided through detailed design. Threatened species likely to use these cliffs and crevices as potential foraging habitats includes Large Bentwing-bat and Large-eared Pied Bat, both of which were recorded in low numbers across the site. There are no breeding roosts identified for each of these species within the development site. No additional assessment has been undertaken for this prescribed impact.
Human-made structures and non-native vegetation	If human-made structures (e.g. bridges, culverts, abandoned buildings) and non-native vegetation (e.g. camphor laurel trees) provide habitat for threatened species, the assessor must: • provide a description of the type of human-made structure or non-native vegetation habitat • prepare a list of threatened species that use these features as habitat • describe how each threatened species could, or does, use the human-made structure or non-native vegetation as habitat (based on published literature and other reliable sources).	There are no bridges, culverts, abandoned buildings, or non-native vegetation that provide habitat for threatened fauna species within the development site. There are no areas of human-made habitats or vegetation that provide habitats for threatened flora species within the development site. No additional assessment has been undertaken for this prescribed impact.

<table>
<tr><th>Prescribed impact</th><th>Requirement for consideration</th><th>Response</th></tr>
<tr><td>Habitat connectivity</td><td>The assessor must use the map of native vegetation cover to identify areas of habitat connectivity between the subject land and the assessment area.

Where corridors or other areas of connectivity link habitat for threatened entities, the assessor must:
• prepare a list of threatened entities that are likely to use or are a part of the connectivity or corridor
• describe the importance of the connectivity to threatened entities, particularly for maintaining movement that is crucial to the species’ life cycle (based on published literature and other reliable sources).</td><td>Areas of connectivity have been identified throughout the study area, as shown on Figure 4 and Figure 19.

Threatened species likely to use these areas of habitat connectivity include:
• Barking Owl
• Masked Owl
• Squirrel Glider
• Dusky Woodswallow
• Speckled Warbler
• Grey-crowned Babbler (Eastern subspecies)

All of these species are highly mobile and will be unaffected by the Project. The only species that will be subject to measurable disruption of connectivity will be Squirrel Glider along the southern portion of the transmission line route, where there will be a loss of connectivity between two large patches of burned forest. The remaining two portions of this forest however are both of sufficient size to allow the species to persist.</td></tr>
<tr><td>Water bodies, water quality and hydrological processes</td><td>Where water bodies or any hydrological processes that sustain threatened entities occur on the subject land, the assessor must:
• prepare a list of threatened entities that may use or depend on water bodies or hydrological processes for all or part of their life cycle, or
• prepare a list of threatened entities that will be, or are likely to be impacted by changes to existing water bodies or hydrological processes or the construction of a new water body
• describe the habitat provided for each threatened entity by the water body or hydrological process, including consideration of water quality, volume, flow paths and seasonal patterns (based on published literature and other reliable sources).</td><td>The project will not affect water bodies, water quality, or any hydrological processes. All crossings within the wind farm are across ephemeral paddock drainages, and will not affect any permanent waterbodies. Crossings of the Coolaburragundy and Talbragar Rivers will be spanned by transmission lines, with no proposed disturbance within the riparian zone itself.</td></tr>
</table>

Prescribed impact	Requirement for consideration	Response
Wind farm developments	For a wind farm development, the assessor must identify a list of protected animals that may use the development site as a flyway or migration route, including: • resident threatened aerial species • resident raptor species • nomadic and migratory species that are likely to fly over the proposed development site. For the species identified above, the assessor must perform a targeted survey: • using appropriate methods as per Section 5.3 (of the BAM) • using methods that measure movement of a species (e.g. ultrasonic bat detectors on monitoring masts or other structures of suitable height) • at times of the year appropriate for identifying the species • as part of an ongoing monitoring program post development approval, and/or • in accordance with any guide published by the Department for this purpose. The technique, effort and timing of targeted surveys for each species must be documented and justified in the BAR. Based on the outcomes of the targeted surveys, the assessor must: • predict and map the habitual flight paths for nomadic and migratory species likely to fly over the proposed development site on the Site Map and Location Map • map the likely habitat for resident threatened aerial and raptor species on the Site Map.	Detailed assessment undertaken for this prescribed impact as described in Chapter 6 of this report.

Prescribed impact	Requirement for consideration	Response
Vehicle strikes	Where the proposal may result in vehicle strike on threatened fauna, or animals that are part of a TEC, the assessor must: • a. identify potential impact locations on the Site Map, and • b. prepare a list of threatened fauna or animals that are part of a TEC at risk of vehicle strike.	The project will manage vehicle movement through a Construction Environment Management Plan including a Traffic Management Plan to facilitate movement of all componentry from the port of Newcastle to the development site. High strike risk traffic and movement (speeds >60km/h) will be undertaken on existing formed roads, and will not increase the risk of vehicle strike on threatened fauna or animals that are part of a TEC, beyond that which currently exists. All new roads within the Project will be trafficked at a slower speed (likely <40km/h) and will unlikely lead to any increased risk of vehicle strike.

6. Prescribed impacts due to Wind Farm Developments

In order to assess the likely prescribed Wind Turbine Strike impacts of the Project, a series of detailed site investigations were undertaken to identify protected resident and nomadic animals and the likely impact on those species. In order to assess the likely impacts on aerial species, the following tasks were undertaken:

- Bat activity monitoring
- Bird utilisation monitoring
- Baseline collision risk assessment
- Collision strike modelling for at risk species

6.1. Bat activity monitoring

Horizontal and vertical bat activity modelling was undertaken within the Project area in two survey events:

1. Horizontal bat activity monitoring using ultrasonic detectors at ground level over Summer 2020/2021; and

2. Vertical bat activity monitoring using ultrasonic detectors at fixed heights on metmasts.

Specific methods of each bat monitoring approach are detailed below.

6.1.1. Horizontal bat activity monitoring methods

Horizontal bat survey methods are described in Section 4.2.6.

6.1.2. Vertical bat activity monitoring

Bat activity monitoring was undertaken at two metmasts within the study area, one at Girragulang Road and one at Mount Hope. Each metmast has been temporarily constructed to record pre-construction wind data within the wind farm.

On each metmast, three ultrasonic detectors were fixed in a westerly direction, to measure bat activity:

- At approximately 2m above ground level, a Songmeter Mini Bat Ultrasonic Recorder (Wildlife Acoustics™)
- At approximately 50m, a SMM-u2 ultrasonic microphone was fixed to the mast and connected to a SM4BAT FS Recorder (Wildlife Acoustics™) at ground level via a 50m extension cable.
- At approximately 100m, a SMM-u2 ultrasonic microphone was fixed to the mast and connected to a SM4BAT FS Recorder (Wildlife Acoustics™) at ground level via two 50m extension cables.

All cables were fixed to the mast using nylon and stainless steel cable ties every 1m, and any connections in cables were secured using thread-locker and self amalgamating tape to prevent unwanted disconnection. The orientation of all three microphones were positioned in a westerly direction, towards the centreline between metmast cables. SM4BAT units were selected for recording data at height as they have the benefit of microphone extension cables, allowing regular data downloading without climbing the mast. For simplicity of operation, a Songmeter Mini Bat was used at the base. Both units have similar sensitivity profiles, and are unexpected to provide different results (Figure 33).

Photograph 39 SMM-U2 ultrasonic microphone fixed to metmast

Photograph 40 SM4BAT devices fixed to base of metmast

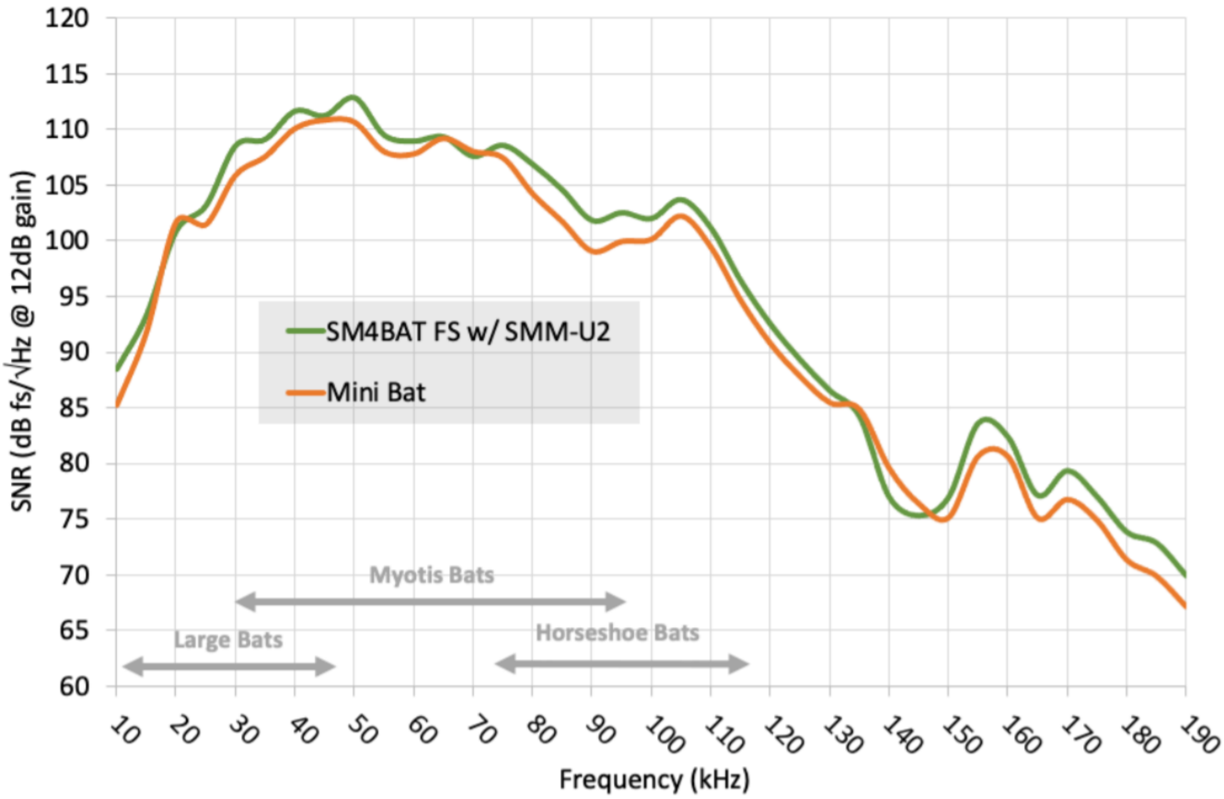


Figure 33 Comparative ultrasonic microphone sensitivity on SM Mini Bat (orange line) and SM4BAT (green line) (Wildlife Acoustics)

Temperature data was measured on each metmast at 10m and 104m above ground height. Wind speed data was measured at 30, 50, 70, 89, and 108.3m above ground level. Wind direction, humidity, and air pressure was also recorded on each metmast but the data is not presented in this report. All data was recorded every 10 minutes, and consolidated by calendar date. Data was then truncated to only include data from 1800 – 0650, to provide minimum temperature and average wind speeds each evening. Weather data collected at the Girragulang Road metmast is shown on Figure 34 and Figure 35. Weather data collected at the Mount Hope metmast is shown on Figure 36 and Figure 37.

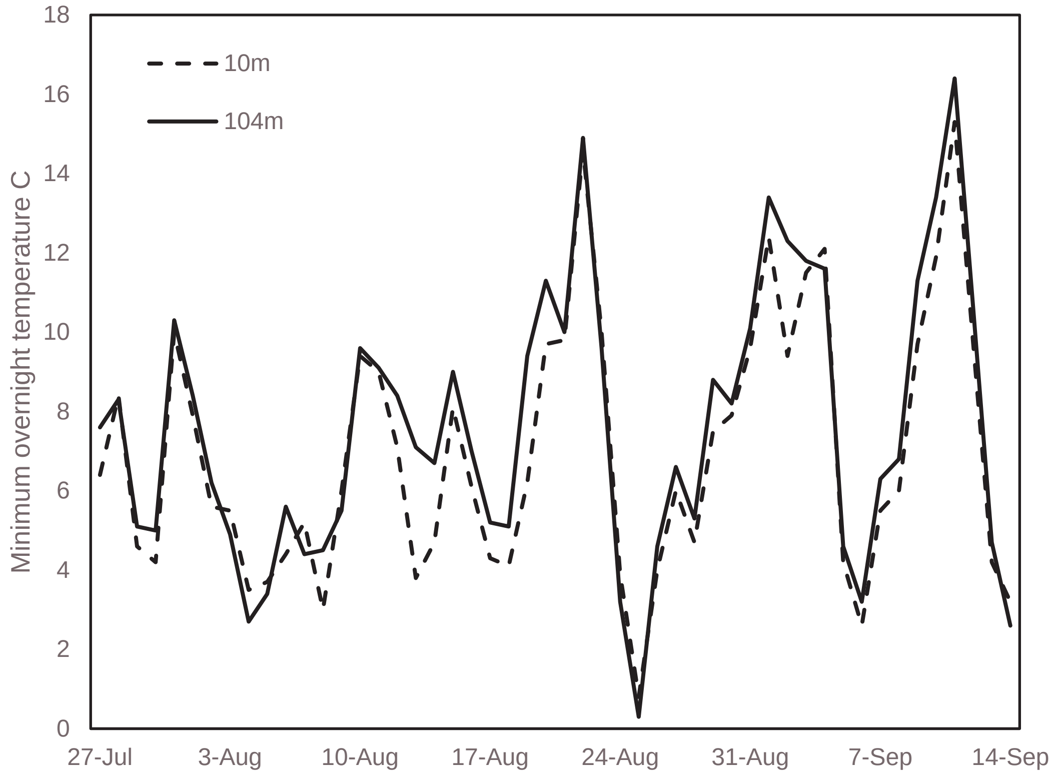


Figure 34 Minimum overnight temperature at Girragulang Road metmast

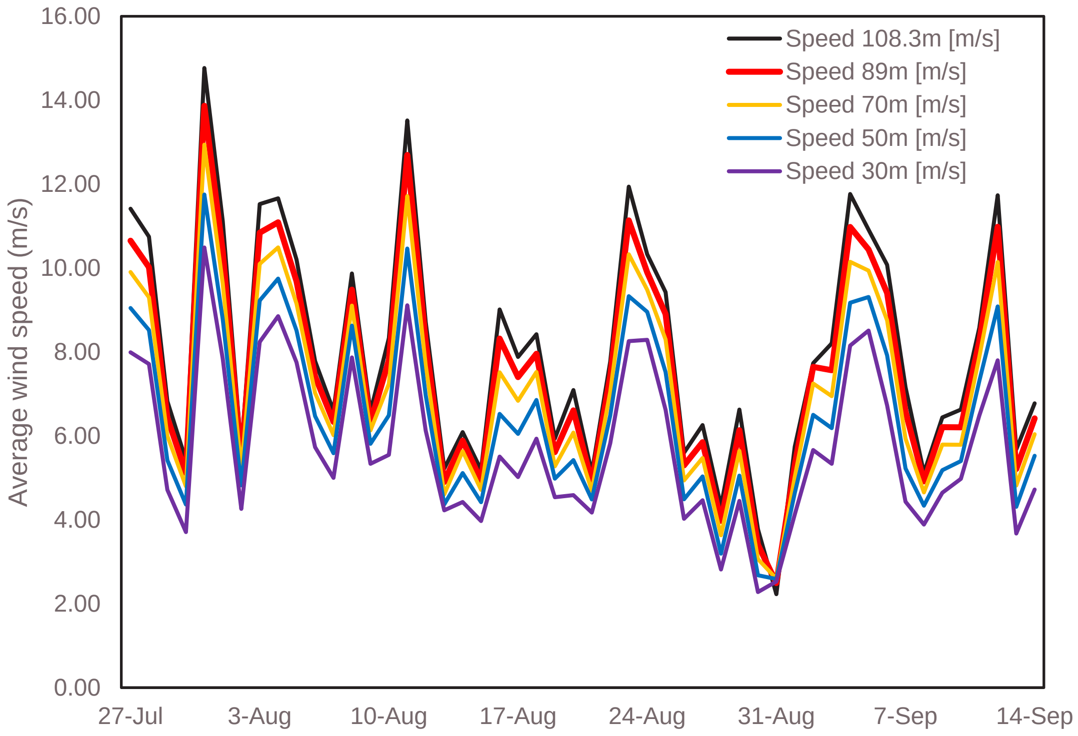


Figure 35 Average overnight windspeed at Girraguland Road metmast

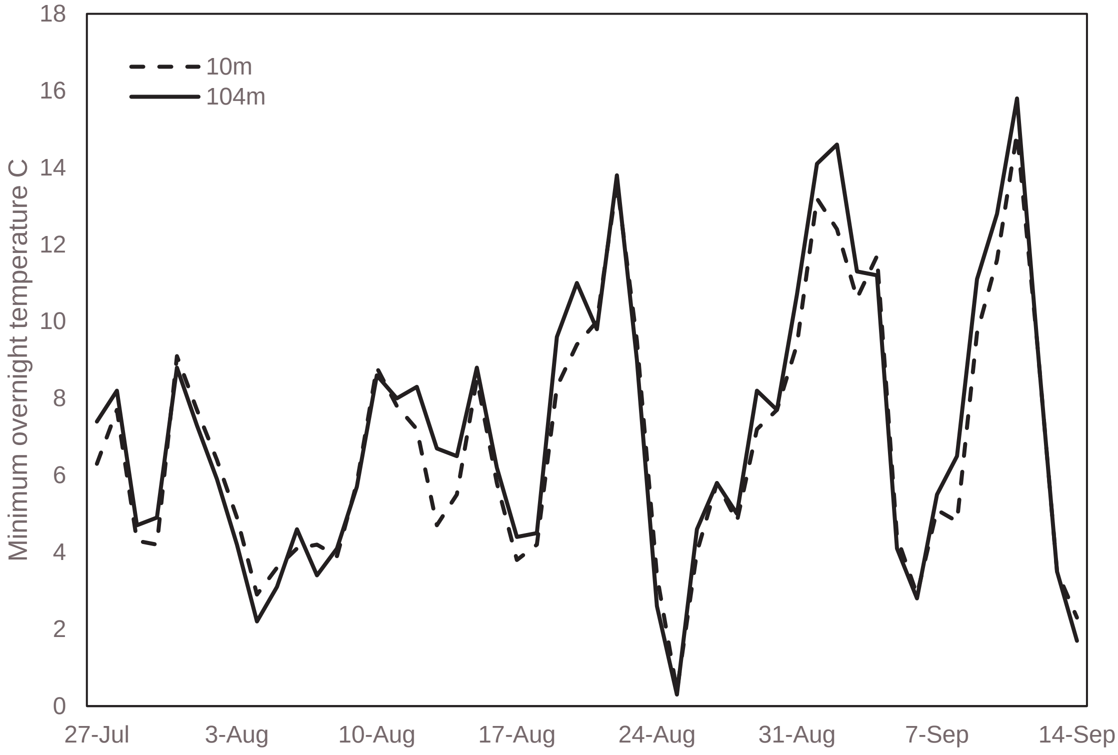


Figure 36 Minimum overnight temperature at Mount Hope metmast

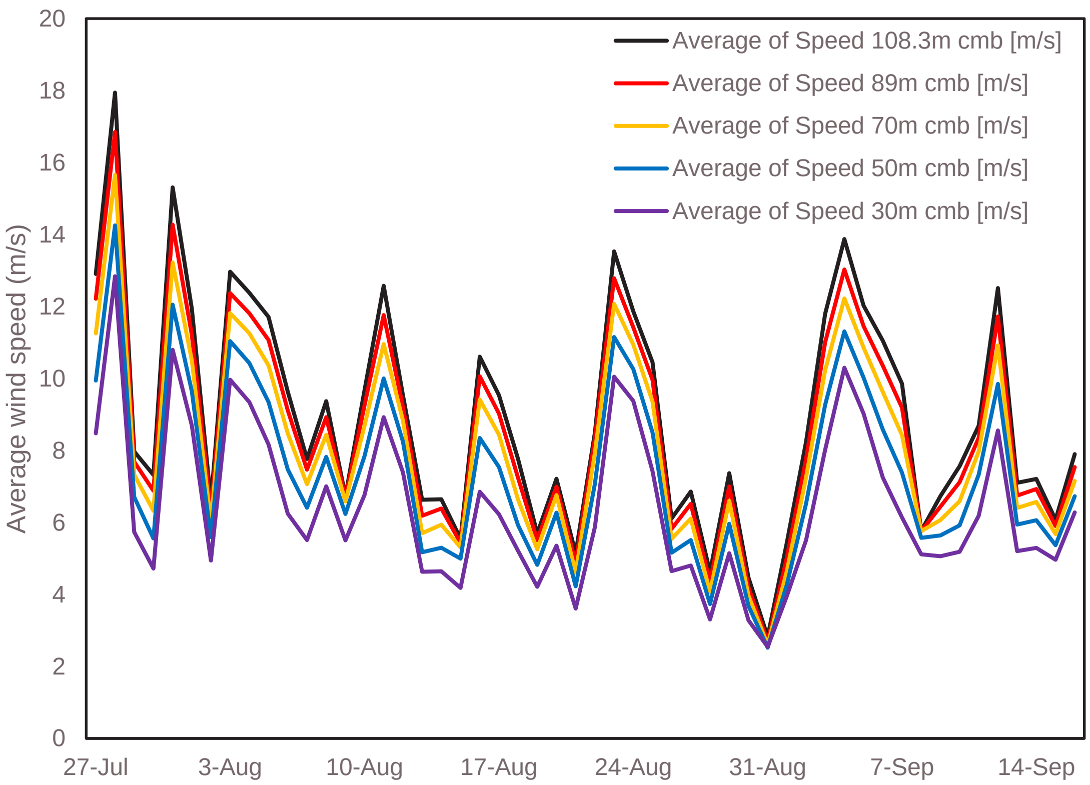


Figure 37 Average overnight windspeed at Mount Hope metmast

6.1.3. Bat monitoring results

All bat data was analysied by Greg Ford at Balance! Environmental.

Horizontal bat surveys over the summer of 2021/2021 positively identified 18 species of microchiropteran bats (microbat) across the study area.

Within the Girragulang Road cluster, 14 species of microbats were identified, including two threatened species:

- *Miniopterus orianae*
- *Saccolaimus flaviventris*

All of these species were recorded in extremely low numbers with only 1 and 3 detections of each species respectively across 182 detector nights. No species listed under the EPBC Act were identified. The most commonly detected species detected within the Girragulang Road cluster was *Chalinolobus gouldii* and *Vespadelus vulturnus* with 1004 and 1052 detections each. Details of all detections positively identified are shown in Table 32.

Within the Leadville cluster, 14 species of microbats were identified, including two threatened species:

- *Chalinolobus dwyeri*
- *Saccolaimus flaviventris*

All of these species were recorded in very low numbers with only 30 and 2 detections of each species respectively across 16 detector nights. *Chalinolobus dwyeri* is listed as vulnerable under the EPBC Act. The most commonly detected species detected within the Leadville cluster was *Vespadelus vulturnus* and *Vespadelus regulus* with 55 and 43 detections each. Details of all detections positively identified are shown in Table 33.

Within the Mount Hope cluster, 16 species of microbats were identified, including two threatened species:

- *Chalinolobus dwyeri*
- *Saccolaimus flaviventris*

Chalinolobus dwyeri and *Saccolaimus flaviventris* were recorded in extremely low numbers with only 4 and 2 detections of each species respectively across 330 detector nights. *Chalinolobus dwyeri* is listed as vulnerable under the EPBC Act. The most commonly detected species detected within the Mount Hope cluster was *Chalinolobus gouldii* and *Vespadelus vulturnus* with 1285 and 964 detections each. Details of all detections positively identified are shown in Table 34.

Complete analysis of all bat data is presented in Appendix J.

Table 32 Bat species positively identified at Girragulang Road

Species	BC Act	EPBC Act	GR_Bustard	GR_Flannyflower	GR_Helioporus	GR_Hibbertia	GR_Lionfish	GR_Spicebush	GR_Toadfish	Species Total	Calls per night
Chalinolobus gouldii			50	354	99	213	54	158	76	1004	5.52
Chalinolobus morio				24	2		2	15	2	45	0.25
Nyctophilus sp.				5	2	3		16	4	30	0.16
Scoteanax rueppellii						1		3		4	0.02
Scotorepens balstoni			2	4	1	3	5	3	1	19	0.10
Vespadelus darlingtoni				1						1	0.01
Vespadelus regulus			11	63	12	43	10	55	20	214	1.18
Vespadelus vulturnus			20	544	40	97	24	230	97	1052	5.78
Miniopterus orianae	Vulnerable						1			1	0.01
Austronomus australis			8	14	13	21	4	13	26	99	0.54
Ozimops petersi			4	22	41	7	5	18	16	113	0.62
Ozimops planiceps				17	25	1	6	11	7	67	0.37
Ozimops ridei				2			4			6	0.03
Saccolaimus flaviventris	Vulnerable					3				3	0.02
Total positively resolved calls			95	1050	235	392	115	522	249	2658	
Total calls			158	1489	443	623	170	837	460	4180	

Table 33 Bat species positively identified at Leadville

Site	BC Act	EPBC Act	LV_Bustard	LV_Firetail	LV_Lionfish	LV_Lotus	Species Total	Calls per night per unit
Rhinolophus megaphyllus				2			2	0.13
Chalinolobus dwyeri	Vulnerable	Vulnerable	3	26	1		30	1.88
Chalinolobus gouldii			13	16	2	6	37	2.31
Nyctophilus sp.				5		5	10	0.63
Scoteanax rueppellii				3		1	4	0.25
Scotorepens balstoni				2		2	4	0.25
Scotorepens orion				4		1	5	0.31
Vespadelus regulus			11	29		3	43	2.69
Vespadelus vulturnus			1	37	3	14	55	3.44
Austronomus australis				8	1	9	18	1.13
Ozimops petersi			5	9		2	16	1.00
Ozimops planiceps			8	22	2	5	37	2.31
Ozimops ridei			2		1		3	0.19
Saccolaimus flaviventris	Vulnerable		2				2	0.13
Total positively resolved calls			45	163	10	48	266	
Total calls			74	213	18	82	387	

Table 34 Bat species positively identified at Mount Hope

Species	BC Act	EPBC Act	MH_Bustard	MH_Firetail-1	MH_Firetail-2	MH_Lionfish	MH_Lotus 1	MH_Lotus 2	MH_Spicebush	MH_Toadfish	MH_Wedgie	MH_Wolverine	Species Total	Calls per night per unit
Chalinolobus dwyeri	Vulnerable	Vulnerable		2			1			1			4	0.01
Chalinolobus gouldii			113	103	41	69	121	19	175	328	180	25	1174	3.56
Chalinolobus morio				29	1	1	6	3	6	4	4	1	55	0.17
Nyctophilus sp.			7	17	12	9	6	5	3	9	7	5	80	0.24
Scoteanax rueppellii				2	3		1		5	10	6		27	0.08
Scotorepens balstoni			1	2	5	3	8	2	18	7	53		99	0.30
Scotorepens orion									2	2	4		8	0.02
Vespadelus darlingtoni				2	2		1	2			1		8	0.02
Vespadelus regulus			214	152	48	106	113	38	117	106	54	16	964	2.92
Vespadelus vulturnus			97	82	74	114	187	117	84	295	196	39	1285	3.89
Miniopterus orianae				7	1	1	1		2			1	13	0.04
Austronomus australis			30	58	11	16	50	11	34	158	25	1	394	1.19
Ozimops petersi			4	16	15	6	2	2	15	18	15	2	95	0.29
Ozimops planiceps			15	63	14	15	41	12	48	48	3		259	0.78
Ozimops ridei			1	4	4		2	5	9	5	3		33	0.10
Saccolaimus flaviventris	Vulnerable		1							1			2	0.01
Total positively resolved calls			483	539	231	340	540	216	518	992	551	90		
Total calls			873	1021	350	573	908	409	762	1889	1133	124	8042	

Vertical bat monitoring positively identified 12 species at the two monitoring locations. A similar suite of species was recorded at both metmasts at all heights, with the exception of *Scotorepens balstoni* that was only recorded at Mount Hope, and *Nyctophilus* sp. which was only recorded at Girragulang Road (Table 35).

Table 35 Vertical bat species detection

Species	BC Act	EPBC Act	Girragulang Road			Mount Hope			Species Total
			0	50	100	0	50	100	
Chalinolobus gouldii			159	6	3	141	26	4	339
Nyctophilus sp.			10						10
Scotorepens balstoni						1			1
Vespadelus darlingtoni			1				2	4	7
Vespadelus regulus			8	4	1	18	29	12	72
Vespadelus vulturnus			28			13	2	1	44
Miniopterus orianae	Vulnerable		4	1	1	7	20	16	49
Austronomus australis			37	10	3		18	14	82
Ozimops petersii			11	1	2	1	10	14	39
Ozimos planiceps			246	108	120	47	230	146	897
Ozimops ridei			11	11	31	2	57	43	155
Saccolaimus flaviventris	Vulnerable		2						2
Total positively resolved calls			517	141	161	230	394	254	
Total calls			608	176	211	301	481	303	2080

The number of calls detected at each metmast at each height was variable, with no clear pattern present. The number of calls at Girragulang Road was generally higher at ground level, whereas there was no such clear trend at Mount Hope. Numbers of calls per night ranged from 3.9 to 16 (Figure 38).

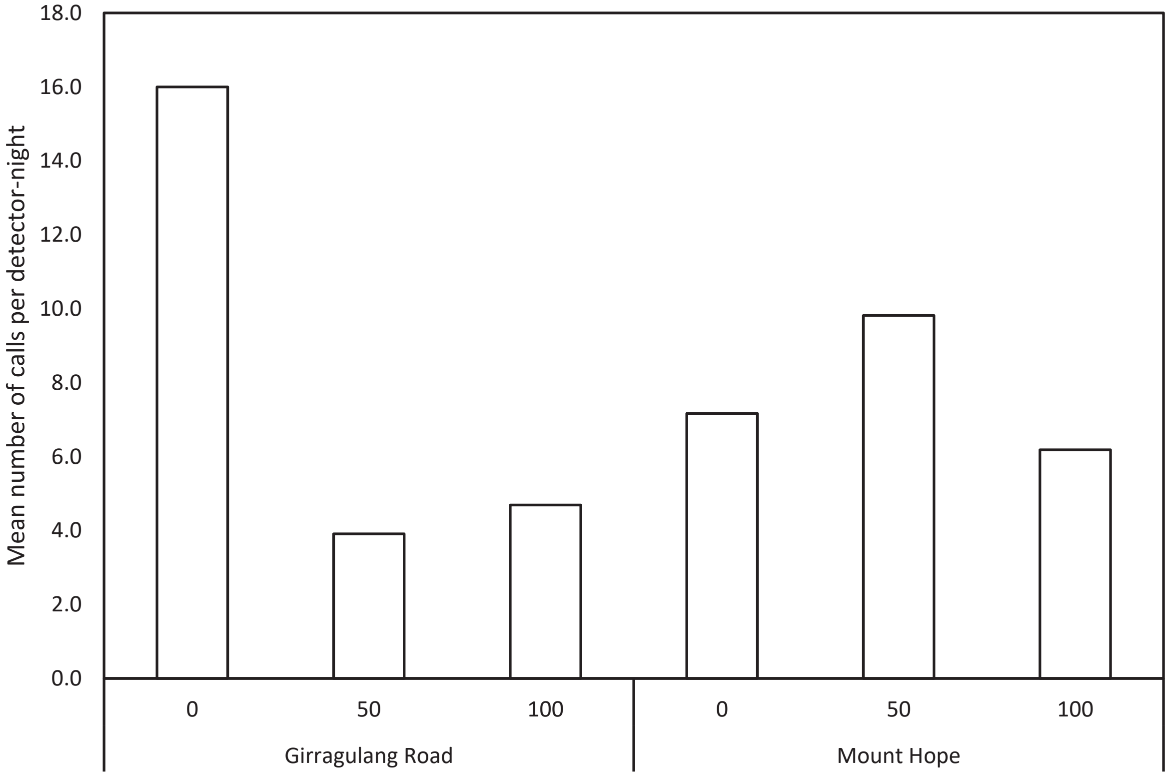


Figure 38 Vertical bat activity levels at Girragulang Road and Mount Hope metmasts

Bat activity by species was also considered as a proportion of total activity to consider which species were contributing most to activity at each height (Figure 39). The vast majority of detections were from *Ozimops planiceps* and *Chalinolobus gouldii*, both of which are common microbats that occur in woodland habitats. Generally there was no clear trend in the frequency of detections or species occurrence at each survey site. This indicates that the bat assemblage and occupancy at 100m (the lower end of the RSA for the proposed turbines) is not significantly different to those bats detected at the ground level. Whilst two threatened species were recorded at the met masts, the records of *S. flaviventris* were so low that there is unlikely to be any detectable trend in the vertical distribution of this species. Only two detections of this species were recorded at Girragulang Road at ground height. M. orianiae oceansis was recorded more consistently across both detectors, with up to 20 detections at the Mount Hope 50m detector over the survey period. These numbers are still very low for the species, and is consistent with the summer data recording.

Complete data for vertical bat data collection is provided in Appendix J. Based on the results of the vertical and horizontal bat activity surveys, the following species will require a collision strike risk assessment:

- *Chalinolobus dwyeri*
- *Miniopterus orianae*
- *Saccolaimus flaviventris*

In addition, a consolidated risk assessment will be required for all non-threatened micro- and megachiropteran bats.

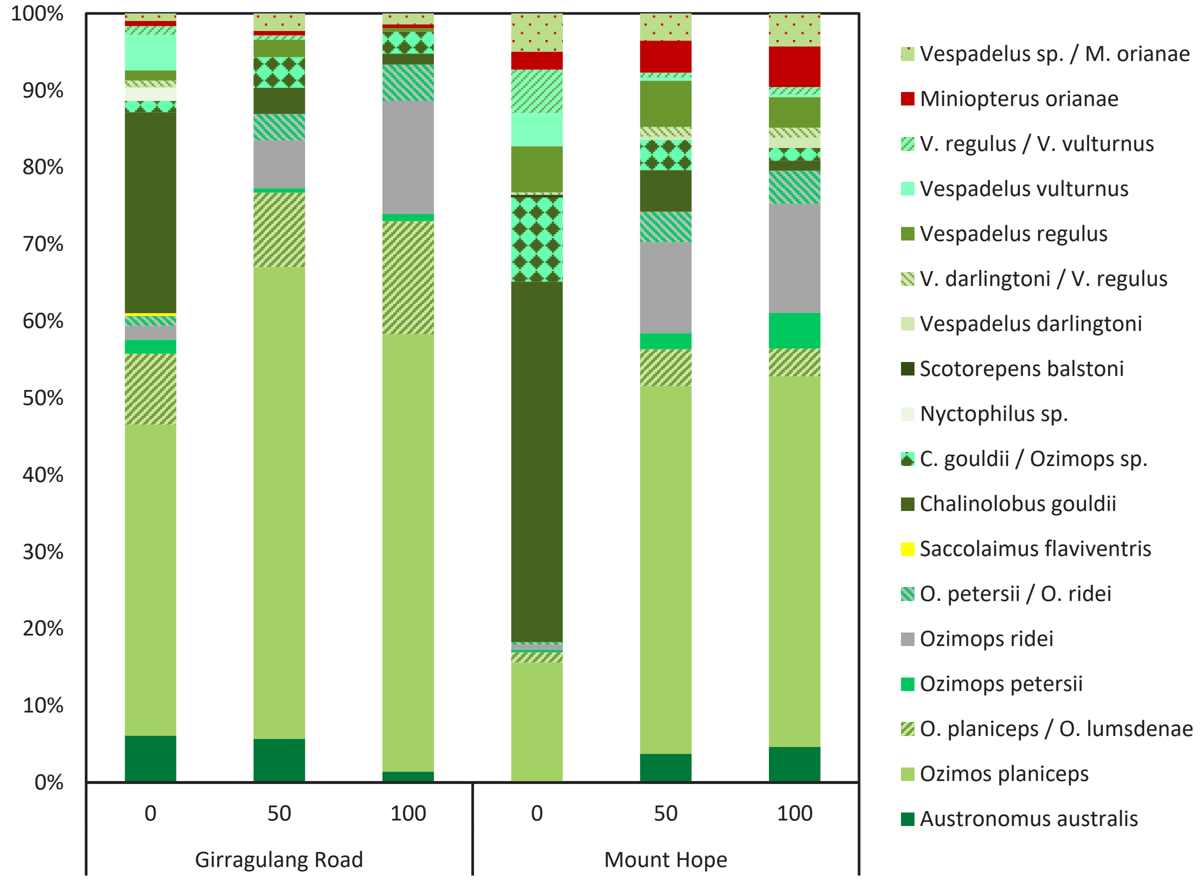


Figure 39 Proportion of calls at each detector height by species

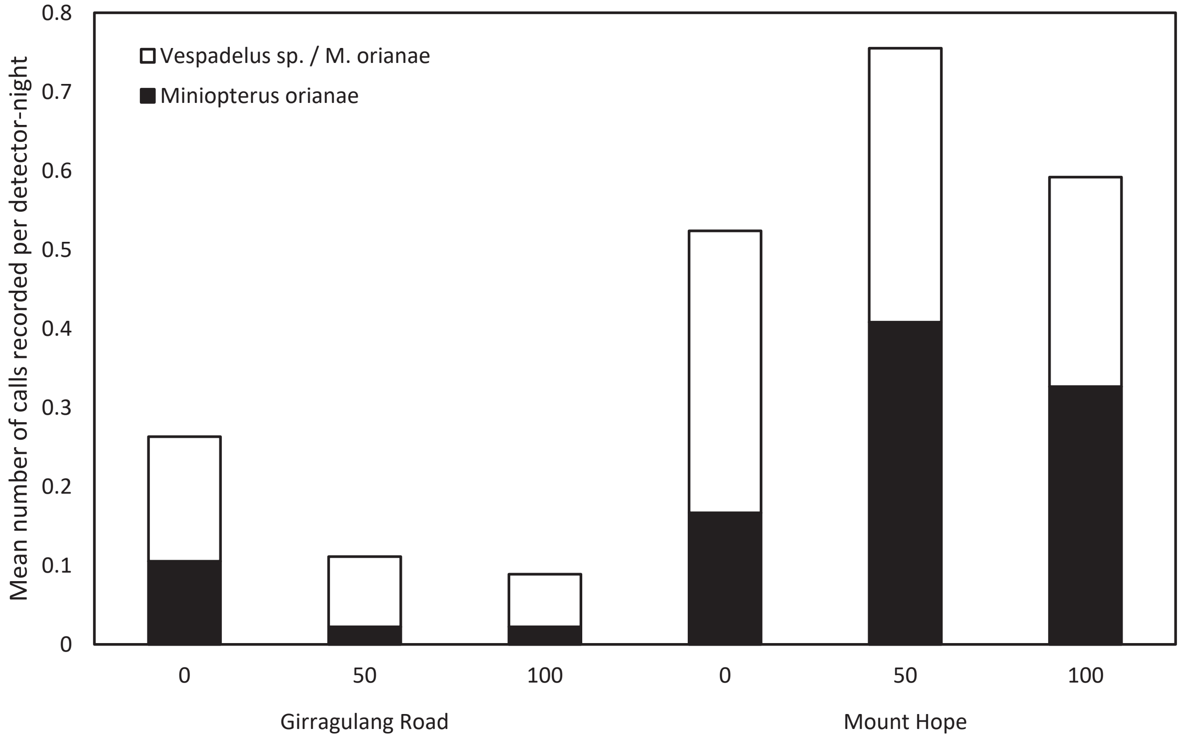


Figure 40 *Miniopterus orianiae oceansis vertical activity*

6.2. Bird utilisation monitoring

Bird utilisation survey was undertaken to identify the type, frequency, and behaviour of protected aerial species within the Study Area. The bird utilisation study was undertaken across three survey events across the Study Area, including:

- A combined summer/autumn survey concurrently with summer surveys
- A targeted winter survey for winter migrants
- A targeted spring survey for spring migrants

6.2.1. Methods

The bird utilisation study was conducted at point locations across the study area. At each point location, the following information was collected using pre-constructed Survey123 pro-formas:

At each site:

- The Cluster name (Mount Hope, Girragulang Road, Leadville)
- The site name/Turbine ID
- Start and end time
- Survey date
- Observers
- Location
- Vegetation structure
- Fauna habitats present
- Landscape element and landscape position

Within each site, all birds recorded in a 20 minute period within an approximately 2ha radius of the survey site were identified to species and the following information collected:

- Bird species
- Count
- Altitude from observer (<20m, 20-40m, 40-60m, 60-80m, and >80m). Additionally all birds recorded at a heigh lower than the observer were also recorded and selected as <0m.
- Bird habitat (Flying above canopy, In/on bridge, In building, Farm/fire dam, In dead tree (stag), Edge of water, In/on post or stump, Flying within canopy, On ground, In grass, In tree hollow, In litter, In reeds, In tree, In water, On fence, On log, On rock, Over water, Powerline, or On road)
- Provisions were also made for general survey notes and photographs if needed.

Within each season, surveys were conducted across the project. Initial baseline surveys were randomly assigned across the wind farm, capturing data throughout all three clusters. During this baseline survey period from 26 August 2020 to 14 May 2021, a total of 158 bird surveys were undertaken by ELA staff.

In winter 2021, a second survey was undertaken to measure bird utilisation and target winter migrant bird species from 21 June to 16 August 2021. Across the study area, 37 fixed point locations were established (Mount Hope = 13, Girragulang Road = 12, Leadville = 12). Fixed points were located across each wind farm cluster to provide a reasonable subsampling of ridges and hills, whilst providing spatial independence from each survey site. Each fixed survey point was surveyed four times each, twice in the morning (generally within 2 hours of dawn) and twice in the afternoon. These 148 fixed site surveys were supplemented by 28 additional opportunistic survey sites to provide a total of 176 surveys across the study area.

In addition to fixed point surveys, any observation of avifauna flying at a height greater than 60m was recorded using Collector for ArcGIS. The species, estimated height, and behaviour was recorded for a period of 5 minutes. In addition, the flight path was digitised to allow for spatial consideration of raptor/high flying species. The location of bird utilisation sites is shown on Figure 25.

6.2.2. Results

A total of 451 bird utilisation surveys were conducted by ELA across the study area between August 2020 and September 2021. The surveys were conducted over all four seasons and detected 107 avifauna species, a full list of which is in Appendix K.

General bird surveys were conducted between August 2020 and May 2021 with surveys located haphazardly across the study area or collocated with Microchiropteran bat survey sites. The winter and spring bird utilization surveys consisted of 37 fixed point survey sites which were surveyed four times and aimed to determine species diversity, abundance and flight heights of species. The methodology used is described in more detail below.

The results of all bird survey are summarized in Table 36. The general surveys included the highest number of surveys and consequently the highest number of species detected and highest total bird count. The average number of species detected per survey across all surveys was 5.7 species. However, the average number of species per survey was highest during the general surveys with 6.0 species. The average bird count per survey was highest during the general surveys and lowest during the spring surveys. Bird survey data has been grouped into their relevant wind farm cluster location: Mount Hope (MH), Leadville (LV) and Girragulang Rd (GR).

Table 36 Summarised findings of bird utilisation surveys.

	General				Winter				Spring			
	MH	LV	GR	Total	MH	LV	GR	Total	MH	LV	GR	Total
Number of surveys	74	31	50	**155**	52	48	48	**148**	52	48	48	**148**
Total number of species	62	61	38	**86**	35	52	37	**63**	37	50	28	**61**
Average number of species per survey	6.1	8.1	4.5	**6**	5.4	5.4	5.7	**5.5**	4.9	6.3	6	**5.7**
Total bird count	1044	589	1313	**2946**	891	825	896	**2612**	681	729	754	**2164**
Average bird count per survey	14.1	19	26.3	**19**	17.1	17.2	18.7	**17.7**	13.1	15.2	15.7	**14.6**

Eight BC Act and EPBC Act listed species were identified during bird utilisation surveys within the study area. These species are listed below in Table 21.

The five most abundant species detected during the surveys include:

- Noisy Miner (*Manorina melanocephala*)
- Common Starling (*Sturnus vulgaris*)
- Eastern Rosella (*Platycercus eximius*)
- Australian Magpie (*Gymnorhina tibicen*)
- Musk Lorikeet (*Glossopsitta concinna*)

The following raptor species were identified during the avifauna surveys:

- Nankeen Kestrel (*Falco cenchroides*)
- Wedge-tailed Eagle (*Aquila audax*)
- Black-shouldered Kite (*Elanus axillaris*)
- Brown Goshawk (*Accipiter fasciatus*)
- Brown Falcon (*Falco berigora*)
- Black Falcon (*Falco subniger*)
- Australian Hobby (*Falco longipennis*)
- Spotted Harrier (*Circus assimilis*)
- Southern Boobook (*Ninox boobook*)

The findings of all seasonal bird utilisation surveys are discussed in more detail in the following sections.

6.2.3. Baseline bird utilisation survey

The flight heights of the five most abundant native species, raptor species and BC Act and EPBC Act listed species detected within the study area are summarized in Table 37. The five most abundant species were generally recorded flying between 0-20 m or in the valley below the survey site. However, there were ten Galahs and one Sulphur-crested Cockatoo recorded flying between 40-60 m above ground on one occasion.

The majority of threatened species detected during survey were recorded flying between 0-20 m above ground or in the valley below. Only two Dusky Woodswallows were recorded flying higher than 40 m above ground. Raptors were recorded flying at the highest heights during the general bird surveys, with 13 Wedge-tailed Eagles flying more than 40 m above ground and one Brown Falcon flying 60-80 m above ground.

Most birds detected during the general bird utilization surveys were recorded flying 0-20 m above ground or in the valley below, with 96% of birds recorded flying within these height classes.

Table 37 Baseline avifauna summary

	Individuals recorded	Height classes					
		< 0 m	< 20 m	20-40 m	40-60 m	60-80 m	> 80 m
Most abundant species							
Noisy Miner	319	105	214	0	0	0	0
Eastern Rosella	260	71	188	1	0	0	0
Australian Magpie	250	117	132	1	0	0	0

	Individuals recorded	Height classes					
		< 0 m	< 20 m	20-40 m	40-60 m	60-80 m	> 80 m
Galah	214	93	97	14	10	0	0
Sulphur-crested Cockatoo	183	161	17	4	1	0	0
Total	1226	547	648	20	11	0	0
BC or EPBC Act listed species							
Varied Sitella	2	0	2	0	0	0	0
Speckled Warbler	9	6	3	0	0	0	0
Grey-crowned Babbler	7	7	0	0	0	0	0
Dusky Woodswallow	10	8	0	0	2	0	0
Spotted Harrier	1	1	0	0	0	0	0
White-throated Needletail	2	0	0	2	0	0	0
Total	31	22	5	2	2	0	0
Raptors							
Wedge-tailed Eagle	21	1	0	7	9	2	2
Nankeen Kestrel	27	8	15	4	0	0	0
Brown Falcon	3	0	1	1	0	1	0
Brown Goshawk	5	1	1	1	0	0	0
Black-shouldered Kite	2	1	1	0	0	0	0
Total	**58**	**11**	**18**	**13**	**9**	**3**	**2**
All birds detected	**2946**	**1174**	**1648**	**79**	**37**	**6**	**2**

6.2.4. Winter bird utilisation survey

A total of 148 bird utilisation surveys were conducted across the study area between June 2021 and August 2021. The dates of survey, surveyors and weather conditions during the surveys are summarised in Table 38. A total of 63 species were detected during the winter bird utilisation surveys, these are included in the total bird species list (Appendix K). The average number of species per survey was 5.5 species and the average bird count per survey was 17.7 birds. The five most abundant species, all raptor species and their flight heights are listed in Table 38below.

There were five BC Act listed species detected, including:

- Little Lorikeet (*Glossopsitta pusilla*)
- Varied Sitella (*Daphoenositta chrysoptera*)
- Speckled Warbler (*Chthonicola sagittata*)
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*)
- Black Falcon (*Falco subniger*)

The flight heights of the five most abundant native species, all raptor species and all BC Act listed species detected within the study area are summarized in Table 38. The five most abundant species were generally recorded flying between 0-20 m or in the valley below the survey site. However, ten Australian

Magpies, two Musk Lorikeets and four Australian Ravens were recorded flying 40-60 m above ground. As well as four Australian Ravens flying more than 80 m above ground.

The majority of threatened species detected were recorded flying 0-20 m above ground. However, three Black Falcons were recorded flying more than 80 m above ground. Other raptor species were also recorded flying at high heights. Nine Wedge-tailed Eagles were recorded flying more than 60 m above ground and one Nankeen Kestrel was recorded soaring more than 80 m above ground.

Most of the birds detected during the winter bird utilization surveys were recorded flying 0-20 m above ground or in the valley below, with 91% of birds recorded flying within these height classes.

Table 38 Winter avifauna summary

	Individuals recorded	Height classes					
		< 0 m	< 20 m	20-40 m	40-60 m	60-80 m	> 80 m
Most abundant species							
Noisy Miner	560	97	463	0	0	0	0
Eastern Rosella	297	47	246	4	0	0	0
Australian Magpie	292	33	244	5	10	0	0
Musk Lorikeet	184	12	159	11	2	0	0
Australian Raven	178	29	101	40	4	0	4
Total	1511	218	1213	60	16	0	4
Threatened species							
Little Lorikeet	6	0	6	0	0	0	0
Varied Sitella	5	1	4	0	0	0	0
Speckled Warbler	2	0	2	0	0	0	0
Black Falcon	3	0	0	0	0	0	3
Total	16	1	12	0	0	0	3
Raptors							
Wedge-tailed Eagle	17	1	2	5	0	1	8
Nankeen Kestrel	61	8	29	18	5	0	1
Brown Falcon	3	1	1	0	1	0	0
Australian Hobby	1	0	1	0	0	0	0
Black-shouldered Kite	10	0	3	7	0	0	0
Total	**92**	**10**	**36**	**30**	**6**	**1**	**9**
All birds detected	**2612**	**396**	**1980**	**191**	**28**	**1**	**16**

6.2.5. Spring bird utilization survey

A total of 148 bird utilization surveys were conducted across the study area between the 6th and 12th September 2021. A total of 61 species were detected during the surveys, these are included in the total bird species list (Appendix K). The average number of species detected per survey was 5.7 species and the average bird count per survey was 14.6 birds. The five most abundant species, all raptor species and their flight heights are listed in Table 39 below.

There were two BC Act listed species detected, including:

- Speckled Warbler (*Chthonicola sagittata*)
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)

The flight heights of the five most abundant native species, raptor species and BC Act listed species detected within the study area are summarized in Table 39. The five most abundant species were generally recorded flying between 0-20 m or in the valley below the survey site and there were no records of any individuals flying higher than 40 m above ground.

No threatened species were recorded flying higher than 40 m above ground. However, 150 Dusky Woodswallows were recorded flying between 20-40 m above ground. Five raptor species were detected during the spring bird utilization surveys. One Nankeen Kestrel was recorded soaring more than 80 m off the ground and six Wedge-tailed Eagles were recorded flying more than 60 m above ground.

The majority of all birds detected during spring bird utilization surveys were recorded flying 0-20 m above ground or in the valley below, with 81% of birds recorded flying within these height classes.

Table 39 Spring avifauna summary

	Individuals recorded	Height classes					
		< 0 m	< 20 m	20-40 m	40-60 m	60-80 m	> 80 m
Most abundant species							
Noisy Miner	242	52	190	0	0	0	0
Eastern Rosella	226	9	215	2	0	0	0
Musk Lorikeet	207	11	132	64	0	0	0
Australian Magpie	183	17	161	5	0	0	0
Striated Pardalote	154	32	118	4	0	0	0
Total	1012	121	816	75	0	0	0
Threatened species							
Dusky Woodswallow	150	0	0	150	0	0	0
Speckled Warbler	2	0	2	0	0	0	0
Total	152	0	2	150	0	0	0
Raptors							
Nankeen Kestrel	28	0	9	13	5	0	1
Wedge-tailed Eagle	14	0	1	5	2	3	3
Brown Goshawk	2	0	0	0	2	0	0
Australian Hobby	1	0	1	0	0	0	0
Black Shouldered Kite	1	0	1	0	0	0	0
Total	46	0	12	18	9	3	4
All birds detected	2164	264	1487	380	16	3	4

6.2.6. Avifauna flight height summary

The flight heights of the five most abundant species, all BC Act or EPBC Act listed species and all raptor species identified during the general, winter and spring bird utilisation surveys are summarised below in Table 40. A small proportion of Australian Magpies (1.4%), Musk Lorikeets (0.5%) and Galahs (4.7%) were recorded flying 40-60 m above ground. No Noisy Miners or Eastern Rosellas were recorded flying more than 40 m above ground.

The majority of threatened species were recorded flying less than 40 m above ground. However, two Dusky Woodswallow's were recorded flying 40-60 m above ground and three Black Falcons were recorded flying more than 80 m above ground.

The relative abundance of raptor species flying more than 40 m above ground was 16.3%. The four species recorded flying at these heights were Nankeen Kestrel, Wedge-tailed Eagle, Brown Goshawk and Brown Falcon. The relative abundance of Wedge-tailed Eagles flying more than 40 m above ground was 29.3% - the highest among all raptor species.

Overall, 98.4% of the 7722 birds detected during the surveys were recorded flying less than 40 m above ground.

Table 40 Avifauna flight height summary

	Individuals recorded	Height classes					
		< 0 m	< 20 m	20-40 m	40-60 m	60-80 m	> 80 m
Most abundant species							
Noisy Miner	1121	254	867	0	0	0	0
Eastern Rosella	783	127	649	7	0	0	0
Australian Magpie	724	167	536	11	10	0	0
Musk Lorikeet	391	23	291	75	2	0	0
Galah	214	93	97	14	10	0	0
Total	3233	664	2440	107	22	0	0
Threatened species							
Dusky Woodswallow	160	8	0	150	2	0	0
Speckled Warbler	13	6	7	0	0	0	0
Grey-crowned Babbler	7	7	0	0	0	0	0
Varied Sittella	7	1	6	0	0	0	0
Little Lorikeet	6	0	6	0	0	0	0
Black Falcon	3	0	0	0	0	0	3
White-throated Needletail	2	0	0	2	0	0	0
Spotted Harrier	1	1	0	0	0	0	0
Total	199	23	19	152	2	0	3
Raptors							
Nankeen Kestrel	116	16	53	35	10	0	2
Wedge-tailed Eagle	58	9	18	14	2	4	11
Black-shouldered Kite	13	1	5	7	0	0	0
Brown Goshawk	7	1	1	1	2	0	0
Brown Falcon	6	1	2	1	1	1	0
Australian Hobby	2	0	2	0	0	0	0
Total	**202**	**28**	**81**	**86**	**15**	**5**	**13**

	Individuals recorded	Height classes					
		< 0 m	< 20 m	20-40 m	40-60 m	60-80 m	> 80 m
All birds detected	**7722**	**1834**	**5115**	**650**	**81**	**10**	**22**

6.2.7. Seasonal trends in flight height

Relative bird abundance within flight height classes was compared between seasons and wind turbine clusters (**Figure 41**). The Girragulang Road cluster (b) exhibited the least variation in flight height among seasons, while the Mount Hope and Leadville clusters exhibited some variation among seasons with a slightly higher proportion of birds recorded at 20-40m during winter and spring. Overall, across all surveys and all clusters there were no strong seasonal trends in bird flight height.

What was consistent across all clusters was the high prevalence of bird activity well below the RSA of the proposed turbines, with the majority of activity focused below 20m height.

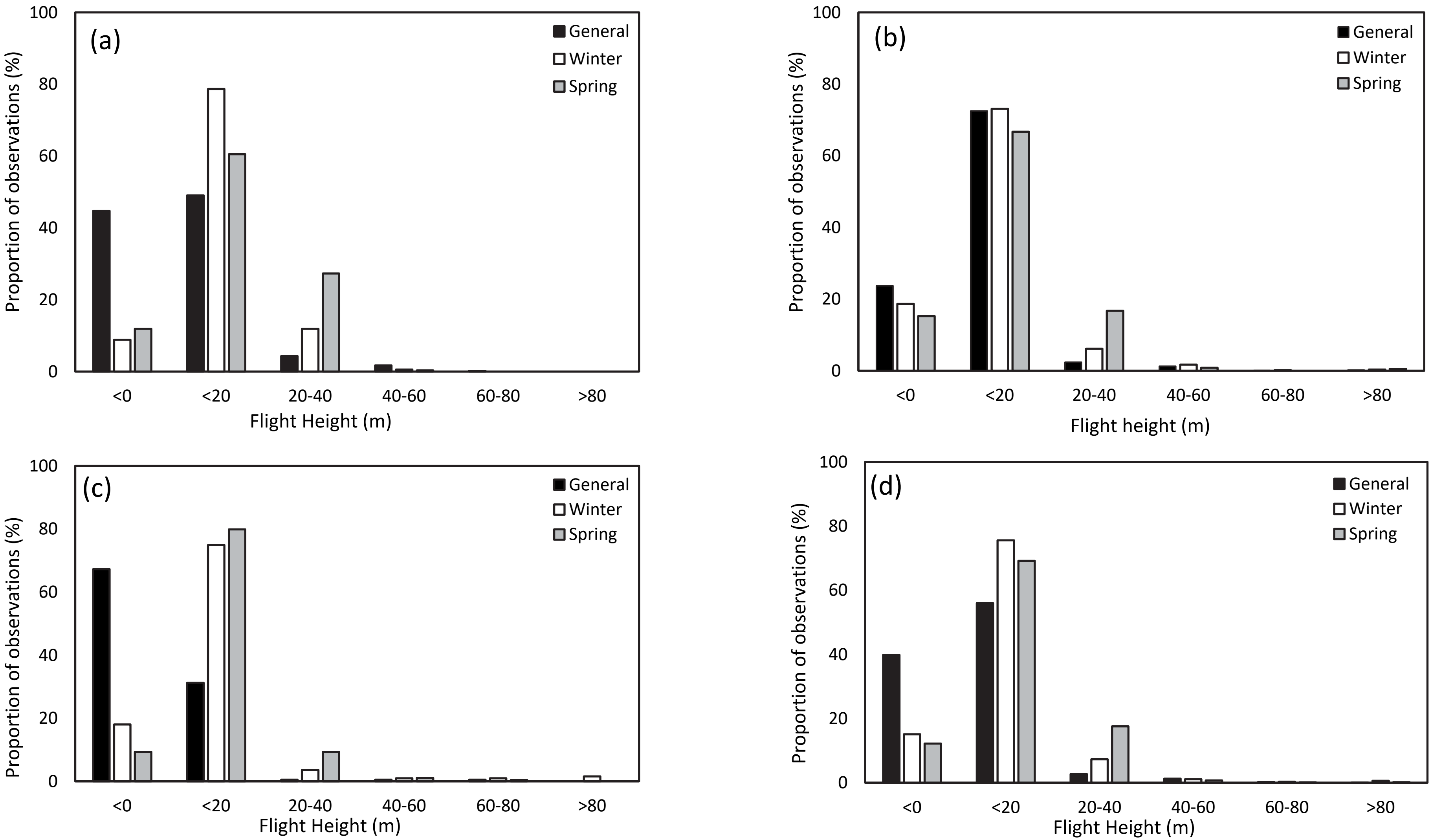


Figure 41 Proportional bird flight height in (a) Mount Hope, (b) Girragulang Road, (c) Leadville, and (d) Consolidated data across all clusters

6.3. Wind Farm strike data review

In order to understand the candidate list of species that have been impacted at other wind farms in NSW, a database review was undertaken for publicly available information on bird and bat strike. The review included consideration of any available data presented on:

- the NSW Major Projects Website; to establish a list of approved wind farms nearby to the project, and capture any biodiversity data available in BDAR/BAR etc
- Individual project websites, to review any monitoring reports and gather a list of species that have been recorded as fatalities due to wind turbine strike.

This review focussed on approved and operations Wind Farms. Those Wind Farms that are currently under preparation, but do not have a project approval have not been considered in this review.

For those projects that contained sufficient data available publicly, the following information was gathered and tabulated:

- Wind farm name
- IBRA region
- EIS Year
- Project status (in planning, approved, under construction, or operational)
- Number of turbines
- Turbine brand/model; to determine the rotor swept area maximum, minimum, and nacelle height
- The distance to the Valley of the Winds Wind farm
- Availability of biodiversity assessments
- Availability of turbine strike data

A summary of the review is shown below on Table 41, and the location of each windfarm relative to the Project is shown on Figure 42.

Of the 24 wind farms identified in the review, 15 (62.5%) are operational but only five (5) have strike data reporting available to the public.

All available strike monitoring was reviewed to understand the species likely to be at risk of turbine strike, and identified

Table 41 Wind farm review

Wind Farm Name	IBRA Region	EIS Year	Status	Number of turbines	Turbine brand/model	Rotor swept area (m max)	Nacelle height (m)	Rotor swept area (m min)	Distance to Project (km)	BDAR Available?	Strike Data Publicly Available?
Valley of the Winds	Brigalow Belt South, NSW South Western Slopes, Sydney Basin	2022	In planning	148	Not yet selected	250	170	90	N/A	N/A	N/A
Liverpool Range*	Brigalow Belt South	Sub: 2013 Det: 2018	Approved	267	Not yet selected	165	80-101	35-65	26	Yes	No
Uungula	NSW South Western Slopes	Sub: 2020 Det: 2021	Approved	97	Not yet selected	250	165	80	86	Yes	No
Bodangora	NSW South Western Slopes	Sub: 2011 Det: 2013	Operational	33	GE 3.43-130	150	85	20	78	Yes	Yes
Crudine Ridge	South Eastern Highlands, NSW South Western Slopes	Sub: 2012 Det: 2016	Under construction	37	GE 3.63 MW	160	91.5	23	110	Yes	No
Blayney	South Eastern Highlands	Commissioned 2000	Operational	15	Vestas V47-660kW	68	45	21	195	No	No
Flyers Creek	South Eastern Highlands	Sub: 2011 Det: 2014	Approved	38	Not yet selected.	160	90	20	190	Yes	No
Sapphire	New England Tablelands	Sub: 2011 Det: 2013	Operational	75	Vestas 3.6MW	200	137	74	296	Yes	Yes
White Rock S1	New England Tablelands	Stage 1 & Stage 2: 2012	Operational	70	Goldwind 121 2.5MW	150	89.5	29	295	Yes	Yes
White Rock S2	New England Tablelands	Stage 2 Mod Det: 2019	Approved	48	Goldwind 140	200	130	30	295	Yes	No
Glen Innes	New England Tablelands	Sub: 2007, Det: 2009	Approved	25	Not yet selected.	150	89	28	300	Yes	No
Crookwell	South Eastern Highlands	Commissioned 1998	Operational	8	Vestas V44-600 Kw	65	45	25	290	No	No
Crookwell 2	South Eastern Highlands	Det: 2005	Operational	28	GE 3.4 MW	160	95	30	295	Yes	No
Crookwell 3	South Eastern Highlands	Det: 2020	Approved	16	Vestas V126-3.45MW	150	87	24	295	Yes	No
Collector	South Eastern Highlands	Det: 2013	Operational	54	Vestas 4.2 MW	150	91.5	33	330	Yes	No
Gullen Range	South Eastern Highlands	Det: 2009 Commissioned: 2014	Operational	73	GW100-2.5MW (56 turbines), GW82-1.5MW (17 turbines)	130 & 126	80 & 85	30 & 44	300	Yes	Yes
Silverton	Broken Hill Complex	Det: 2009 Commissioned: 2020	Operational	58	GE 3.43-130	180	110	40	800	Yes	Yes
Biala	South Eastern Highlands	Det: 2017 Commissioned: 2020	Operational	31	Goldwind 3.5 MW	180	110	40	300	Yes	No
Gunning	South Eastern Highlands	Commissioned: 2011	Operational	31	Acciona AW-77 1.5 MW	110	71.5	33	325	No	No

Wind Farm Name	IBRA Region	EIS Year	Status	Number of turbines	Turbine brand/model	Rotor swept area (m max)	Nacelle height (m)	Rotor swept area (m min)	Distance to Project (km)	BDAR Available?	Strike Data Publicly Available?
Cullerin Range	South Eastern Highlands	Commissioned: 2009	Operational	15	Senvion 2MW	128	80	32	325	Yes	No
Woodlawn	South Eastern Highlands	Commissioned: 2011	Operational	23	Suzlon S88 2.1MW	124	80	36	355	Yes	No
Bango	NSW South Western Slopes	Det: 2018	Under construction	46	GE Cypress 5.3 MW	200	121	42	305	Yes	No
Capital	South Eastern Highlands	Det: 2006, Commissioned: 2009	Operational	67	Suzlon S88 2.1MW	124	80	36	360	Yes	No
Capital 2	South Eastern Highlands	Det: 2011	Approved	41	Not yet selected.	157	94	31	360	Yes	No
Taralga	South Eastern Highlands	Det: 2012, Commissioned: 2015	Operational	51	Vestas: 21x(V100 1.8 MW), 21x(V90 2.0MW), 9x(V90 3.0 MW)	21xWTGS = 130, 30xWTGS = 125	80	21xWTGS = 30, 30xWTGS = 35	280	No	No

* Liverpool Range Wind farm is currently under modification. Data presented is based on approved project.

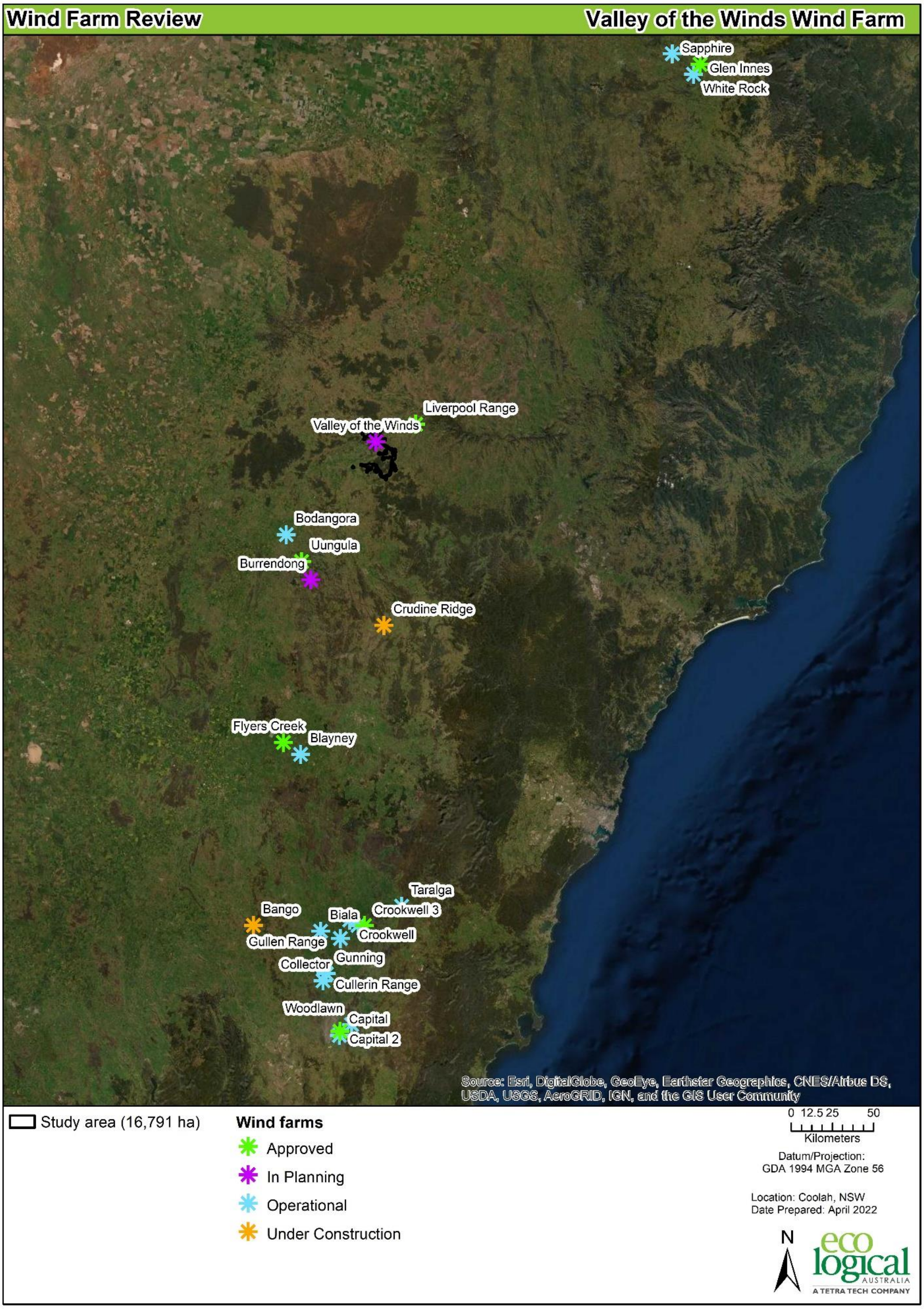


Figure 42 Wind farm review

The wind farm review identified 59 species identified as at risk of strike, by detection as mortalities across the operational wind farms. Across these wind farms five regularly represented species had sufficient data to consider the number of collisions per turbine per year, including four birds: Wedge-tailed Eagle (Figure 43), Nankeen Kestrel (Figure 44), Australian Magpie (Figure 45), and White-throated Needletail (Figure 46) and two microchiropteran bats: Gould's Wattled Bat (Figure 47) and White-striped Freetail-bat (Figure 48) All of these species share a distribution across all of the wind farms in review, including the Project.

Across all of these species the strike rates were generally low, with less than 0.4 collisions per turbine per year for all species. The review identified that there is generally a trend of decreasing strike rate per year, with increasing lower RSA height. This may be indicative of a spatial separation from the RSA to woodland/forest habitat types, or may be an artefact of individual wind farm locations/habitat types present. The consistency across all six species, indicates a reasonable trend exists. Interestingly, White Rock and Sapphire Wind Farms have significant differences in the strike rates, given they are spatially located close to each other and in similar habitats.

The nacelle height and RSA dynamics for the Project are expected to be a similar swept area for Sapphire Wind Farm, but with a nacelle height 50m greater (and thus 50m additional ground clearance).

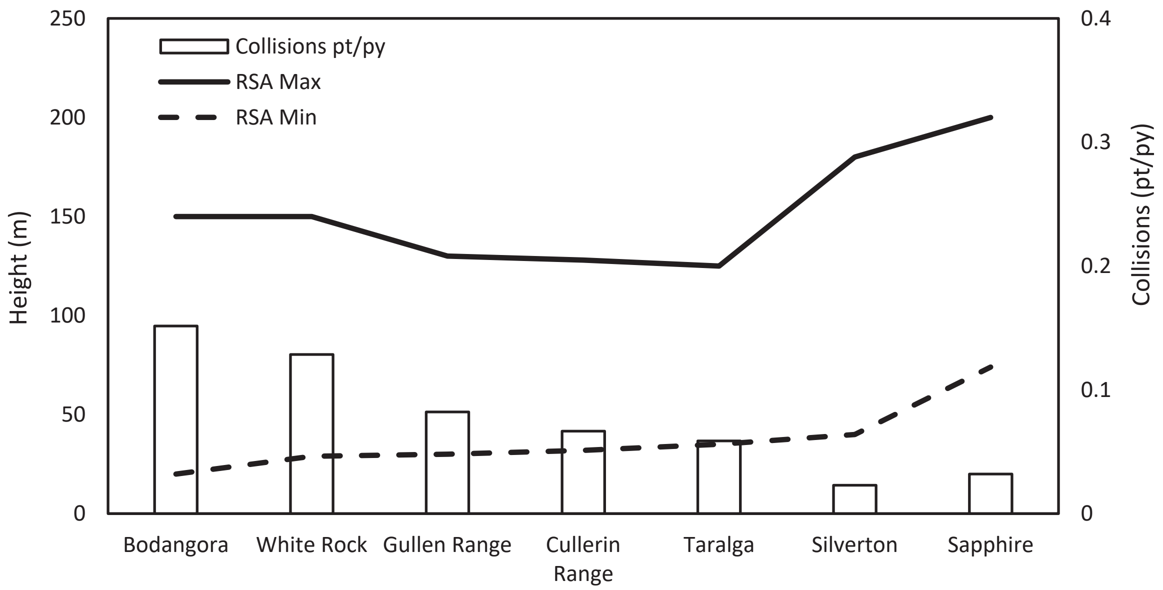


Figure 43 Wedge-tailed Eagle collision rate at NSW wind farms

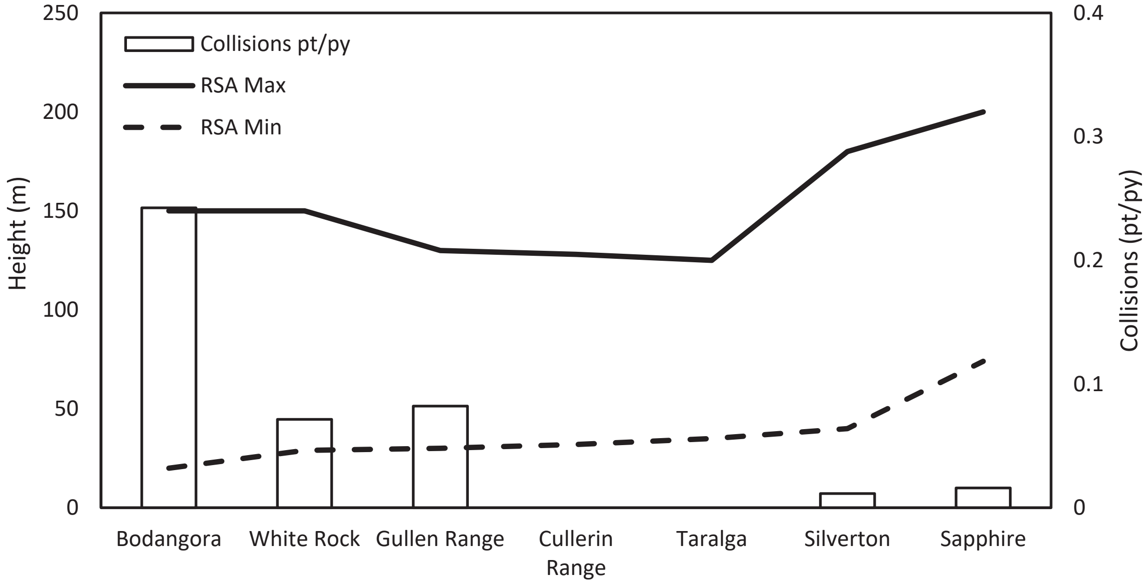


Figure 44 Nankeen Kestrel collision rate at NSW wind farms

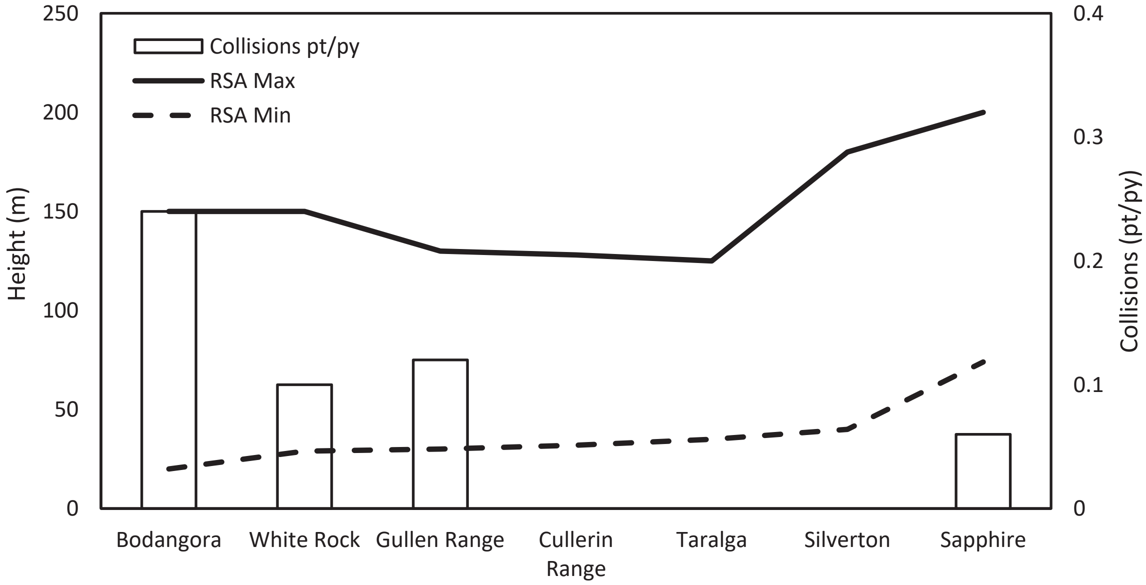


Figure 45 Australian Magpie collision rate at NSW wind farms

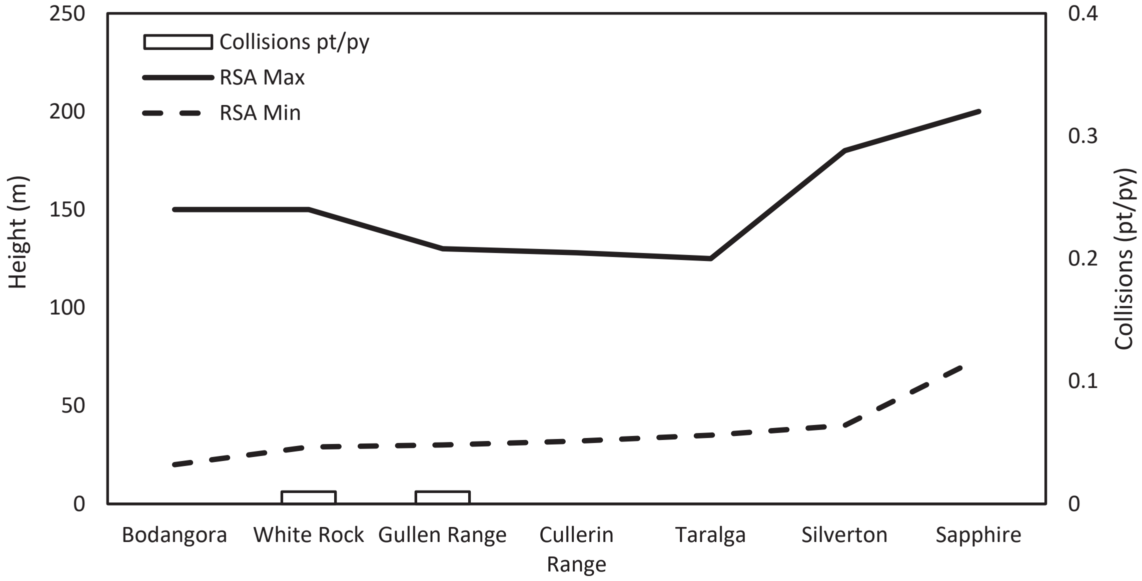


Figure 46 White-throated Needletail collision rate at NSW wind farms

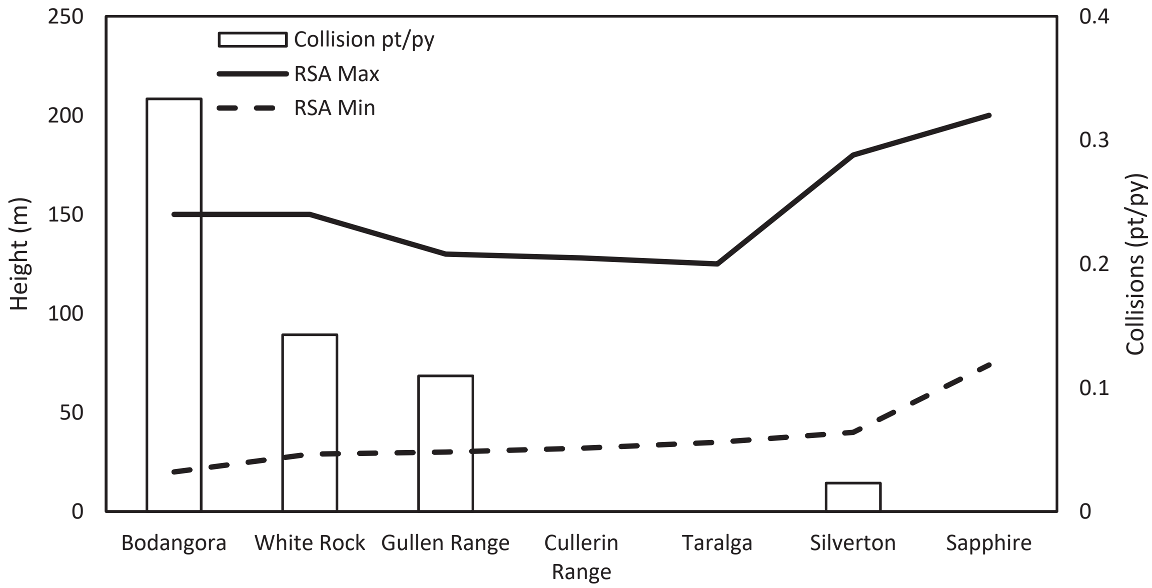


Figure 47 Gould's Wattled Bat collision rate at NSW wind farms

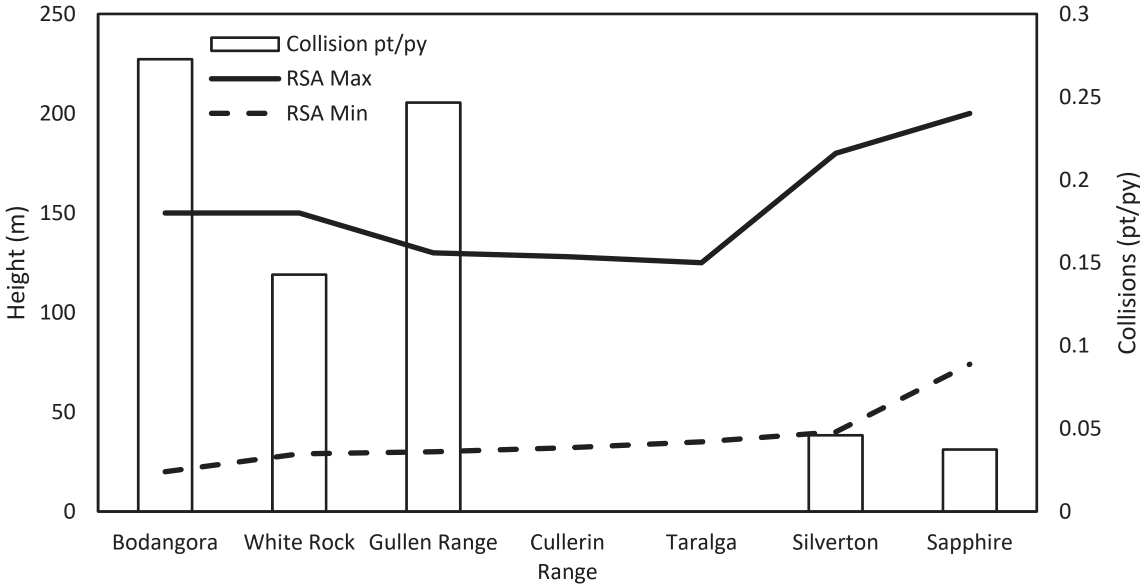


Figure 48 White-striped Freetail-bat collision rate at NSW wind farms

6.4. Aerial habitat mapping

Using data collected during the field surveys, the habitual paths of aerial species was drafted by consolidating flight path data. A total of 161 aerial flights were recorded.

During surveys 10 aerial species were identified outside of bird utilisation surveys, and recorded incidentally whilst staff were traversing the study area. The most frequently observed species was Wedge-tailed Eagle and Nankeen Kestrel, both of which are resident aerial species. No threatened species were included within this dataset. The location of all observed flights is shown on Figure 49.

Within the Mount Hope cluster, seven species were identified in 48 recorded flights. The most frequently observed species were Wedge-tailed Eagle and Nankeen Kestrel. Wedge-tailed Eagle was observed soaring between 2 and 100m above observer height, with an average flight height of 54m. Nankeen Kestrel was observed soaring and fluttering between 8 and 50m height, with an average of 21.75m. The majority of observations were of Wedge-tailed Eagles soaring between 100 and 500m parallel to ridgelines, utilising updrafts created by gully heads. These areas are also heavily vegetated with dry sclerophyll forest. Flight paths cross from one gully head to another generally at low points along ridges.

Withing Girragulang Road cluster, six species were observed in 62 flights. Similarly to Mount Hope the most frequently observed species within Girragulang Road were Wedge-tailed Eagle and Nankeen Kestrel. Wedge-tailed Eagle was observed soaring between 20 and 150m above observer height, with an average flight height of 59m. Nankeen Kestrel was observed soaring and fluttering between 0 and 30m height, with an average of 13.2m. Observations within Girragulang Road were less aligned with ridgelines and gully habitats, as the topography is more mild with less drastic topographic variance. The undulating hills within Girragulang Road likely produce more variable wind dynamics which makes predictability of flight paths less reliable.

Withing Leadville cluster, five species were observed in 51 flights. Similarly to Mount Hope and Girragulang Road the most frequently observed species within Leadville were Wedge-tailed Eagle and Nankeen Kestrel. Wedge-tailed Eagle was observed soaring between 10 and 150m above observer height, with an average flight height of 51.6m. Nankeen Kestrel was observed soaring and fluttering between 10 and 80m height, with an average of 31m. Observations within Leadville were strongly aligned with ridgelines and gully habitats, as the topography contains abrupt variance between valley floor and ridgelines. Flight paths within Leadville also corresponded to bird traverses between larger patches of remnant burnt bushland.

All species identified within the aerial flight path analysis have been included below in the baseline collision risk assessment.

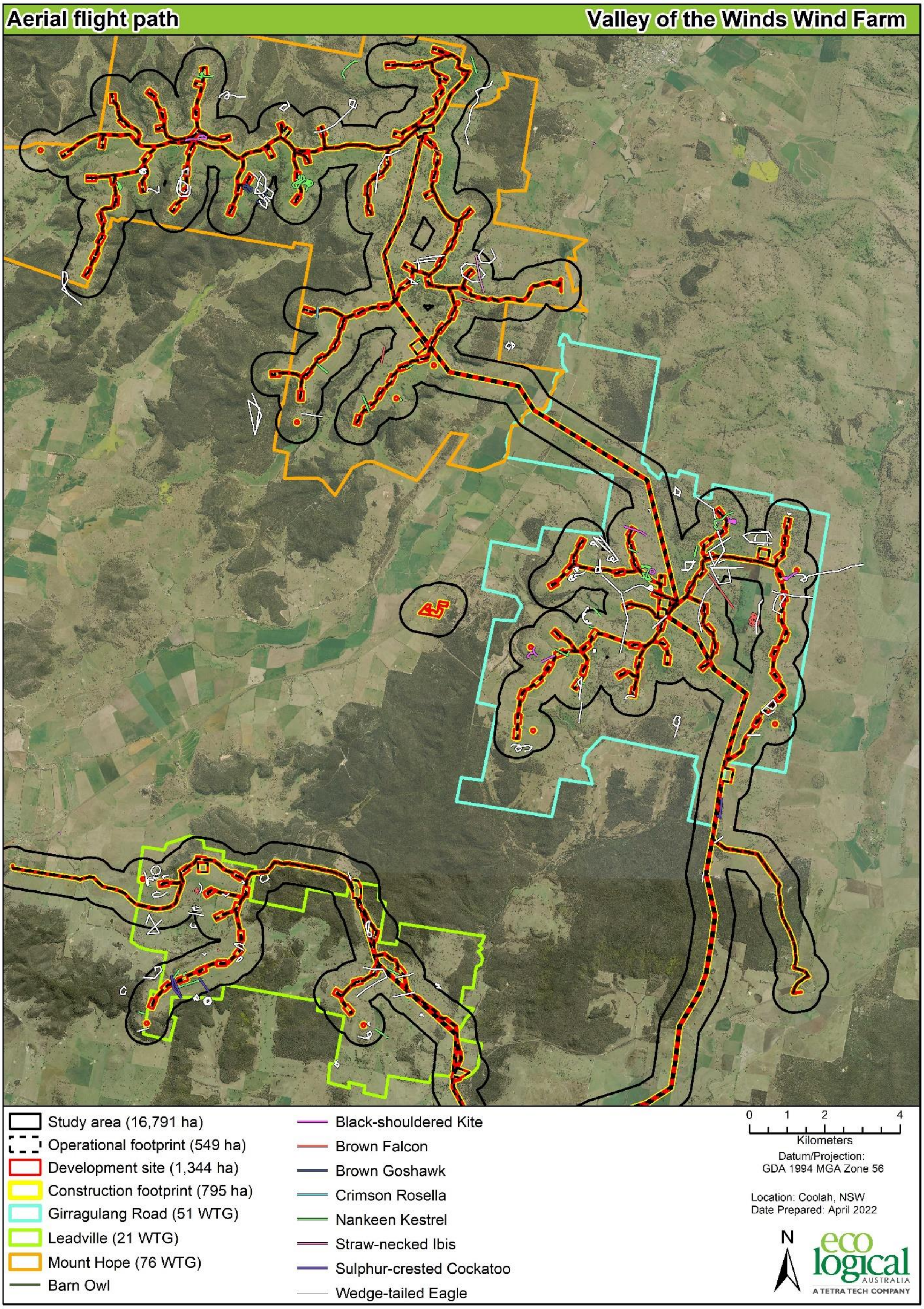


Figure 49 Aerial flight path recording

6.5. Regional migratory pathways

Assessment was undertaken for four threatened species identified by BCD to be potentially at risk of interference of migratory pathways. These species included Dusky Woodswallow, White-browed Woodswallow, Rainbow Bee-eater, and White-throated Needletail.

The assessment utilised all data available on the Atlas of Living Australia (ALA) for each species across eastern Australia, to determine if the project was within, or would likely interfere with any migratory flight patterns. The analysis also included consideration of the results of the field assessment presented in Section 6.2 above. All data was sorted into season (summer, autumn, winter, spring) and analysed using kernel density analysis to show areas of high species activity each season. All data from 1 January was deleted from the dataset, as there was a disproportionate number of entries on this date (and likely an artefact of data gap filling).

Kernel density analysis was normalised to show the following proportion of each species activity each season to identify activity 'hotspots'. The map of each species activities across eastern Australia (as well as within 100 km of the project) is shown on Figure 50 to Figure 57. Based on review of the seasonal data available, the following trends were identified:

6.5.1. Dusky Woodswallow

This species is regionally migratory but also a permanent resident to eastern Australia. The project is at the western periphery of the activity areas. The greatest risk for collision for this species is during late winter/spring, whereby the activity of the species regionally is highest. This species was observed on several occasions across the study area, and is likely to have a low impact by the project.

6.5.2. White-browed Woodswallow

Regionally nomadic species that is most active from late winter to spring. The species activity mapping suggests a broadscale movement from south-eastern NSW and Victoria in summer, to winter/autumn occupation of north-western Queensland. The greatest risk for collision for this species is during late winter/spring, whereby the activity of the species regionally is highest. This species was not observed within the study area, and is unlikely to be impacted by the project.

6.5.3. Rainbow Bee-eater

Regionally nomadic species with activity highest in summer. The species activity mapping suggests a broadscale movement from south-eastern NSW and Victoria in summer, to winter/autumn occupation of north-western Queensland and Northern Territory. The greatest risk for collision for this species is during late winter/spring, whereby the activity of the species regionally is highest. This species was not observed within the study area, and is unlikely to be impacted by the project.

6.5.4. White-throated Needletail

International migrant which is exclusively aerial during activity in Australi. The majority of activity of this species is concentrated along the coast, with activity inland generally associated with summer storms. The greatest collision risk for this species is in summer during storm activity. This species was observed on two occasions across the study area, and is likely to have a low impact by the project.

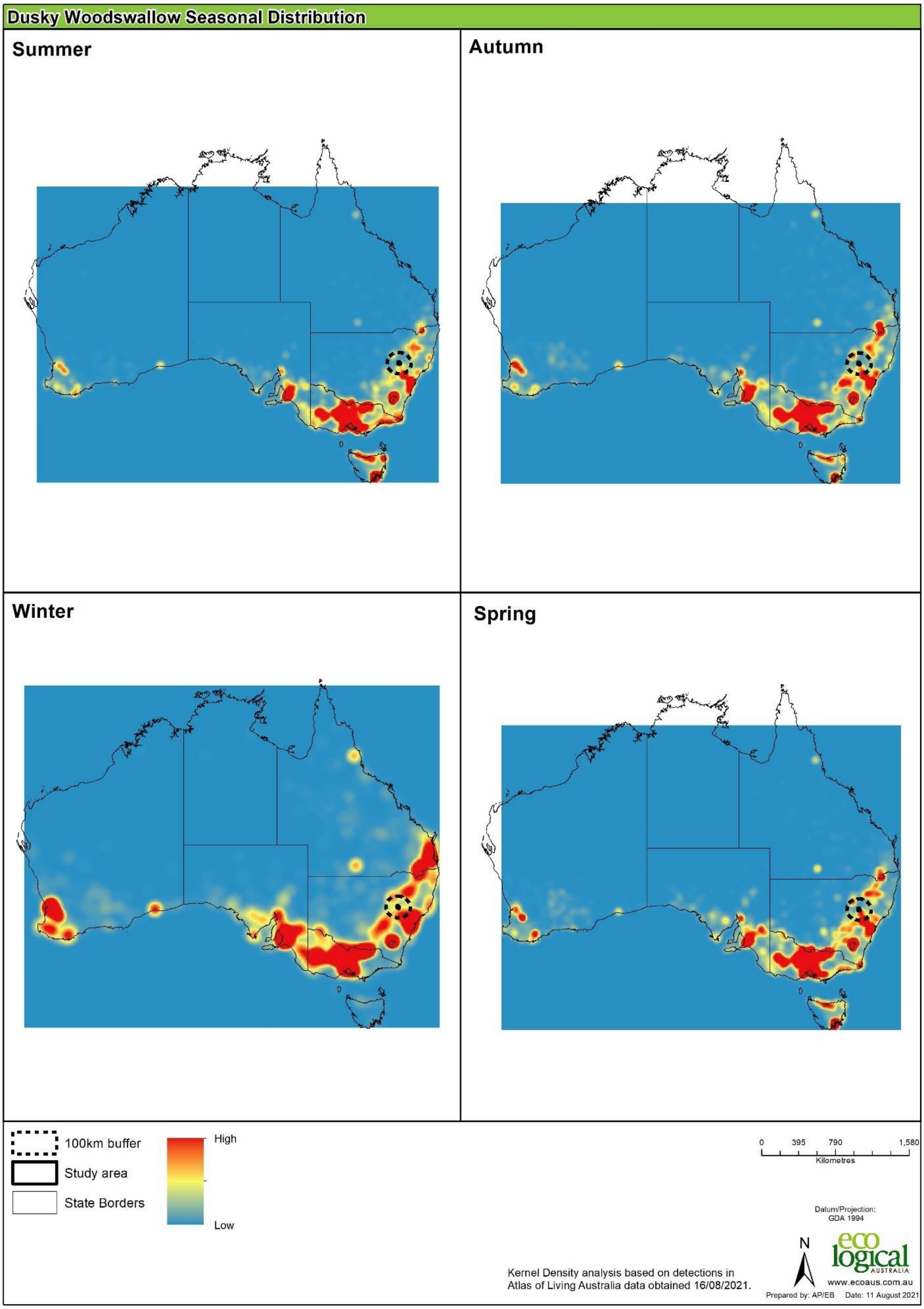


Figure 50 Seasonal distribution of Dusky Woodswallow across eastern Australia

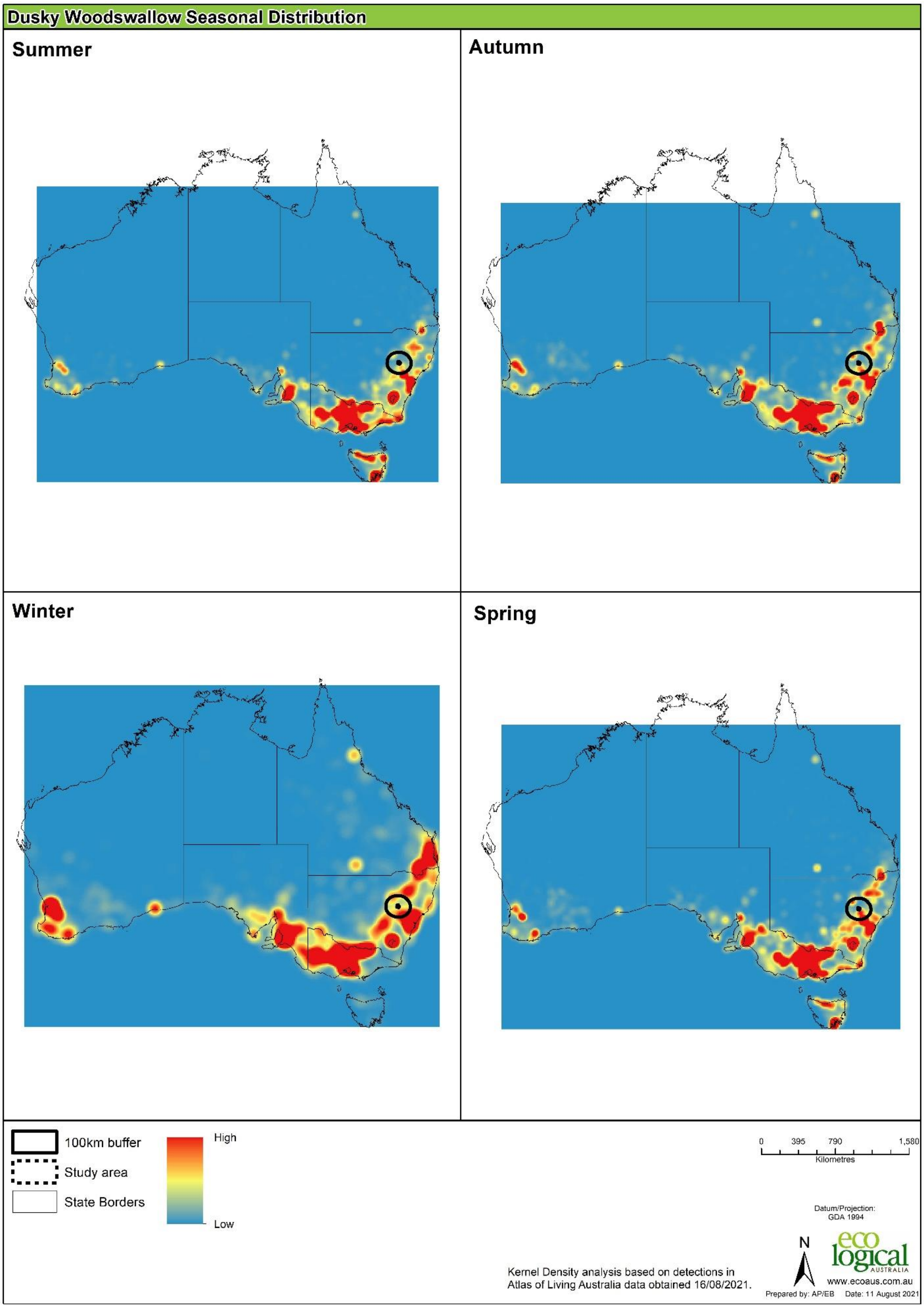


Figure 51 Seasonal distribution of Dusky Woodswallow within 100km of the Project

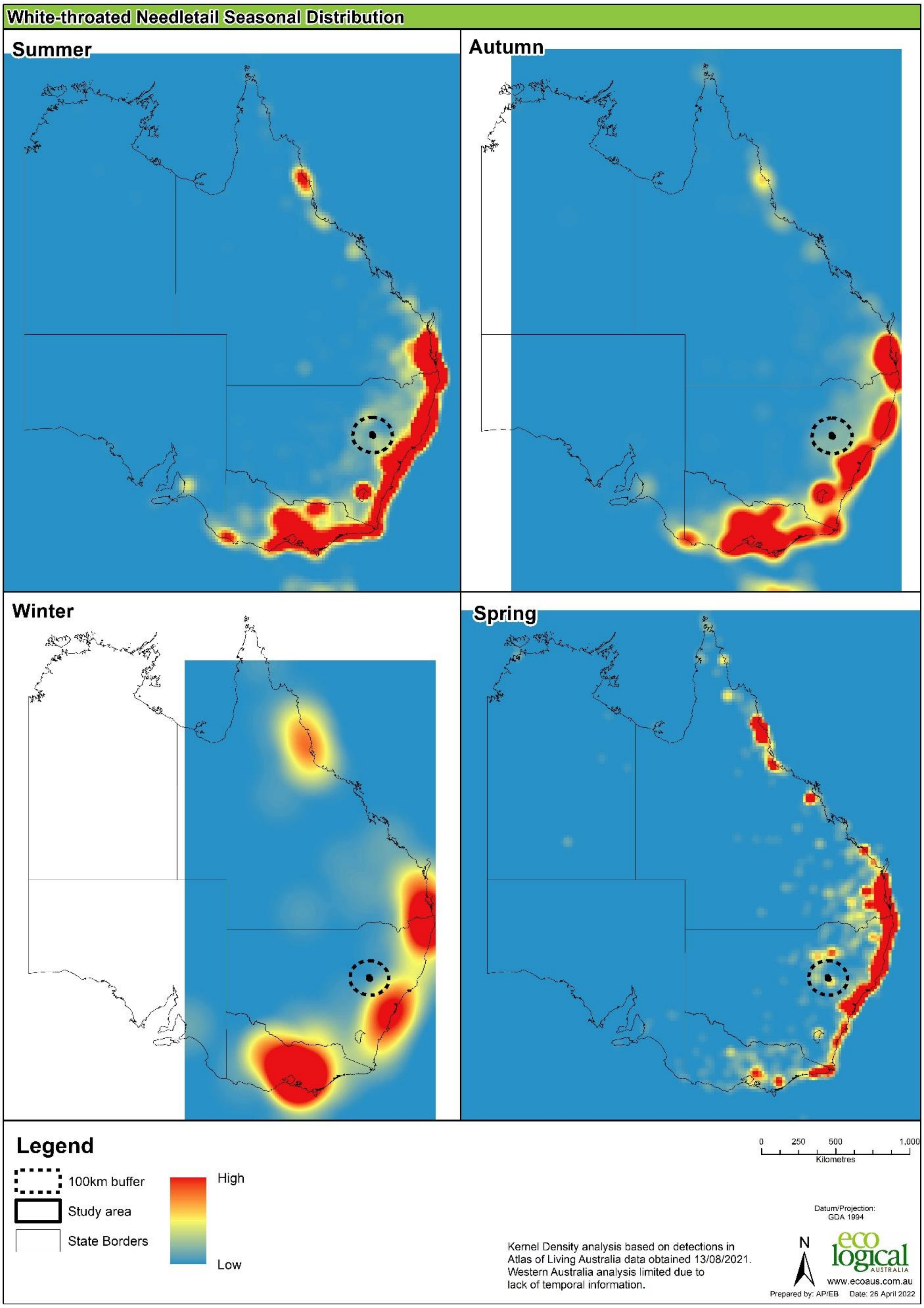


Figure 52 Seasonal distribution of White-browed Woodswallow across eastern Australia

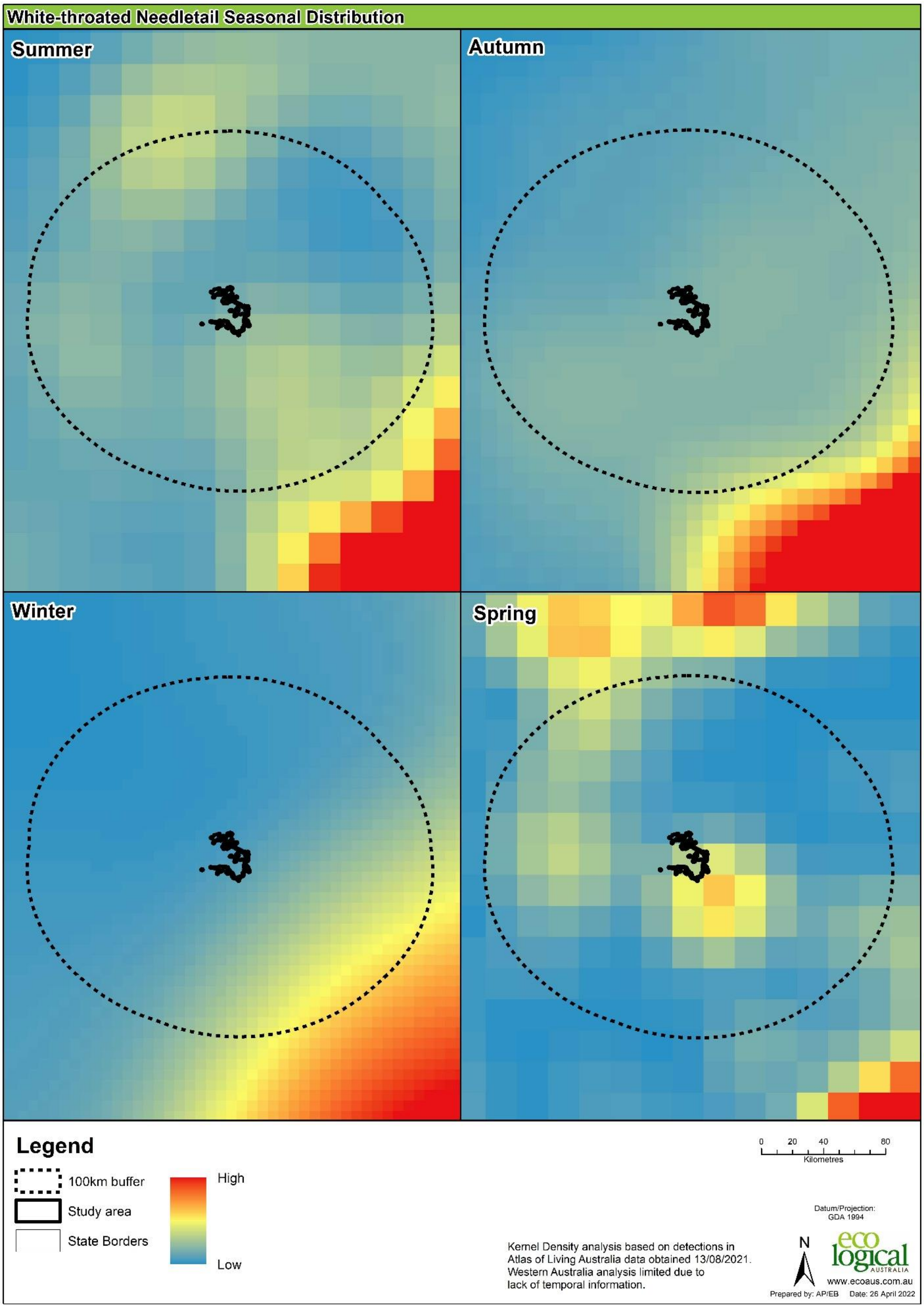


Figure 53 Seasonal distribution of White-browed Woodswallow within 100km of the Project

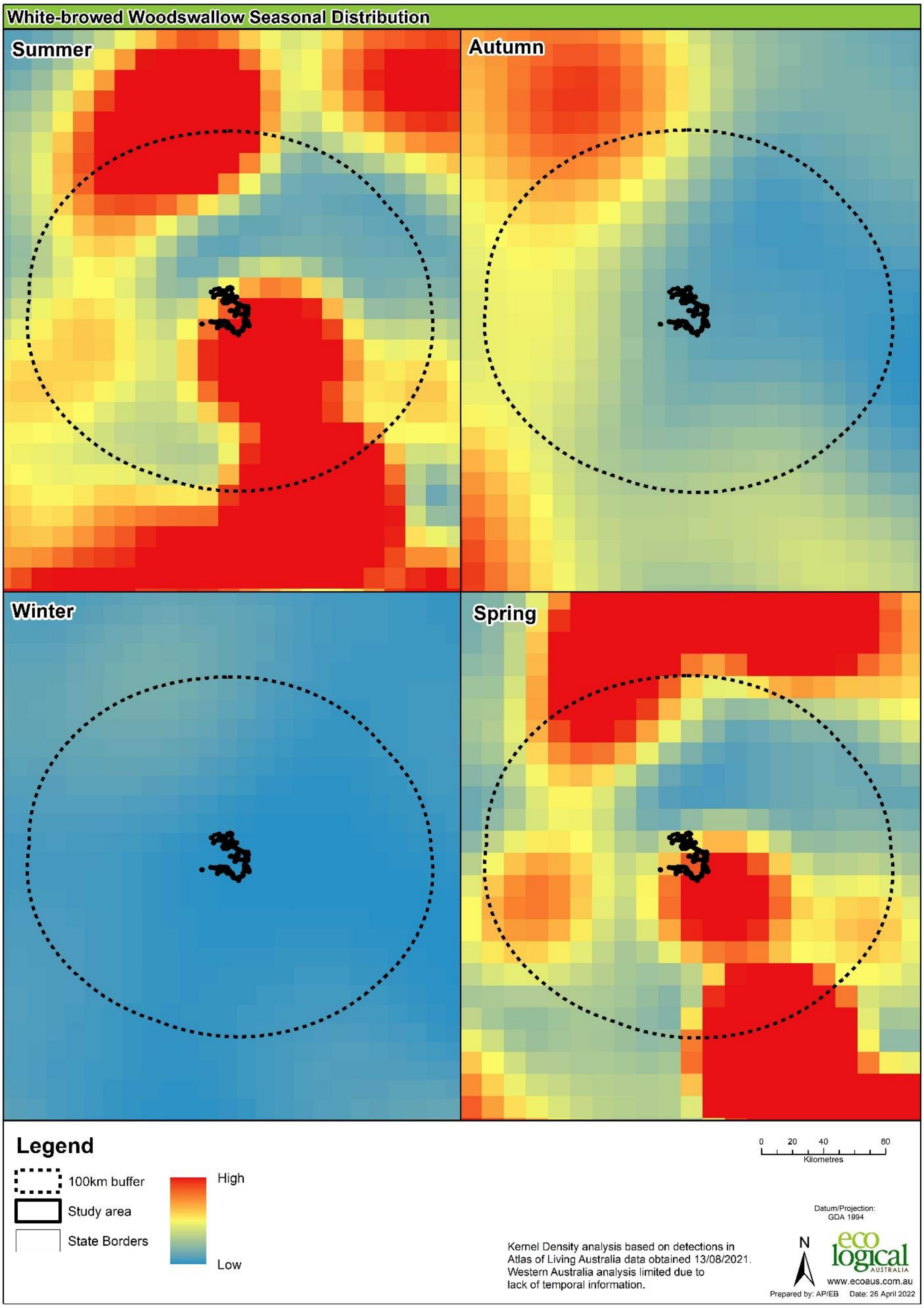


Figure 54 Seasonal distribution of Rainbow Bee-eater across eastern Australia

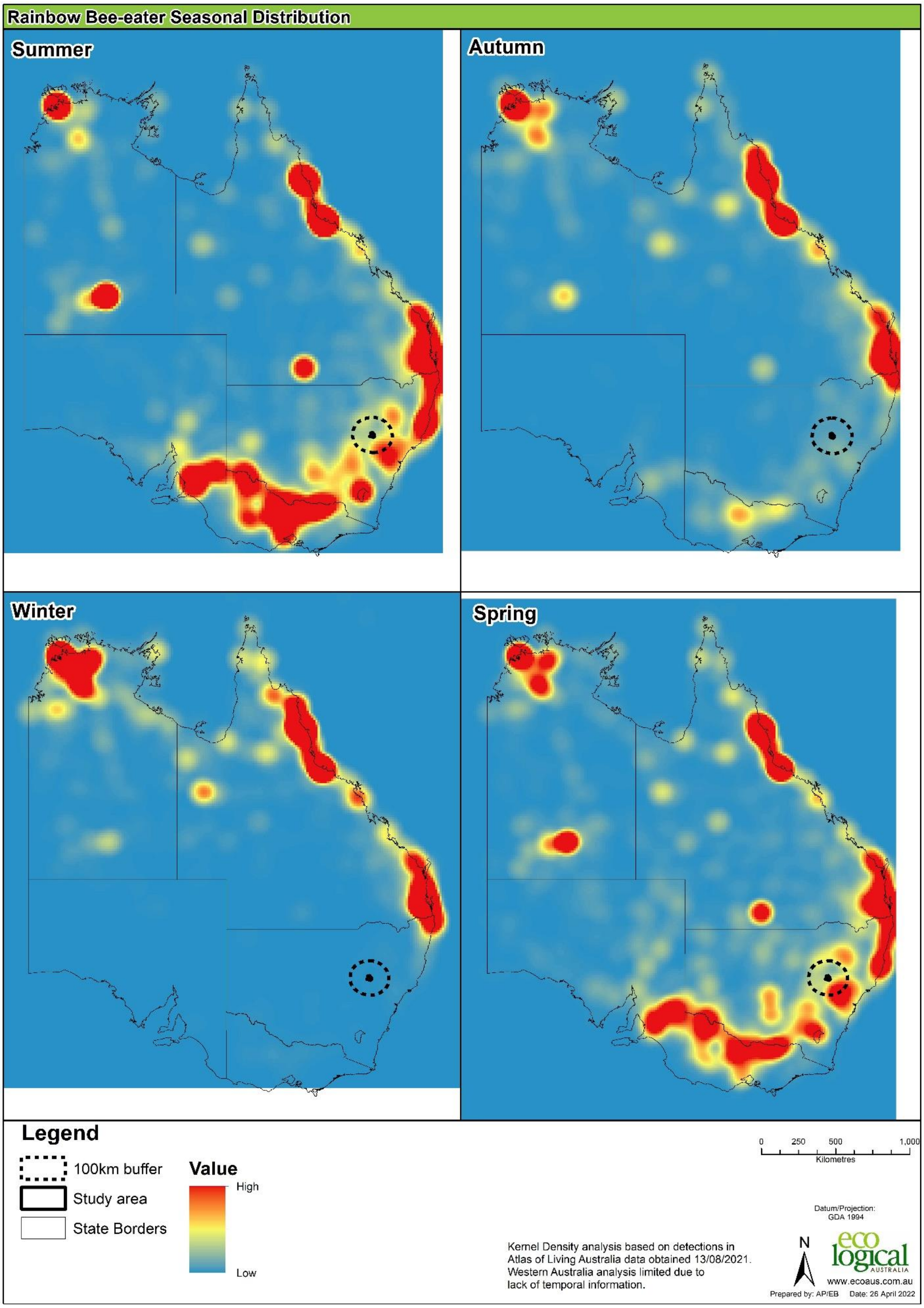


Figure 55 Seasonal distribution of Rainbow Bee-eater within 100km of the Project

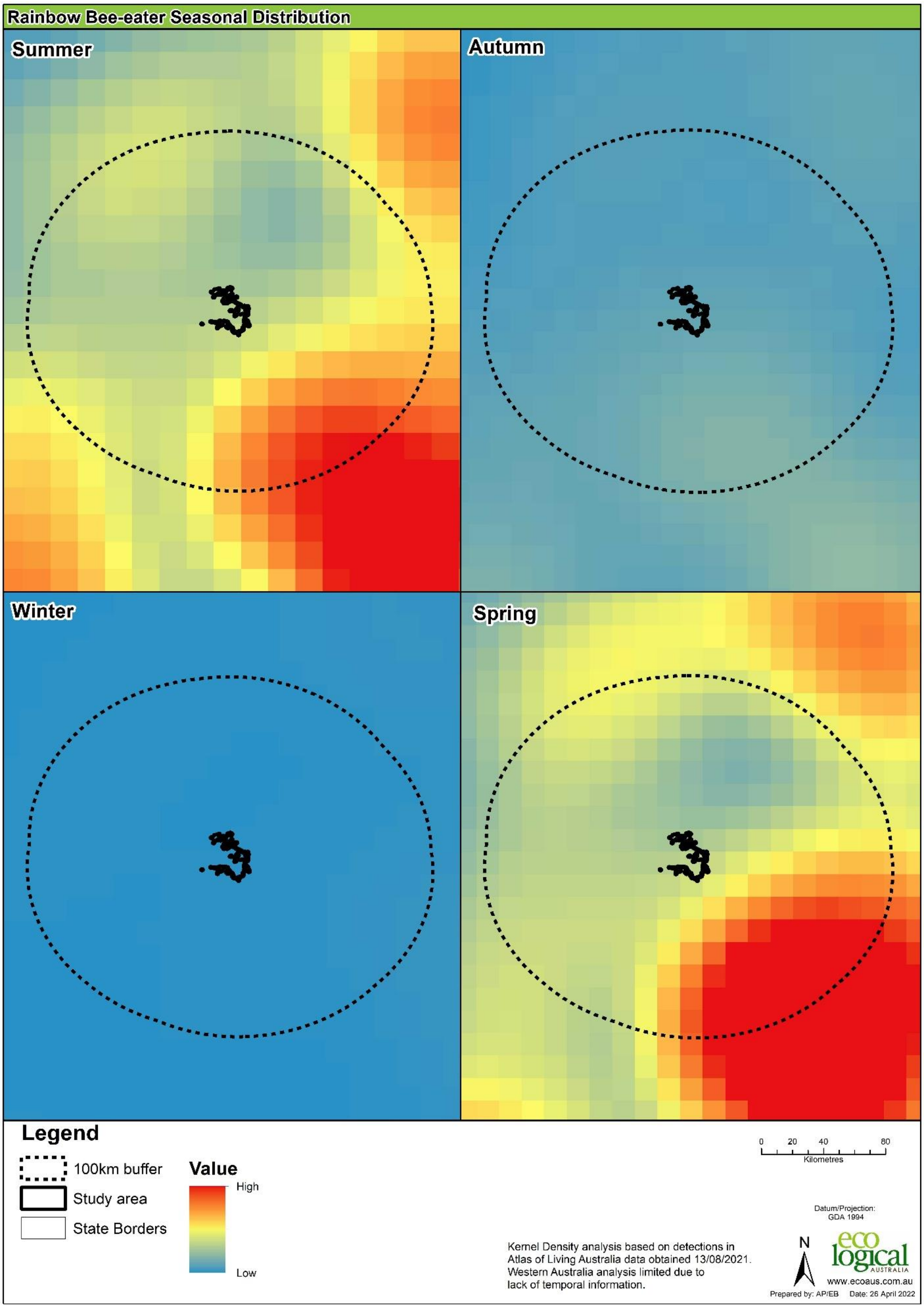


Figure 56 Seasonal distribution of White-throated Needletail across eastern Australia

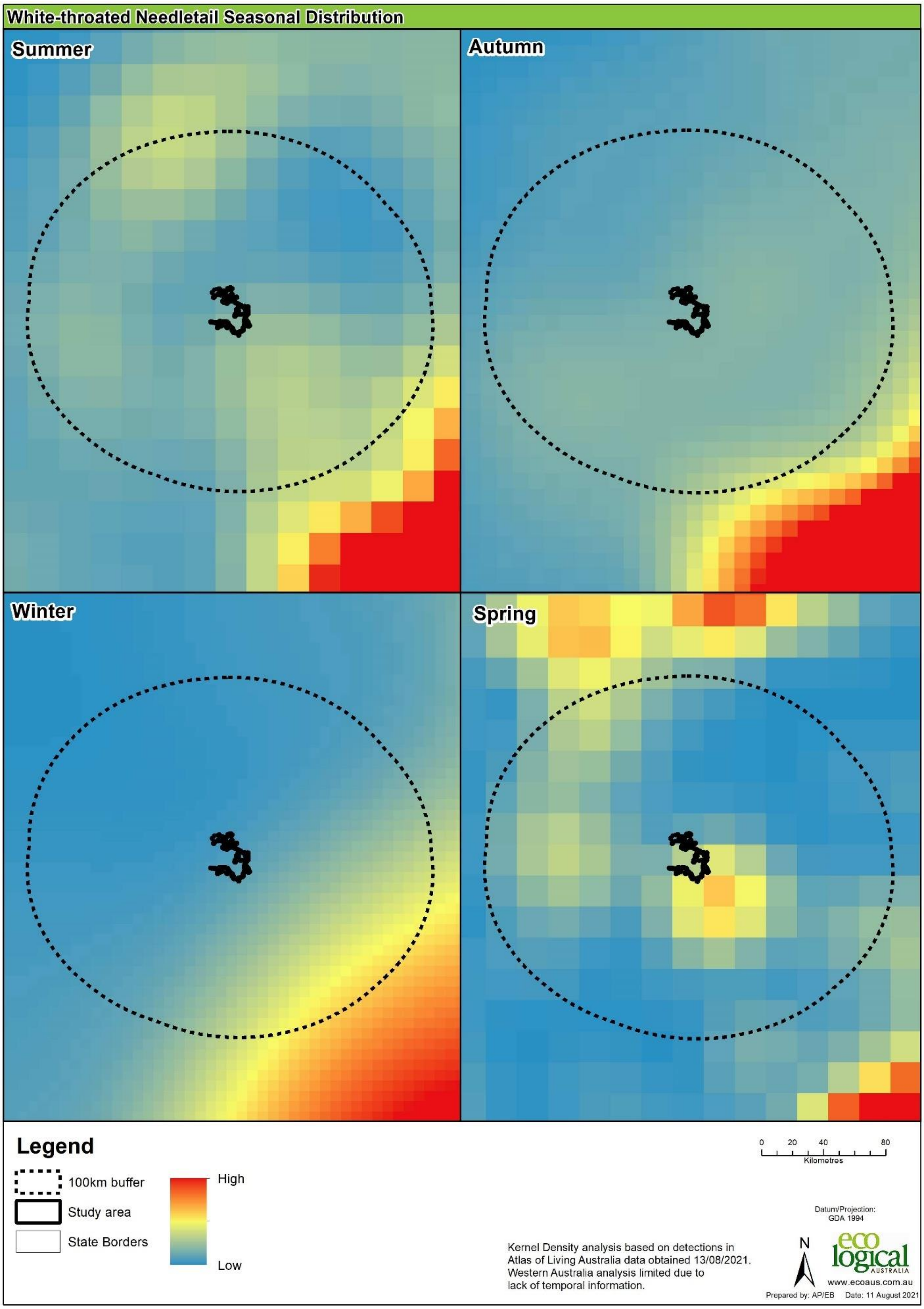


Figure 57 Seasonal distribution of White-throated Needletail within 100km of the Project

6.6. Baseline Collision Risk Assessment

A baseline collision risk assessment was undertaken for aerial fauna species identified as species of concern within the development site. A species of concern is any species that:

- Any threatened species listed under the BC Act and/or EPBC Act recorded within the study area
- Species known to be prone to collision, as evidenced by fatality at another wind farm in NSW (Section 6.3 above)
- Was recorded flying within the rotor swept area of the turbines (>80m above ridge line)

Each species was subject to a risk assessment, as adapted from Brett Lane & Associates (2017). The risk assessment was designed to identify species of moderate (or greater) risk that would require additional collision modelling and monitoring.

The risk assessment operates by identifying for each species the likelihood of a collision event (Table 42) with the consequence of the collision rate (Table 43). The likelihood and consequence assessment is then used to determine a species collision risk rating for the project (Table 44).

Table 42 Likelihood ratings for collision risk assessment

Likelihood	Description
Certain	It is very probable that the risk event could occur in any year (>95%)
Almost certain	It is more probable than not that the risk event could occur in any year (>50%)
Likely	It is equally probable that the risk event could or could not occur in any year (50%)
Unlikely	It is less probable than not that the risk event could occur in any year (<50%)
Rare	It is improbable that the risk event could occur in any year (<5%).

Table 43 Consequence ratings for collision risk assessment

Consequence	Description
Severe	Extreme loss in numbers of individuals, leading to reduction in regional or state population viability for a period of at least 10 years
High	Major loss in numbers, leading to reduction in regional or state population viability for between five and ten years
Moderate	Moderate loss in numbers of individuals, leading to a minor reduction in localised or regional population viability for between one and five years
Low	Repeated loss of small numbers of individuals but no reduction in local or regional population viability
Negligible	Occasional individuals lost but no reduction in local or regional population viability

Table 44 Collision risk rating

Likelihood			Consequence		
	Negligible	*Low*	*Moderate*	*High*	*Severe*
Certain	Negligible	Low	High	Severe	Severe
Almost certain	Negligible	Low	Moderate	High	Severe
Likely	Negligible	Low	Moderate	High	High
Unlikely	Negligible	Negligible	Low	Moderate	High
Rare	Negligible	Negligible	Negligible	Low	Low

Table 45 Bird and Bat Risk Assessment

Common name	Species Name	BC Act	EPBC Act	Reason for assessment	Likelihood	Consequence	Risk rating
Australian Hobby	*Falco longipennis*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Australian Magpie	*Gymnorhina tibicen*	Not listed	Not listed	P	Almost certain	Low	Low
Australian Owlet Nightjar	*Aegotheles cristatus*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Australian Raven	*Corvus coronoides*	Not listed	Not listed	P	Almost certain	Low	Low
Australian Wood Duck	*Chenonetta jubata*	Not listed	Not listed	P	Likely	Negligible	Negligible
Barking Owl	*Ninox connivens*	Vulnerable	Not listed	P, TS	Unlikely	Low	Negligible
Barn Owl	*Tyto alba*	Not listed	Not listed	P	Likely	Low	Low
Black Falcon	*Falco subniger*	Vulnerable	Not listed	P, TS	Unlikely	Low	Negligible
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Black-shouldered Kite	*Elanus axillaris*	Not listed	Not listed	P	Likely	Negligible	Negligible
Brown Falcon	*Falco berigora*	Not listed	Not listed	P	Likely	Negligible	Negligible
Brown Goshawk	*Accipiter fasciatus*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Common Bronzewing	*Phaps chalcoptera*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Common Starling	*Sturnus vulgaris*	Not listed	Not listed	P	Likely	Negligible	Negligible
Crested Pigeon	*Ocyphaps lophotes*	Not listed	Not listed	P	Likely	Negligible	Negligible
Crimson Rosella	*Platycercus elegans*	Not listed	Not listed	P	Likely	Negligible	Negligible
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	Vulnerable	Not listed	TS	Likely	Low	Low
Eastern Rosella	*Platycercus eximius*	Not listed	Not listed	P	Likely	Negligible	Negligible
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Galah	*Eolophus roseicapilla*	Not listed	Not listed	P	Likely	Negligible	Negligible
Grey Butcherbird	*Cracticus torquatus*	Not listed	Not listed	P	Unlikely	Negligible	Negligible

Common name	Species Name	BC Act	EPBC Act	Reason for assessment	Likelihood	Consequence	Risk rating
Grey Fantail	*Rhipidura albiscapa*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Grey Shrike-thrush	*Colluricincla harmonica*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Grey Teal	*Anas gracilis*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	Vulnerable	Not listed	TS	Unlikely	Low	Negligible
Large Bentwing-bat	*Miniopterus orianae oceanensis*	Vulnerable	Not listed	TS	Likely	Low	Low
Large-eared Pied Bat	*Chalinolobus dwyeri*	Vulnerable	Vulnerable	TS	Unlikely	Low	Negligible
Laughing Kookaburra	*Dacelo novaeguineae*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Little Lorikeet	*Glossopsitta pusilla*	Vulnerable	Not listed	TS	Unlikely	Low	Negligible
Little Raven	*Corvus mellori*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Magpie-lark	*Grallina cyanoleuca*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Masked Owl	*Tyto novaehollandiae*	Vulnerable	Not listed	P, TS	Unlikely	Low	Negligible
Megachiropteran bats	*All other non-threatened megachiropteran bats*	Not listed	Not listed	P	Unlikely	Low	Negligible
Microchiropteran bats	*All other non-threatened microchiropteran bats*	Not listed	Not listed	P	Unlikely	Low	Negligible
Musk Lorikeet	*Glossopsitta concinna*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Nankeen Kestrel	*Falco cenchroides cenchroides*	Not listed	Not listed	P	Likely	Moderate	Moderate
Noisy Miner	*Manorina melanocephala*	Not listed	Not listed	P	Likely	Negligible	Negligible
Pacific Black Duck	*Anas superciliosa*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Pied Currawong	*Strepera graculina*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Red Wattlebird	*Anthochaera carunculata*	Not listed	Not listed	P	Unlikely	Negligible	Negligible

Common name	Species Name	BC Act	EPBC Act	Reason for assessment	Likelihood	Consequence	Risk rating
Red-rumped Parrot	*Psephotus haematonotus*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Speckled Warbler	*Chthonicola sagittata*	Vulnerable	Not listed	TS	Unlikely	Low	Negligible
Spotted Harrier	*Circus assimilis*	Vulnerable	Not listed	P, TS	Unlikely	Low	Negligible
Spotted Pardalote	*Pardalotus punctatus*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Striated Pardalote	*Pardalotus striatus*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Sulphur-crested Cockatoo	*Cacatua galerita*	Not listed	Not listed	P	Likely	Low	Low
Tawny Frogmouth	*Podargus strigoides*	Not listed	Not listed	P	Unlikely	Negligible	Negligible
Varied Sittella	*Daphoenositta chrysoptera*	Vulnerable	Not listed	TS	Unlikely	Low	Negligible
Wedge-tailed Eagle	*Aquila audax*	Not listed	Not listed	P	Almost certain	Moderate	Moderate
White-throated Needletail	*Hirundapus caudacutus*	Not listed	Vulnerable/Marine/Migratory	P	Unlikely	Low	Negligible
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	Vulnerable	Not listed	P, TS	Likely	Low	Low

P = previously recorded as strike mortality, TS = threatened species

6.7. Collision strike modelling for at-risk species

The collision risk assessment identified two species of moderate concern:

- Nankeen Kestrel
- Wedge-tailed Eagle

As such collision strike modelling was undertaken for these two species, adapting the methodology described in Environmental Resources Management (2013), with the refined Band spreadsheet for wind turbine collision risk.

The collision strike assessment followed three steps:

Step 1. Assess individual species collision risk

Step 2 Assess bird activity for at-risk species

Step 3 Incorporate steps 1 and 2 to estimate number of bird collisions

6.7.1. Step 1. Assess individual species collision risk

Collision risk for each of the at-risk species identified above was undertaken using the refined Band model (Band, 2000 & Band 2007) as presented in Christie & Urquhart (2015). This model estimates the collision risk based on the blade rotation and bird speed/size, based on a range of up-wind and down-wind trajectories. The collision risk assessment uses parameter inputs for the turbine specifications, as well as each bird species dimension and behaviour. Model parameters for each species are shown in

Table 46 Band Collision Risk Model parameters – Nankeen Kestrel & Wedge-tailed Eagle

Model parameter	Value	
Turbine		
Radius (m)	90	
Blades	3	
Pitch (degrees)	24	
Maximum chord width (m)	2	
Period (s)	4.29	
	Nankeen Kestrel	**Wedge-tailed Eagle**
Length (m)	0.3	1.06
Wingspan (m)	0.7	2.32
Speed relative to air (m/s)	15	15
Flapping (0) or Gliding (1)	1	1

For each species, the strike risk was modelled at wind speeds of 0, 5, and 10 m/s, to incorporate variability in wind speeds likely to be experienced within the Project area (Table 47). The mean risk across all wind speeds was then used for the collision assessment. Based on this calculation the *Band collision risk* for Nankeen Kestrel is 5.09% and Wedge-tailed Eagle is 10.92%.

Table 47 Band Collision Risk Model – Wind speed collision risk

Radius	Chord	Nankeen Kestrel			Wedge-tailed Eagle		
		Risk (Wind speed 0 m/s)	Risk (Wind speed 5 m/s)	Risk (Wind speed 10 m/s)	Risk (Wind speed 0 m/s)	Risk (Wind speed 5 m/s)	Risk (Wind speed 10 m/s)
0.05	0.73	0.0008	0.0008	0.0009	0.0014	0.0014	0.0014
0.1	0.79	0.0007	0.0008	0.0008	0.0013	0.0014	0.0014
0.15	0.88	0.0006	0.0007	0.0008	0.0013	0.0013	0.0014
0.2	0.96	0.0005	0.0007	0.0008	0.0013	0.0013	0.0014
0.25	1	0.0004	0.0006	0.0007	0.0013	0.0013	0.0013
0.3	0.98	0.0006	0.0004	0.0006	0.0016	0.0012	0.0013
0.35	0.92	0.0008	0.0004	0.0005	0.0021	0.0013	0.0012
0.4	0.85	0.0010	0.0006	0.0004	0.0024	0.0016	0.0012
0.45	0.8	0.0012	0.0007	0.0004	0.0028	0.0019	0.0014
0.5	0.75	0.0014	0.0009	0.0005	0.0032	0.0022	0.0016
0.55	0.7	0.0016	0.0010	0.0007	0.0035	0.0025	0.0018
0.6	0.64	0.0017	0.0011	0.0008	0.0038	0.0027	0.0020
0.65	0.58	0.0018	0.0012	0.0008	0.0041	0.0029	0.0022
0.7	0.52	0.0019	0.0013	0.0009	0.0043	0.0031	0.0024
0.75	0.47	0.0019	0.0013	0.0010	0.0046	0.0033	0.0026
0.8	0.41	0.0020	0.0014	0.0010	0.0048	0.0035	0.0027
0.85	0.37	0.0020	0.0014	0.0011	0.0050	0.0037	0.0029
0.9	0.3	0.0020	0.0014	0.0011	0.0052	0.0038	0.0030
0.95	0.24	0.0020	0.0014	0.0011	0.0053	0.0039	0.0031
1	0	0.0014	0.0010	0.0008	0.0049	0.0037	0.0030

Direction	Angle	Nankeen Kestrel			Wedge-tailed Eagle		
		Risk (0 m/s)	Risk (5 m/s)	Risk (10 m/s)	Risk (0 m/s)	Risk (5 m/s)	Risk (10 m/s)
Upwind	0	4.76%	6.48%	11.64%	8.39%	11.84%	22.29%
	5	4.76%	6.47%	11.62%	8.39%	11.83%	22.27%
	10	4.74%	6.43%	11.53%	8.36%	11.77%	22.11%
	15	4.72%	6.36%	11.38%	8.31%	11.65%	21.83%
	20	4.73%	6.27%	11.16%	8.36%	11.48%	21.43%
	25	4.79%	6.17%	10.89%	8.60%	11.27%	20.91%
	30	4.90%	6.07%	10.55%	9.01%	11.08%	20.28%
	35	5.05%	6.03%	10.17%	9.62%	11.09%	19.55%
	40	5.20%	6.04%	9.74%	10.28%	11.30%	18.73%
	45	5.33%	6.09%	9.27%	10.91%	11.72%	17.82%
	50	5.45%	6.14%	8.76%	11.51%	12.22%	16.86%
	55	5.55%	6.17%	8.27%	12.05%	12.69%	15.87%
	60	5.62%	6.17%	7.89%	12.54%	13.10%	15.16%
	65	5.67%	6.15%	7.65%	12.98%	13.47%	15.03%
	70	5.71%	6.12%	7.42%	13.39%	13.81%	15.15%
	75	5.73%	6.07%	7.19%	13.80%	14.15%	15.31%
	80	5.77%	6.04%	6.99%	14.21%	14.48%	15.39%
	85	5.89%	6.08%	6.80%	10.66%	10.67%	10.70%
	90	0.87%	0.87%	0.87%	2.01%	2.01%	2.01%
Downwind	95	5.70%	5.76%	6.21%	10.65%	10.66%	10.68%
	100	5.35%	5.34%	5.66%	13.84%	13.84%	14.19%
	105	5.10%	5.03%	5.23%	13.17%	13.10%	13.29%
	110	4.88%	4.76%	4.86%	12.55%	12.42%	12.52%

Direction	Angle	Nankeen Kestrel			Wedge-tailed Eagle		
		Risk (0 m/s)	Risk (5 m/s)	Risk (10 m/s)	Risk (0 m/s)	Risk (5 m/s)	Risk (10 m/s)
	115	4.66%	4.49%	4.51%	11.95%	11.77%	11.78%
	120	4.43%	4.22%	4.17%	11.33%	11.11%	11.05%
	125	4.20%	3.95%	3.86%	10.68%	10.42%	10.31%
	130	3.96%	3.67%	3.55%	9.99%	9.70%	9.56%
	135	3.71%	3.40%	3.24%	9.27%	8.95%	8.77%
	140	3.45%	3.12%	2.95%	8.52%	8.16%	7.97%
	145	3.20%	2.84%	2.66%	7.75%	7.36%	7.15%
	150	2.95%	2.57%	2.39%	7.06%	6.55%	6.33%
	155	2.78%	2.31%	2.12%	6.57%	5.79%	5.51%
	160	2.65%	2.12%	1.88%	6.27%	5.24%	4.79%
	165	2.59%	1.98%	1.71%	6.18%	4.87%	4.28%
	170	2.58%	1.90%	1.60%	6.19%	4.69%	3.96%
	175	2.58%	1.89%	1.54%	6.20%	4.67%	3.83%
	180	2.57%	1.88%	1.53%	6.20%	4.66%	3.82%
	Average	**4.39%**	**4.69%**	**6.20%**	**9.67%**	**10.15%**	**12.93%**

6.7.2. Step 2 Assess bird activity for at-risk species

The total risk area is measured off the distance of internal electrical reticulation (150.4km) then multiplied by 250m (top of blade height). The Proportional risk of this area is the proportional RSA:

$$Proportional\ risk = (\pi \times r^2 \times N_{turbines})/\text{Total risk area}$$

Based on a top of blade height of 250m and internal wind farm electrical reticulation distance of 150.4km the total risk area = 37.6km^2. Based on 148 turbines with 90m blades the turbine risk area = 3.766 km^2; and therefore the *Proportional risk window* is 0.10.

Once individual species collision risk had been established, the frequency of encounter was modelled based on the findings of field surveys (Section 4.2.7). The number of birds at risk was calculated by reviewing the total number of individuals observed within the RSA (>80m above observer) divided by the number of surveys undertaken in each survey period – *Birds at risk per survey*.

The number of *Birds at risk per BUS survey (per hour)* is the hourly rate of occurrence of each species, as calculated by a 20 minute survey times 3. The *Birds at risk per day* was calculated by multiplying the *Birds at risk per BUS survey (per hour)* by 10 hours of activity per day for both Nankeen kestrel and Wed-tailed Eagle. The number of *Birds at risk per month* was calculated by multiplying the *Birds at risk per day* by 30.4.

The number of Birds passing through the rotor area was calculated by *Birds at risk per month* by the *Proportional risk window*.

6.7.3. Step 3 Incorporate steps 1 and 2 to estimate number of bird collisions

The final step was to incorporate all data to calculate an approximate number of birds at risk per month. Values were calculated using a separate model inputs for each survey season, to detect whether any period would have a greater likelihood of impacts to avifauna species.

For each survey period the number of collisions per month is estimated by multiplying the *Birds at risk per month* by the *Band collision risk*.

Based on the calculation of collision frequency, between 0.002 and 0.173 Nankeen Kestrels would be struck each year based on the 0 and 99% avoidance scenario's.

Based on the calculation of collision frequency, between 0.029 and 2.89 Wedge-tailed Eagles would be struck each year based on the 0 and 99% avoidance scenario's.

Species	Band collision risk	Season	Observations (surveys)	Number of surveys	Observations in RSA	Birds at risk per BUS survey	Birds at risk per BUS survey (per hour)	Birds at risk per day	Birds at risk per month	Total risk area (km2)	Turbine risk area (km2)	Proportional risk window	Birds passing through rotor area	No avoidance	95% avoidance	99% avoidance
Nankeen Kestrel	0.0509	Summer/Autumn	27 (17)	158	0	0.000	0.000	0.000	0.000	37.6	3.766	10.02%	0.00	0.0000	0.0000	0.0000
	0.0509	Winter	67 (40)	176	1	0.006	0.017	0.170	5.182	37.6	3.766	10.02%	0.52	0.0264	0.0013	0.0003
	0.0509	Spring	28 (19)	148	1	0.007	0.020	0.203	6.162	37.6	3.766	10.02%	0.62	0.0314	0.0016	0.0003
Wedge-tailed Eagle	0.1092	Summer/Autumn	21 (12)	158	2	0.013	0.038	0.380	11.544	37.6	3.766	10.02%	1.16	0.1263	0.0063	0.0013
	0.1092	Winter	18 (13)	176	9	0.051	0.153	1.534	46.636	37.6	3.766	10.02%	4.67	0.5101	0.0255	0.0051
	0.1092	Spring	14 (10)	148	3	0.020	0.061	0.608	18.486	37.6	3.766	10.02%	1.85	0.2022	0.0101	0.0020

7. Avoiding and Minimising Impacts on Biodiversity Values

Following preliminary scoping studies, the development footprint has been subject to a number of revisions in collaboration between ELA and UPC, to avoid and minimise impacts on biodiversity.

Avoidance of high value vegetation such as CEECs was considered a priority, with areas of habitat, such as hollow bearing trees also heavily influencing the placement and design of infrastructure and access tracks. The following sections outline the strategies employed to reduce the overall footprint of the Project, through impact avoidance and minimisation techniques.

All areas of aquatic habitat have been avoided through designing and appropriate operational footprint. All crossings of key fish habitat will be spanned by transmission lines, with no ground disturbance within the riparian corridor.

7.1. Avoiding impacts

7.1.1. Locating a project to avoid and minimise impacts on vegetation and habitat

The development has been located in a way which avoids and minimises impacts as outlined in Table 48.

Table 48: Locating a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
locating the project in areas where there are no biodiversity values	Areas of cleared land and low condition vegetation have been utilised wherever possible.	The placement of the development site has centred around the areas of lowest biodiversity value within the development boundary (cleared paddock – Category 1 Land), avoiding larger woodland areas where possible.
locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition	Impacts to native vegetation have generally been restricted to isolated paddock trees or small, isolated patches of trees. Larger areas of more intact native vegetation have been avoided wherever possible.	The placement of the development site has centred around the area of lowest biodiversity value (cleared paddock – Category 1 Land). The transmission line south of the Girragulang Road cluster impacts on a large patch of vegetation, but has been located to take the shortest pathway possible from the wind farm to the connection point.
locating the project in areas that avoid habitat for species and vegetation in high threat categories (e.g. an EEC or CEEC), indicated by the biodiversity risk weighting for a species	The development site has not been able to completely avoid impacts to areas providing species habitat and EEC vegetation.	The placement of the development site has centred around the area of lowest biodiversity value (cleared paddock – Category 1 Land) and aimed to minimise impacts to CEEC and species habitat by avoiding higher quality remaining vegetation within and surrounding the development site.
locating the project such that connectivity enabling movement of	The development footprint has been centred around the area of least	The major connectivity features within the landscape are within vegetated

Approach	How addressed	Justification
species and genetic material between areas of adjacent or nearby habitat is maintained	biodiversity impact with the aim to conserve connectivity values surrounding the development site.	gullies within each of the wind farm clusters. Connectivity will be retained in these areas around the periphery of the proposal.

Regarding measures to avoid and minimise impacts during site selection and planning phase, the suitability of the development site has been selected with consideration given to limiting the amount of intact vegetation to be removed. The original investigations for the Project included a broader area than the current development site, and multiple iterations of the development site boundary have resulted in a development site that largely avoids intact native vegetation, with majority of the proposed development site being located on Category 1 Land with little to no biodiversity value. Table 49 below identifies the key changes in development design between the initial proposal (as presented in the scoping study in 2019) and the final proposal.

Table 49 Project development design changes

Development feature	Initial proposal (Scoping Study 2019)	Final proposal	Result
Wind turbine locations	175 wind turbines proposed across three wind farm clusters.	Reduced to 148 turbines.	15% reduction in wind turbines. Turbines in high-risk locations have been removed from the development. Final turbine layout maximises category 1 land and low condition native grassland.
Internal access tracks and electrical reticulation	Not included in original design	Internal access follows existing cleared farm tracks where possible.	Majority of all other tracks to be located in category 1 land and low condition native grassland. Electrical reticulation to be trenched along access tracks to consolidate area of ground disturbance.
Internal transmission lines (between wind farm clusters)	Connector transmission line between Girragulang Road and Mount Hope not included in original design. Connector transmission lines proposed directly between Leadville and Girragulang Road clusters through approximately 7.2km of forested vegetation.	Connector transmission line between Girragulang Road and Mount Hope crosses valley floor that is predominately cleared for cropping. Connector transmission lines proposed directly between Leadville and Girragulang Road abandoned, in preference for direct connection to REZ	Areas of better-quality vegetation have generally been avoided by following cleared areas.

Development feature	Initial proposal (Scoping Study 2019)	Final proposal	Result
		Transmission line from Leadville.	
External transmission lines (wind farm to REZ Transmission line)	Approximately 75km of 500kv transmission line proposed from Girragulang Road cluster to Mount Piper to Bayswater Transmission line south of Merriwa, impacting CEEC and Regent Honeyeater important areas.	Approximately 15km of up to 500kv transmission line between Girragulang Road/Leadville clusters, to connect to the Central West Renewable Energy Zone Transmission line	Avoidance of significant areas of native vegetation. Significant reduction in area of CEEC impacted. Avoidance of Regent Honeyeater important areas.
Substations	Not included in original design	Located within category 1 land with little to no biodiversity value	Low impact and preservation of better-quality areas
Component haulage and construction access	Access to Mount Hope cluster via Neilrex Road and Mount Hope Road, resulting in potential major road upgrades through moderate condition native vegetation	Access to Mount Hope now follows existing farm tracks off Black Stump Way, no upgrades to public roadways required.	Low impact and preservation of better-quality areas
Ancillary infrastructure (site offices, laydown areas, etc)	Not included in original design	Located within category 1 land with little to no biodiversity value	Low impact and preservation of better-quality areas
Workers camp	Not included in original design	Located within category 1 land with little to no biodiversity value	Low impact and preservation of better qualitybetter-quality areas

Based on the biodiversity values present and the design changes proposed by UPC, the final site location analysis is provided below:

Table 50 Project location analysis

Location consideration	Project response
Alternative modes or technologies that would avoid or minimise impacts on biodiversity values	Wind energy generation has a significantly smaller disturbance footprint compared to a similar energy output from solar energy. Coal and gas energy generation would have a larger environmental footprint as they would require both a power station as well as large-scale ancillary impacts (such as mines or gas wells).
Alternative routes that would avoid or minimise impacts on biodiversity values	A number of alternative transmission line routes have been assessed to inform the final corridor, ensuring it follows existing cleared areas where possible.
Alternative locations that would avoid or minimise impacts on biodiversity values	No other locations for the project have been considered, however two previously identified clusters of turbines have been removed, resulting in reduced overall biodiversity impacts.
Alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values.	The location of development within the property has been selected based on the lowest biodiversity impact.

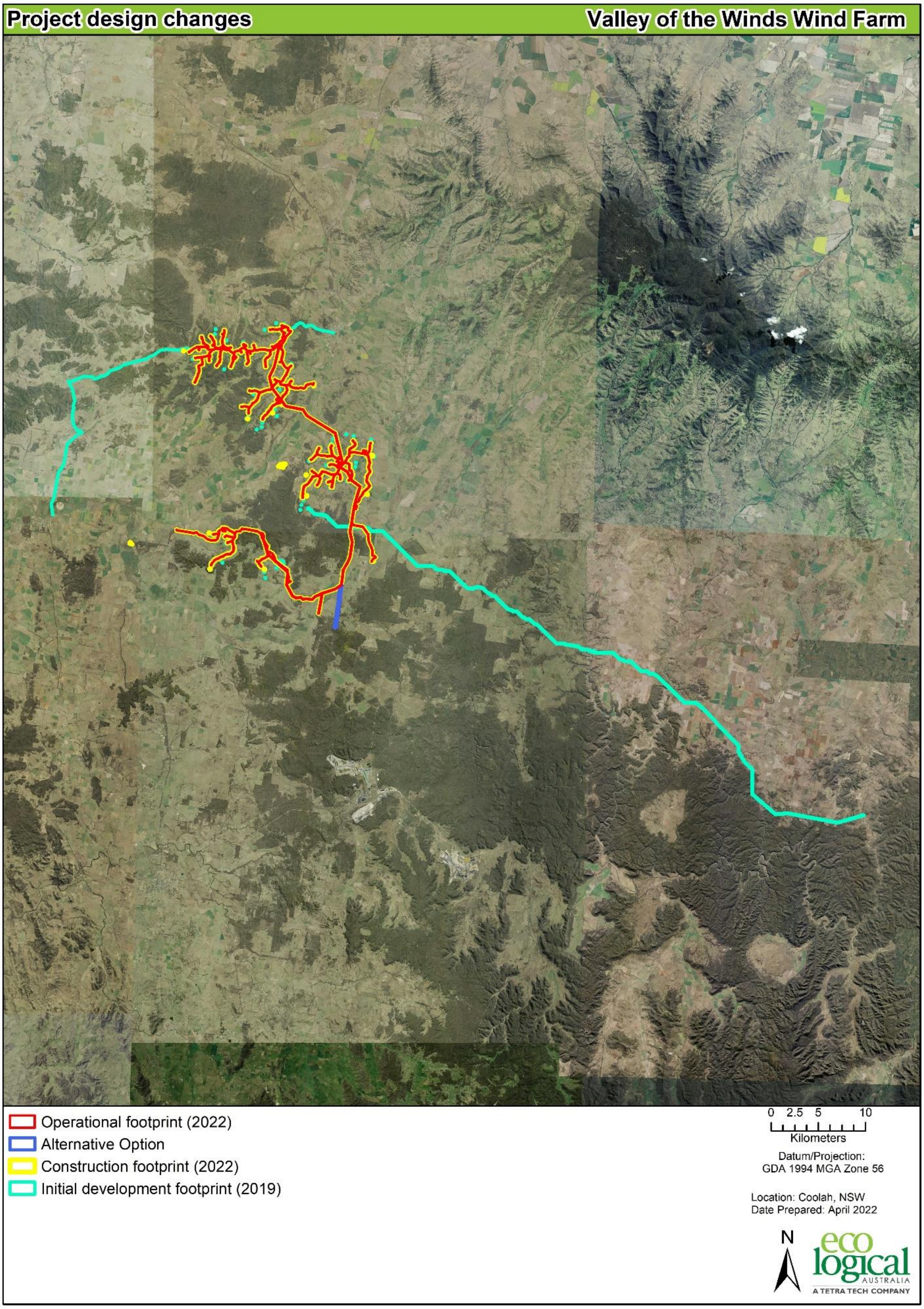


Figure 58 Project design changes

7.1.2. Prescribed impacts

The following analysis was undertaken to demonstrate how the project has avoided prescribed impacts where possible.

Table 51 Avoidance of prescribed impacts through project location

Prescribed impact consideration	Project response
Locate surface works to avoid direct impacts on the habitat features identified in Chapter 6 (prescribed impacts)	All development has been located to avoid all direct impacts to caves and cliffs.
Locate subsurface works, in both the horizontal and vertical planes, to avoid and minimise operations beneath the habitat features identified in Chapter 6 (of the BAM). For example, locating longwall panels away from geological features of significance, groundwater-dependent plant communities and their supporting aquifers	Minimal subsurface activities are proposed and will not affect any geological features of significance, groundwater-dependent plant communities and their supporting aquifers
Locate the proposal to avoid severing or interfering with corridors connecting different areas of habitat and migratory flight paths, to important habitat or local movement pathways	Field assessment and did not identify any migratory flight paths (Section 6.5).
Optimise the proposal layout to minimise interactions with threatened entities; for example, design a wind farm that has: • 100 m turbine-free buffers around features that attract and support aerial species, such as forest edges, riparian corridors, wetlands, ridgetops and gullies • turbine-free corridors in zones of regular movement for species of concern, to avoid a barrier effect	All forest edges, riparian corridors, wetlands and gullies have been avoided. Turbines have been positioned along ridgetops as these are the areas which contain the least biodiversity values. Throughout the study area, there are numerous turbine-free zones to allow for movement of species of concern. There is unlikely to be a barrier effect from the proposed layout.
Locate the proposal to avoid impacts on water bodies or hydrological processes	No impacts to any water bodies or hydrological processes are proposed.

In order to minimise prescribed impacts, the following elements have been included into the project design (Table 52).

Table 52 Design elements to minimise prescribed impacts

Design element	Project response
Engineering solutions, such as proven techniques to: • minimise fracturing of bedrock underlying features of geological significance, or groundwater-dependent communities and their supporting aquifers • restore connectivity and movement corridors	The project will not result in any impacts to bedrock underlying features of geological significance. The project is unlikely to impact any connectivity or movement corridors.
Design elements that minimise interactions with threatened entities, such as: • designing turbines to dissuade perching and minimise the diameter of the rotor swept area	Turbines will not have any additional external features that would persuade perching, other than those items required for safe operation of the turbine. The large rotor swept area of the turbine is a mandatory requirement of the project. A smaller RSA would necessitate more turbines to be built and

Design element	Project response
• designing fencing to prevent animal entry to transport corridors • providing vegetated buffers rehabilitated with native species	would allow turbines to be build closer together further increasing any barrier effect of the proposal. This project does not propose to provide any additional vegetated buffers other than those that already exist within the study area.
Maintaining environmental processes that are critical to the formation and persistence of habitat features not associated with native vegetation	The project will not change any environmental processes that are critical to persistence of habitat features (i.e. caves and cliffs).
Maintaining hydrological processes that sustain threatened entities	Hydrological processes will be unaffected by the project.
Controlling the quality of water released from the site, to avoid or minimise downstream impacts on threatened entities.	Any runoff captured within the construction and operational footprint will be released in accordance with construction site and erosion standards.

8. Assessment of Impacts

The project will have several discrete impact types as part of the development of an operational wind farm including ground disturbance and vegetation removal for the development of roads, internal reticulation, substations, turbine footings and pads, site offices and transmission lines. There may also be a requirement to clear native vegetation within a construction footprint around the wind turbines, to allow for sufficient space to set down componentry and temporary laydown areas.

8.1. Direct impacts

The direct impacts of the development on:

- native vegetation and threatened ecological communities are outlined in Table 53
- threatened species and threatened species habitat is outlined in Table 54
- prescribed biodiversity impacts is outlined in Section 6.4.

Direct impacts including the final project footprint (construction and operation) are shown on Figure 2.

Table 53: Direct impacts to native vegetation

PCT ID	PCT Name	BC Act listing	EPBC Act listing	Study area (ha)	Direct impact (ha)
01 42 M	River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Not listed	Not listed	25.59	0.66
02 84 M	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Not listed	Not listed	13.86	1.14
03 272 M	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	EEC	EEC (in part)	10.70	0.31
04 272 L	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	EEC	EEC (in part)	140.57	12.37
05 281 G	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	CEEC	CEEC (in part)	85.96	4.27
06 281 M	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	CEEC	CEEC (in part)	442.91	28.43
07 281 L	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	CEEC	Not listed	305.23	20.81
08 461 B	Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	Not listed	Not listed	18.08	0
09 461 M	Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	Not listed	Not listed	21.39	0
10 478 G	Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion	Not listed	Not listed	8.01	0.11
11 479 B	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Not listed	Not listed	1,428.93	35.73

PCT ID	PCT Name	BC Act listing	EPBC Act listing	Study area (ha)	Direct impact (ha)
12 479 M	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Not listed	Not listed	1,114.21	7.39
13 479 Reg	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Not listed	Not listed	56.75	8.57
14 483 G	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	CEEC	CEEC	95.29	1.67
15 483 M	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	CEEC	CEEC (in part)	2,991.97	200.01
16 483 L	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	CEEC	Not listed	2,171.39	172.45
17 616 M	Grey Myrtle - Rusty Fig dry rainforest in sandstone gorges of the upper Hunter Valley, mainly Sydney Basin Bioregion	Not listed	Not listed	40.03	0
	Total native vegetation			8,924.79	493.92
Exotic/cleared land		Not listed	Not listed	7,723.71	846.85
Total				**16,648.50**	**1,340.78**

Table 54: Direct impacts on threatened species and threatened species habitat

Species	Common Name	Direct impact number of individuals / habitat (ha)	BC Act listing status	EPBC Act Listing status
Dichanthium setosum	Bluegrass	0 – species not impacted	Vulnerable	Vulnerable
Chalinolobus dwyeri	Large-eared Pied Bat	180.49 ha of foraging habitat 0.0 ha of breeding habitats	Vulnerable	Vulnerable
Miniopterus orianae	Large Bentwing-bat	0.0 ha of breeding habitats	Vulnerable	Not listed
Tyto novahollandiae	Masked Owl	0.0 ha of breeding habitats	Vulnerable	Not listed
Ninox connivens	Barking Owl	12.16 ha of potential breeding habitat	Vulnerable	Not listed
Petaurus norfolcensis	Squirrel Glider	76.80 ha of foraging habitat	Vulnerable	Not listed

8.2. Change in vegetation integrity

The change in vegetation integrity as a result of the development is outlined in Table 55 to Table 57.

Table 55 Change in vegetation integrity score – Brigalow Belt South Bioregion

PCT ID	PCT Name	BC Act listing	EPBC Act listing	VI Score Before	VI Score After
01 42 M	River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Not listed	Not listed	n/a	n/a
02 84 M	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Not listed	Not listed	25.5	0
03 272 M	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	EEC	EEC (in part)	58.5	0
04 272 L	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	EEC	EEC (in part)	25	0
05 281 G	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	CEEC	CEEC (in part)	76.6	0
06 281 M	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	CEEC	CEEC (in part)	80.3	0
07 281 L	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	CEEC	Not listed	14.6	0
08 461 B	Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	Not listed	Not listed	n/a	n/a
09 461 M	Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	Not listed	Not listed	n/a	n/a
10 478 G	Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion	Not listed	Not listed	n/a	n/a
11 479 B	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Not listed	Not listed	60.4	0

PCT ID	PCT Name	BC Act listing	EPBC Act listing	VI Score Before	VI Score After
12 479 M	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Not listed	Not listed	67.6	0
13 479 Reg	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Not listed	Not listed	n/a	n/a
14 483 G	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	CEEC	CEEC	70	0
15 483 M	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	CEEC	CEEC (in part)	32	0
16 483 L	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	CEEC	Not listed	20.3	0
17 616 M	Grey Myrtle - Rusty Fig dry rainforest in sandstone gorges of the upper Hunter Valley, mainly Sydney Basin Bioregion	Not listed	Not listed	n/a	n/a

Table 56 Change in vegetation integrity score – NSW South Western Slopes

PCT ID	PCT Name	BC Act listing	EPBC Act listing	VI Score Before	VI Score After
01 42 M	River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Not listed	Not listed	n/a	n/a
02 84 M	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Not listed	Not listed	n/a	n/a
03 272 M	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	EEC	EEC (in part)	n/a	n/a
04 272 L	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	EEC	EEC (in part)	n/a	n/a
05 281 G	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	CEEC	CEEC	88.3	0
06 281 M	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	CEEC	CEEC	78.1	0
07 281 L	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	CEEC	Not listed	n/a	n/a
08 461 B	Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	Not listed	Not listed	n/a	n/a
09 461 M	Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	Not listed	Not listed	n/a	n/a
10 478 G	Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion	Not listed	Not listed	66	0
11 479 B	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Not listed	Not listed	59.1	0

PCT ID	PCT Name	BC Act listing	EPBC Act listing	VI Score Before	VI Score After
12 479 M	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Not listed	Not listed	76.7	0
13 479 Reg	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Not listed	Not listed	31.4	0
14 483 G	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	CEEC	CEEC	n/a	n/a
15 483 M	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	CEEC	CEEC (in part)	30.3	0
16 483 L	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	CEEC	Not listed	21.9	0
17 616 M	Grey Myrtle - Rusty Fig dry rainforest in sandstone gorges of the upper Hunter Valley, mainly Sydney Basin Bioregion	Not listed	Not listed	n/a	n/a

Table 57 Change in vegetation integrity score – Sydney Basin

PCT ID	PCT Name	BC Act listing	EPBC Act listing	VI Score Before	VI Score After
01 42 M	River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Not listed	Not listed	100*	0
02 84 M	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Not listed	Not listed	n/a	n/a
03 272 M	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	EEC	EEC (in part)	53.9	0
04 272 L	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	EEC	EEC (in part)	21.9	0
05 281 G	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	CEEC	CEEC	n/a	0
06 281 M	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	CEEC	CEEC	71.1	0
07 281 L	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	CEEC	Not listed	6.6	0
08 461 B	Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	Not listed	Not listed	n/a	n/a
09 461 M	Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	Not listed	Not listed	n/a	n/a
10 478 G	Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion	Not listed	Not listed	n/a	n/a
11 479 B	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Not listed	Not listed	47.3	0

PCT ID	PCT Name	BC Act listing	EPBC Act listing	VI Score Before	VI Score After
12 479 M	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Not listed	Not listed	n/a	n/a
13 479 Reg	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Not listed	Not listed	33.3	0
14 483 G	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	CEEC	CEEC	n/a	n/a
15 483 M	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	CEEC	CEEC (in part)	25.3	0
16 483 L	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	CEEC	Not listed	17.6	0
17 616 M	Grey Myrtle - Rusty Fig dry rainforest in sandstone gorges of the upper Hunter Valley, mainly Sydney Basin Bioregion	Not listed	Not listed	n/a	n/a

8.3. Indirect impacts

The indirect impacts of the development are outlined in Table 58.

Table 58: Indirect impacts

Indirect impact	Nature	Extent	Frequency	Biodiversity affected	Duration/ Timing	Consequence
Inadvertent impacts on adjacent habitat or vegetation	Trampling grass and groundcover by site vehicles	Limited to within the construction footprint	Daily during construction phase	Native vegetation	Daily, during the construction phase.	Minimal impact to native vegetation during construction phase. All impacts within the construction footprint have been included within vegetation integrity loss.
Reduced viability of adjacent habitat due to edge effects	No impacts likely as the development is situated in an existing agricultural landscape. Potential edge effects are likely as a result of the transmission lines or accessways.	Limited to within the construction footprint of the transmission lines	Daily during construction and operational phase of the project	Native vegetation, threatened species habitats	Daily, for the life of the project.	Minimal edge effects along transmission line routes through existing native vegetation.
Reduced viability of adjacent habitat due to noise, dust or light spill	Noise and dust created from machinery (no night works proposed therefore no light spill)	Noise and dust likely to carry further than 10 m from Development boundary	Daily, during construction works Nightly during construction, operation of development	Fauna species and their habitats	Construction noise expected to only persist for the construction period. Operational noise to occur daily, for the life of the project	Short term impacts. No measurable impact likely.
transport of weeds and pathogens from the site to adjacent vegetation	Spread of weed seed or pathogens becoming established within study area.	Potential for spread into adjacent habitat	Daily, during construction works	Native vegetation	Sporadic throughout construction period	Weed and pathogens to be managed under a Biodiversity Management Plan during construction phase. No impacts expected following commissioning of the operational phase of the project.

Indirect impact	Nature	Extent	Frequency	Biodiversity affected	Duration/ Timing	Consequence
Increased risk of starvation or exposure and loss of shade or shelter	No increase of starvation or exposure or loss of shade and shelter expected.	n/a	n/a	n/a	n/a	n/a
loss of breeding habitat	No loss of breeding habitat expected due to indirect impacts.	n/a	n/a	n/a	n/a	n/a
trampling of threatened flora species	No trampling of threatened flora species expected.	n/a	n/a	n/a	n/a	n/a
Inhibition of nitrogen fixation and increased soil salinity	No inhibition of nitrogen fixation and increased soil salinity expected.	n/a	n/a	n/a	n/a	n/a
Fertiliser drift	No fertiliser drift expected.	n/a	n/a	n/a	n/a	n/a
rubbish dumping	Minor littering. Inappropriate construction waste disposal.	Potential for rubbish to spread via wind into adjacent vegetation	Potential to occur at any time throughout construction or operational phases	Adjacent native vegetation and habitats.	During working hours for construction	Minor, short term impacts.
wood collection	There is very little wood available for collection within the project.	Minor (but unlikely) collection possible by construction crew staff.	Potential to occur at any time throughout construction or operational phases	Adjacent native vegetation and habitats.	During working hours for construction	Minor, short term impacts.
removal and disturbance of rocks including bush rock	There is very little bush rock available for removal or disturbance within the project.	Minor (but unlikely) collection possible by construction crew staff.	Potential to occur at any time throughout construction or operational phases	Adjacent native vegetation and habitats.	During working hours for construction	Minor, short term impacts.
increase in predators	There is already an extensive population of feral Pigs, Foxes, and Cats, within the study area.	Unlikely to increase the risk of any pest vertebrates.	n/a	n/a	n/a	n/a

Indirect impact	Nature	Extent	Frequency	Biodiversity affected	Duration/ Timing	Consequence
increase in pest animal populations	There is already an extensive population of feral Pigs, Foxes, Cats, Rabbits, Hares, Rats, and Mice within the study area.	Unlikely to increase the risk of any pest vertebrates.	n/a	n/a	n/a	n/a
changed fire regimes	The project will not change the current fire regime in any way.	n/a	n/a	n/a	n/a	n/a
disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	No disturbance to any specialist breeding habitats are likely.	n/a	n/a	n/a	n/a	n/a
sedimentation and contaminated and/or nutrient rich run-off	No increase in sediment or contaminated run off is expected. All construction works to be managed under an Erosion and Sediment plan.	n/a	n/a	n/a	n/a	n/a

8.4. Prescribed biodiversity impacts

The development site has the prescribed biodiversity impacts as outlined in Table 59.

Table 59: Direct impacts on prescribed biodiversity impacts

Prescribed biodiversity impact	Description (Nature, extent and frequency)	Consequences	Justification	Additional information
Karst, caves, crevices, cliffs, rocks and other geological features of significance	No impacts	n/a	n/a	n/a
Human made structures or non-native vegetation	No impacts	n/a	n/a	n/a
Habitat connectivity	Disruption of connectivity due to transmission line route	Clearing of a 70m wide easement through burned bushland	Mnimum width required for easement	EIS
Water bodies, water quality and hydrological processes	No direct impacts to ground. All crossings will be spanned by transmission lines.	n/a	n/a	n/a
Wind turbine strikes on protected animals	Bird and bat strike likely.	Minor ongoing impacts to common species.	Detailed bird and bat strike assessment undertaken as part of the preparation of this BDAR.	Section 8.5
vehicle strikes	No impacts	n/a	n/a	n/a

8.5. Discussion of Wind Turbine Strike on Protected Animals

An assessment has been undertaken to determine the impacts of wind turbine strike on protected animals as required by Section 8.3.5 of the BAM.

Table 60 Additional information for wind farm developments

Prescribed impact consideration	Project justification/response
Predict the impact on species living in, or likely to fly over, the proposed development site, including bat or bird strike and barotrauma	Collision risk assessment has been undertaken as part of this BDAR and is described in detail in Section 6.6.
Predict the rate and timing of impact per turbine per year for species likely to be affected	The rate and timing of collisions with turbines has been modelled for moderate and high risk species as described in Section 6.7.
Predict the consequences of impacts for the persistence of populations	The rate, timing, and consequence on protected species has been undertaken and is described in detail in Section 6.6.
Predict the cumulative impacts of the proposed development alongside existing wind farms, on species mortality, movement patterns and use of adjacent habitat	The proposed wind farm is not collocated with any other wind farms locally. The nearest wind farm is the Liverpool Range Wind farm which is proposed for 26 km north-east of the project.
Predict the likelihood and nature of impacts on aerial species living in, or likely to fly over, the proposed development site, including barriers to migratory pathways, and breeding, feeding and resting resources	The project is unlikely to have any significant impact on aerial species living within or flying over the development site as assessed in Section 6.7.
Predict the impact of avoidance behaviour for migratory species relative to migration distances, and the availability of suitable habitat for breeding, feeding and resting over the migration route	Field studies and database review identified that the project is located at the periphery of the activity range for migratory species, which was also evidenced by the limited number of records identified. No breeding, feeding, or resting areas were identified for migratory species.
Justify predictions with reference to data, collision risk modelling (if available), relevant literature or other published sources including any publications by the Department	The rate and timing of collisions with turbines has been modelled for moderate and high risk species as described in Section 6.7.
Map the disturbance zone around wind turbines, and the significant landscape and habitat features within that zone, for species likely to be affected, e.g. hollow bearing trees and important habitat for migratory species.	Disturbance zones around wind turbines have been incorporated into the construction areas footprint which allows for an area of additional impact around each turbine. No hollow-bearing trees or other significant habitat features outside of this zone are likely to be impacted.

8.6. Mitigating and managing direct and indirect impacts

Measures proposed to mitigate and manage impacts at the development site before, during and after construction are outlined in Table 61.

These measures are to be documented in a Biodiversity Management Plan, prior to commencement of construction.

Table 61: Measures proposed to mitigate and manage impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
timing works to avoid critical life cycle events such as breeding or nursing	Moderate	Minor	Active breeding or nesting identified during pre-clearance surveys will be avoided in August, September and October which is the breeding/nesting period for most fauna species.	Impacts to fauna during nesting/nursing avoided	Construction	Site manager
instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	Major	Minor	Pre-clearance surveys will be undertaken prior to tree clearing. A qualified ecologist/licenced wildlife handler will supervise tree removal in accordance with best practise methods.	Any fauna utilising habitat within the Development Site will be identified and managed to ensure clearing works minimise the likelihood of injuring resident fauna	Prior to construction	Site ecologist
relocate habitat features (fallen timber, hollow logs) from within the development site	Moderate	Minor	A procedure will be developed for the relocation of habitat features (e.g. fallen timber, hollow logs) to adjacent retained habitat.	Enhancement of retained habitats	Prior to construction	Site manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chain-saw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	Moderate	Minor	Clearing protocols will be developed that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance (e.g. removal of native vegetation by chainsaw instead of heavy machinery where only partial clearing is proposed). Fencing (or other barriers as required) and signage will be placed around those areas of vegetation to be maintained to prevent any accidental construction damage and provide a permanent barrier between the development footprint and retained areas. The type of fencing during construction may be of a temporary nature and scale that is robust enough to withstand damage during this stage of work. Use of appropriate machinery for vegetation removal adjacent to retained areas.	Vegetation to be retained outside of the Development Site boundary will not be disturbed	Construction	Site manager
sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Minor	Negligible	Appropriate controls will be implemented to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways. All works within proximity to the drainage lines will have adequate sediment and erosion controls (e.g. sediment barriers, sedimentation ponds). Revegetation will also commence as soon as is practicable to minimise risks of erosion. Suitable species will be used as ground cover species in any revegetation areas.	Erosion and sedimentation will be controlled	Construction and decommissioning	Site manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	Minor	Negligible	Construction works will predominately be undertaken during daylight hours. Noise impacts around batch plants and compounds to be managed where they impact on residents.	Noise impacts associated with the development will be managed	Construction / operation /decommissioning	Site manager
light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	Minor	Negligible	Construction works will generally be undertaken during daylight hours. Occasionally night lights will be used during concrete pours. Lights associated with operation will be directional to avoid unnecessarily shining light into adjacent retained vegetation where possible.	Light impacts of construction will be avoided.	Minor	Negligible
adaptive dust monitoring programs to control air quality	Minor	Negligible	Dust suppression measures will be implemented to limit dust on site. Revegetation will also be commenced as soon as practicable to minimise areas likely to create dust. Suitable species will be used as ground cover species in any revegetation areas.	Mitigate dust created during construction activities	Minor	Negligible
temporary fencing to protect significant environmental features such as riparian zones	Minor	Negligible	Temporary fencing to be installed when works are within 100m of any threatened flora. Threatened flora to have a 10m exclusion zone around known locations. Temporary fencing also required to demarcate the exact easement of the transmission line during construction.	Protection of threatened flora.	Construction	Site manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Minor	Negligible	All machinery will be cleaned prior to entering and exiting the construction site to minimise the transport of weeds to vegetated areas to be retained. Weeds that are present within the study area that are listed under the NSW Biosecurity Act 2015 will be managed in accordance with a weed management plan.	Weed impacts managed	Construction	Site manager
staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Minor	Negligible	All personnel working on the project will undertake an environmental induction as part of their site familiarisation. This will include: • site environmental procedures (vegetation management, sediment and erosion control, exclusion fencing and noxious weeds) • what to do in case of environmental emergency (e.g. chemical spills, fire, injured fauna) • key contacts in the case of an environmental emergency.	Staff trained and aware of environmental issues and responsibilities on site	Construction	Site manager

8.7. Mitigating prescribed impacts and adaptive management strategy

Measures proposed to mitigate and manage prescribed biodiversity impacts at the development site are to be documented in an approved Bird and Bat Adaptive Management Plan (BBAMP). The BBAMP is to include:

- Up to 12 months of bird utilisation studies at the 33 designated sites described in this report, across four (4) seasons, to provide more accurate risk data
- Carcass monitoring during the first 2 years of the operation of the wind farm, to estimate the number of birds and bats struck by turbine blades
- Scavenger assessment, to allow adjustment of carcass search data for carcasses removed prior to surveys.
- Bird Utilisation Studies at a subset of the 33 sites, to measure the ongoing impacts of the wind farm on bird populations locally
- Monitoring of bats across four seasons, to measure the ongoing impacts of the wind farm on microbat populations locally.
- A strategy and notification protocol in the event that the wind farm significantly impacts protected or threatened species.

The BBAMP is to be implemented for the first 5 years of operation of the project.

9. Impact summary

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

9.1. Serious and Irreversible Impacts (SAII)

The development has candidate Serious and Irreversible Impacts (SAII) values as outlined in Table 62, and the rationale for listing that entity is provided in Table 63. Detailed consideration of whether impacts on TECs that are serious and irreversible is included in Table 64.

Table 62: Serious and Irreversible Impacts Summary

Species / Community	Common Name	Direct impact individuals / area (ha)	Threshold
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	Box Gum Woodland	234.76 ha of good to moderate woodlands 193.76 ha of poor condition grasslands	No threshold identified.

Table 63: Determining whether impacts are serious and irreversible

Determining whether impacts are serious and irreversible	Assessment
Principle 1	
Does the proposal impact on a species, population or ecological community that is a candidate entity because it is in a rapid rate of decline?	Yes, the White Box Yellow Box Blakely's Red Gum Woodland is identified as potentially being SAII.
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	There is no threshold for impacts that may trigger a serious and irreversible impact. Therefore, the determination of a serious and irreversible impact is to be assessed on a case-by-case basis
Principle 2	
Does the proposal impact on a species that is a candidate entity because it has been identified as having a very small population size?	Yes
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible	No threshold is identified, and the community is widespread in several bioregions NSW. Further consideration of potential serious and irreversible impacts is outlined in Table 65 below
Principle 3	

Determining whether impacts are serious and irreversible	Assessment
Does the proposal impact on the habitat of a species or an area of an ecological community that is a candidate entity because it has a very limited geographic distribution?	No
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.	n/a
Principle 4	
Does the proposal impact on a species, a component of species habitat or an ecological community that is a candidate entity because it is irreplaceable?	No
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.	n/a

Table 64: Evaluation of an impact on a TEC consistent with 9.1.1 of the BAM

Impact Assessment Provisions	Assessment
1. the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII	Measures to avoid direct and indirect impacts are detailed in Section 7 of this report.
2a. evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)	The current total geographic extent of the TEC has been estimated by calculating the area of associated PCTs as mapped on the Brigalow Belt South – Nandewar, Central West – Lachlan, Upper Hunter, and Riverina PCT Maps (Figure 59). Based on this mapping, there is potentially 3,690,648 ha of the TEC currently in NSW. The reduction of the TEC since 1970 is not known, however Section 8 of the Final Determination identified that: *"White Box Yellow Box Blakely's Red Gum Woodland has been drastically reduced in area and highly fragmented because of clearance for cropping and pasture improvement. Austin et al. (2000) found the community had been reduced to less than 1% of its pre-European extent in the Central Lachlan region. Comparable degrees of reduction have been documented for NSW south western slopes and southern Tablelands (estimated <4% remaining, Thomas et. al. 2000), and for the Holbrook area (estimated <7% remaining, Gibbons and Boak (2000). Gibbons and Boak (2000) found remnants of woodlands dominated by Eucalyptus albens, E. melliodora and E. blakelyi were severely fragmented."*
2b. extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by: **i. change in community structure** **ii. change in species composition**	Within the operational footprint of the development site, the community structure will be entirely removed. Within the construction footprint there will be removal of trees that interfere with construction activities. There may also be temporary disturbance to the ground layer in set down areas and temporary parking areas.

Impact Assessment Provisions	Assessment
iii. disruption of ecological processes **iv. invasion and establishment of exotic species** **v. degradation of habitat, and** **vi. fragmentation of habitat**	Species composition is expected to be reduced to 0, within all areas of the development footprint. There is unlikely to be any invasion or establishment of exotic species, beyond those that already occur throughout the study area. Habitats within the development site will be removed. Habitats that occur outside the development site may be fragmented from each other, however the majority of the development site is located in an already fragmented landscape and is unlikely to further reduce connectivity of the TEC.
2c. evidence of restricted geographic distribution (Principle 3, clause 6.7 (2) (c) BC Regulation), based on the TECs geographic range in NSW according to the: **i. extent of occurrence** **ii. area of occupancy, and** **iii. number of threat-defined locations.**	The TECs geographic range in NSW includes the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions. The current extent of occurrence based on the Brigalow Belt South – Nandewar, Central West – Lachlan, Upper Hunter, and Riverina PCT Maps (Figure 59) is potentially 3,690,648 ha of the TEC currently in NSW. There are no threat-defined locations for this TEC.
2d. evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7 (2) (d) BC Regulation).	From section 11 of the Final Determination: *"Disturbed remnants are still considered to form part of the community including remnants where the vegetation, either understorey, overstorey or both, would, under appropriate management, respond to assisted natural regeneration, such as where the natural soil and associated seed bank are still at least partially intact."*
3. Where the TBDC indicated that data is 'unknown' or 'data deficient' for a TEC for a criterion listed in subsection 9.1.1(2), the assessor must record this in the BDAR or BCAR.	N/A
4a. the impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal: **i. in hectares, and** **ii. as a percentage of the current geographic extent of the TEC in NSW.**	The total area of the TEC to be impacted by the proposal is 428.51 ha. The percentage of impact to the TEC across the current geographic extent is 0.01 %.
4b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by: **i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the development footprint or equivalent area for other types of proposals** **ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by:** **• distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the**	The extent of the TEC within 500m of the development is shown on Figure 60. The current connectivity and isolation of patches of the TEC was measured using Euclidean distance analysis between patches of the TEC (Figure 61). The change in the proportion of area between patches (i.e. future separation of the TEC) changed from an average separation of 55.06m before development to 57.16 after development. The project is unlikely to isolate any patches of the TEC, as the extent of the TEC is so prevalent locally. The maximum dispersal distance for native flora species before and after the development is unchanged.

Impact Assessment Provisions	Assessment
average distance if the remnant is removed as proposed, and **• estimated maximum dispersal distance for native flora species characteristic of the TEC, and** **• other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development** **iii. describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone(s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.**	The area to perimeter ratio before the development is 21.44 m^2/m. The area to perimeter ratio after the development is 20.92 m^2/m. The condition of the TEC according to the vegetation integrity score is provided in Table 12 to Table 14.

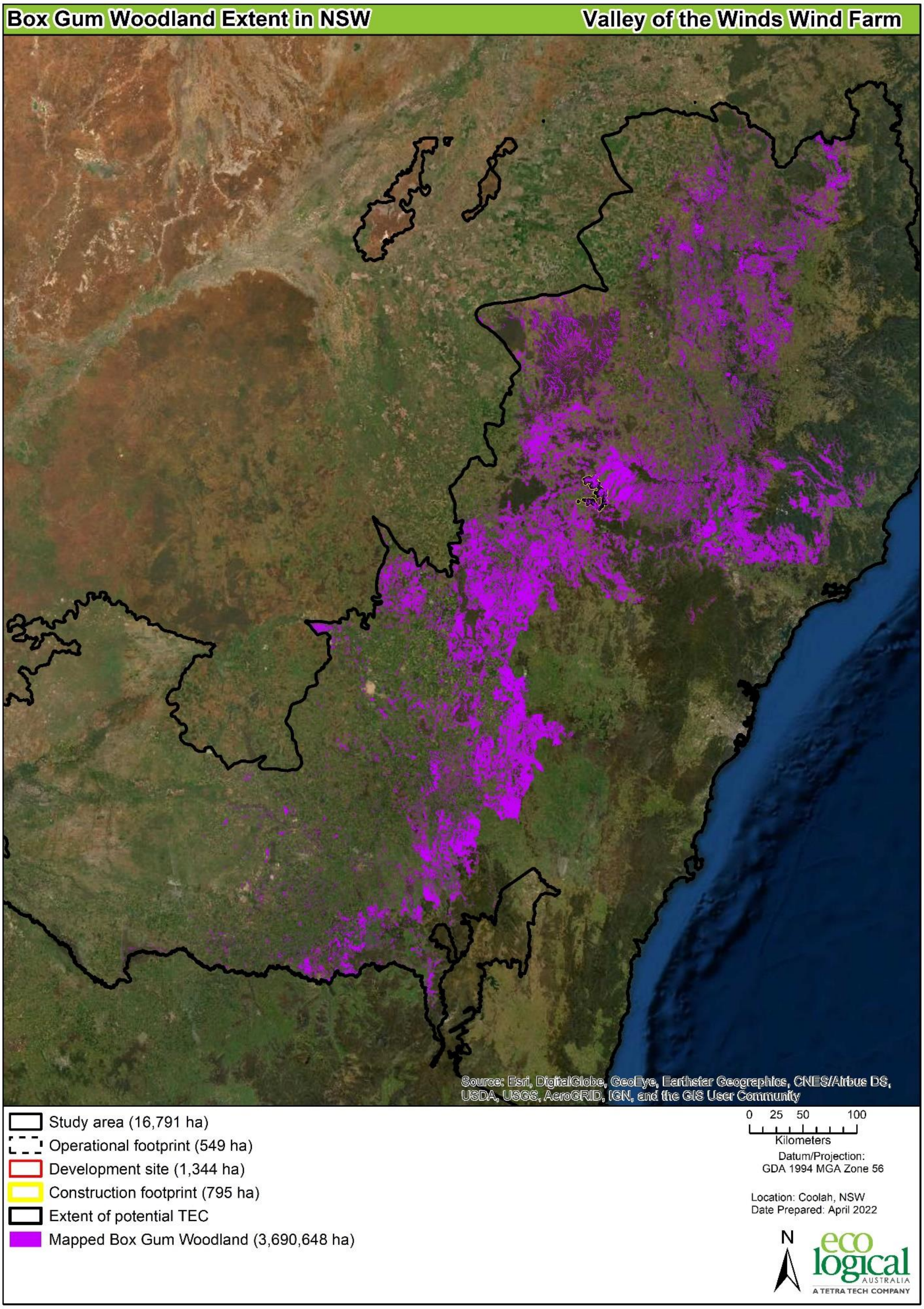


Figure 59 Extent of Box Gum Woodland TEC in NSW

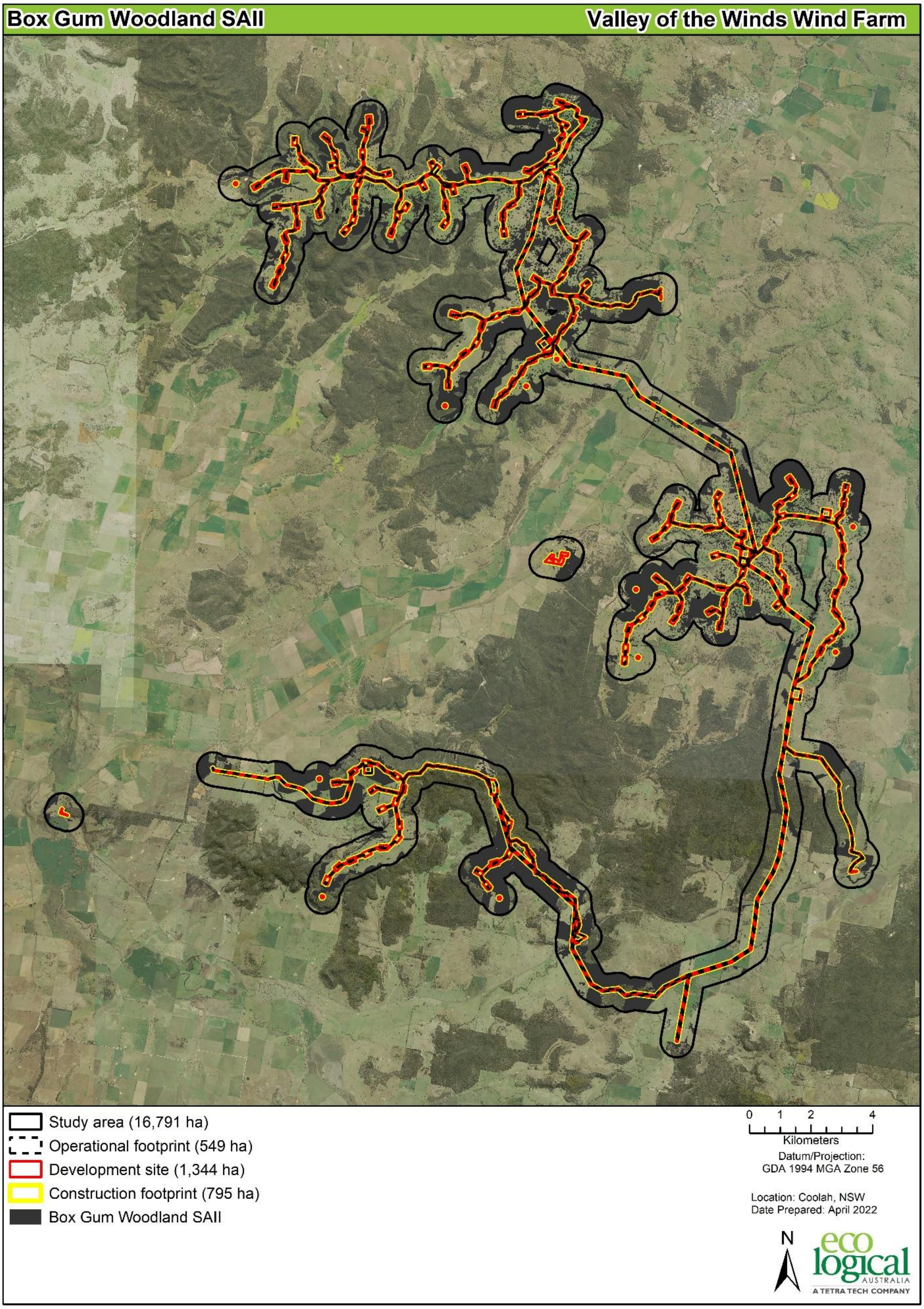


Figure 60 Extent of Box Gum Woodland TEC within 500m of the development

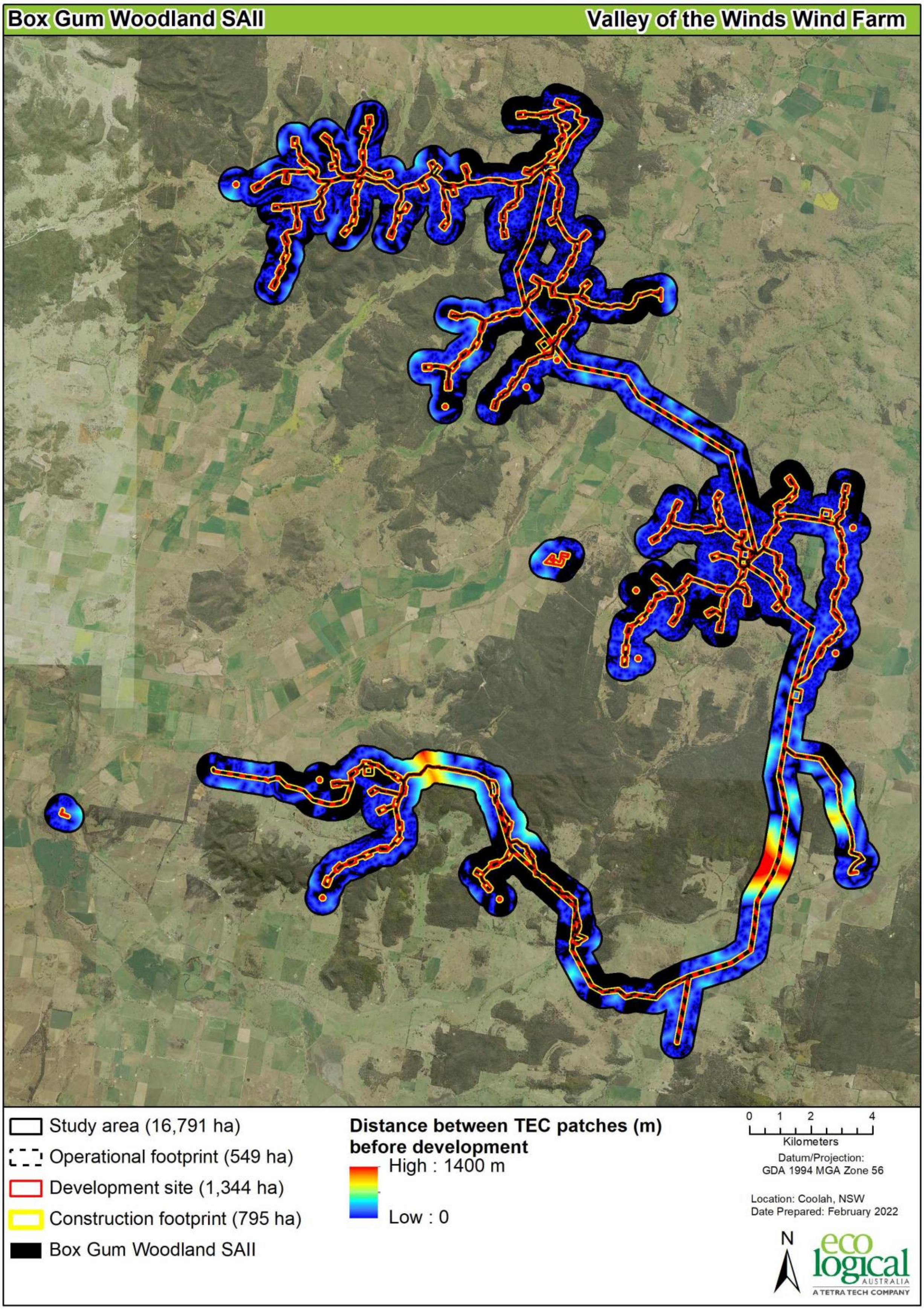


Figure 61 Patch connectivity of the TEC before the development

9.2. Impacts requiring offsets

The impacts of the development requiring offset for native vegetation are outlined in Table 65 and shown on Figure 62. The impacts of the development requiring offset for species credit species and their habitat are outlined in Table 66 and on Figure 62.

Table 65: Impacts to native vegetation that require offsets

Vegetation Zone	PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
01 42 M	42	River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Inland Riverine Forests	Forested Wetlands	0.66
02 84 M	84	River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Eastern Riverine Forests	Forested Wetlands	1.14
03 272 M	272	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	Western Slopes Grassy Woodlands	Grassy Woodlands	0.31
04 272 L	272	White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	Western Slopes Grassy Woodlands	Grassy Woodlands	12.37
05 281 G	281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Western Slopes Grassy Woodlands	Grassy Woodlands	4.27
06 281 M	281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Western Slopes Grassy Woodlands	Grassy Woodlands	28.43
09 478 G	478	Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion	Western Slopes Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	0.11
10 479 B	479	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Western Slopes Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	35.73

Vegetation Zone	PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
11 479 M	479	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Western Slopes Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	7.39
12 479 Reg	479	Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Western Slopes Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	8.57
13 483 G	483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Western Slopes Grassy Woodlands	Grassy Woodlands	1.67
14 483 M	483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Western Slopes Grassy Woodlands	Grassy Woodlands	200.01
15 483 L	483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Western Slopes Grassy Woodlands	Grassy Woodlands	172.45

Table 66: Impacts on threatened species and threatened species habitat that require offsets

Species	Common Name	Direct impact number of individuals / habitat (ha)	BC Act listing status	EPBC Act Listing status
Dichanthium setosum	Bluegrass	0 – species not impacted	Vulnerable	Vulnerable
Chalinolobus dwyeri	Large-eared Pied Bat	0.0 ha of breeding habitats 180.49 ha of foraging habitat	Vulnerable	Vulnerable
Tyto novahollandiae	Masked Owl	0.0 ha of breeding habitat	Vulnerable	Not listed
Ninox connivens	Barking Owl	32.20 ha of potential breeding habitat including assumed areas	Vulnerable	Not listed

Species	Common Name	Direct impact number of individuals / habitat (ha)	BC Act listing status	EPBC Act Listing status
Petaurus norfolcensis	Squirrel Glider	63.28 ha including assumed areas of foraging habitat	Vulnerable	Not listed

9.3. Impacts not requiring offsets

The impacts of the development not requiring offset for native vegetation are outlined in Table 67 and shown on Figure 62.

Table 67: Impacts to native vegetation that do not require offsets

Vegetation Zone	PCT ID	PCT Name	Direct impact (ha)	Rationale
07 281 L	281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	20.81	Vegetation integrity score below offset threshold

9.4. Areas not requiring assessment

Areas not requiring assessment are shown on Figure 62. This includes all areas of Category 1 land.

9.5. Credit summary

The number of ecosystem credits required for the development are outlined in Table 68 The number of species credits required for the development are outlined in Table 68. A biodiversity credit report is included in Appendix O.

9.5.1. Assumed species and areas without access

In addition to those species that have been identified as present within the development site, species have been assumed present where they are likely to occur on lands that have not yet been surveyed. In order to fulfil the requirement of the BAM, and assume presence of threatened species, the following additional calculation has been entered into the BAMC for the Sydney Basin calculation only:

- All impacts to native vegetation have been entered into the total area of each vegetation zone present
- All species credit species within PCT42 in moderate condition have been assumed present across the entire 0.66 ha
- All species credit species within PCT281 in moderate condition have been assumed present across the entire 8.89 ha
- All species credit species within PCT479 in burnt condition have been assumed present across the entire 9.33 ha.

Species credits have not been assumed present within areas of low condition native grassland, or cleared land, as these areas are not considered to be suitable habitat for any of the candidate species.

To avoid confusion about which species credits have been assumed, all assumed species have been entered with the same area of 20.32 ha, commensurate to the area of unsurveyed woodland.

The areas of assumed presence of species credit species will be surveyed at the appropriate time, as a commitment of the proponent to understanding the whole and finite extent of environmental impacts of the project.

9.5.2. Impact requirement of wind farm and transmission line components

The final impact calculation has been partitioned between the wind farm and transmission line components of the project as described in the table below. Credits have been assigned to the bioregion, and impact type between the transmission line and wind farm accordingly. Transmission line values have been calculated from their origin in the Leadville and Girragulang Road clusters at the relevant substation sites.

Separate BAMCC calculations have been undertaken to delineate the credit requirements of the project for each bioregion, as well as for the Transmission line and Wind farm elements as follows:

Wind farm:

- Brigalow Belt South (00021959/BAAS17021/20/00021962)
- NSW South-western Slopes (00021959/BAAS17021/20/00021961)
- Sydney Basin (00021959/BAAS17021/20/00021960)

Transmission line

- Brigalow Belt South (00021959/BAAS17021/22/00032036)
- NSW South-western Slopes (Not required)
- Sydney Basin (00021959/BAAS17021/21/00028366)

Table 68 Impact types by wind farm or transmission line within each bioregion

Zone/Species	TXL Impacts (Ha))			WF Impacts (Ha))			TXL Credits			WF Credits			Sub-total impacts (ha)		Sub-total credits		Total	
	BBS	SWS	SB	BBS	SWS	SB	BBS	SWS	SB	BBS	SWS	SB	TXL	WF	TXL	WF	Area	Credit
01 42 M	0.00	0.00	0.66	0.00	0.00	0.00	0	0	41	0	0	0	0.66	0.00	41	0	0.66	41
02 84 M	0.00	0.00	0.00	1.14	0.00	0.00	0	0	0	11	0	0	0.00	1.14	0	11	1.14	11
03 272 M	0.28	0.00	0.04	0.00	0.00	0.00	7	0	1	0	0	0	0.31	0.00	8	0	0.31	8
04 272 L	3.31	0.00	9.05	0.00	0.00	0.00	36	0	87	0	0	0	12.37	0.00	123	0	12.37	123
05 281 G	3.31	0.00	0.00	0.00	0.96	0.00	159	0	0	0	53	0	3.31	0.96	159	53	4.27	212
06 281 M	0.74	0.00	10.68	14.77	0.30	2.32	41	0	534	741	15	103	11.42	17.01	575	859	28.43	1434
07 281 L	0.00	0.00	10.10	4.46	0.00	6.17	0	0	0	0	0	0	10.10	10.71	0	0	20.81	0
08 461 B	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00	0.00	0	0	0	0
09 461 M	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00	0.00	0	0	0	0
10 478 G	0.00	0.00	0.00	0.00	0.11	0.00	0	0	0	0	3	0	0.00	0.11	0	3	0.11	3
11 479 B	11.96	0.00	11.26	5.22	1.23	6.06	271	0	200	118	27	107	23.22	12.51	471	252	35.73	723
12 479 M	3.72	0.00	0.00	3.12	0.55	0.00	96	0	0	79	16	0	3.72	3.67	96	95	7.39	191
13 479 Reg	0.00	0.00	0.00	0.00	3.48	5.10	0	0	0	0	41	64	0.00	8.57	0	105	8.57	105
14 483 G	0.00	0.00	0.00	1.67	0.00	0.00	0	0	0	73	0	0	0.00	1.67	0	73	1.67	73
15 483 M	3.74	0.00	5.36	173.11	2.12	15.70	75	0	85	3462	40	248	9.09	190.92	160	3750	200.01	3910
16 483 L	1.78	0.00	18.63	83.46	30.98	38.18	23	0	204	1061	425	419	20.41	152.04	227	1910	172.45	2137
17 616 M	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00	0.00	0	0	173.45	0
Total Native vegetation	**28.84**	**0.00**	**65.78**	**286.93**	**39.72**	**73.52**	**708**	**0**	**1152**	**5545**	**620**	**941**	**94.62**	**399.30**	**1860**	**7106**	**667.37**	**8966**
Acacia ausfeldii (Ausfeld's Wattle)*	0.00	0.00	18.80	0.00	0.00	1.30	0	0	606	0	0	45	18.80	1.30	606	45	20.10	651
Burhinus grallarius (Bush Stone-curlew)*	0.00	0.00	18.80	0.00	0.00	1.30	0	0	606	0	0	45	18.80	1.30	606	45	20.10	651
Callocephalon fimbriatum (Gang-gang Cockatoo)*	0.00	0.00	18.80	0.00	0.00	1.30	0	0	606	0	0	45	18.80	1.30	606	45	20.10	651
Calyptorhynchus lathami (Glossy Black-Cockatoo)*	0.00	0.00	18.80	0.00	0.00	0.00	0	0	606	0	0	0	18.80	0.00	606	0	18.80	606
Cercartetus nanus (Eastern Pygmy-possum)*	0.00	0.00	18.80	0.00	0.00	0.00	0	0	606	0	0	0	18.80	0.00	606	0	18.80	606
Chalinolobus dwyeri (Large-eared Pied Bat)	0.67	0.00	9.13	138.07	7.46	4.00	16	0	346	3620	222	132	9.80	149.53	362	3974	159.33	4336
Commersonia procumbens (Commersonia procumbens)*	0.00	0.00	18.80	0.00	0.00	1.30	0	0	606	0	0	45	18.80	1.30	606	45	20.10	651
Cynanchum elegans (White-flowered Wax Plant)*	0.00	0.00	18.80	0.00	0.00	0.00	0	0	606	0	0	0	18.80	0.00	606	0	18.80	606
Hoplocephalus bitorquatus (Pale-headed Snake)*	0.00	0.00	0.60	0.00	0.00	0.00	0	0	30	0	0	0	0.60	0.00	30	0	0.60	30
Hoplocephalus stephensii (Stephens' Banded Snake)*	0.00	0.00	0.60	0.00	0.00	0.00	0	0	30	0	0	0	0.60	0.00	30	0	0.60	30
Lophoictinia isura (Square-tailed Kite)*	0.00	0.00	18.80	0.00	0.00	0.00	0	0	455	0	0	0	18.80	0.00	455	0	18.80	455
Monotaxis macrophylla (Large-leafed Monotaxis)*	0.00	0.00	18.80	0.00	0.00	1.30	0	0	606	0	0	45	18.80	1.30	606	45	20.10	651
Ninox connivens (Barking Owl)	0.00	0.00	18.80	12.20	0.00	1.30	0	0	606	261	0	45	18.80	13.50	606	306	32.30	912
Petauroides volans (Greater Glider)*	0.00	0.00	18.80	0.00	0.00	0.00	0	0	606	0	0	0	18.80	0.00	606	0	18.80	606
Petaurus norfolcensis (Squirrel Glider)	18.90	0.00	22.66	16.60	3.12	2.00	610	0	726	597	115	60	41.56	21.72	1336	772	63.28	2108
Petrogale penicillata (Brush-tailed Rock-wallaby)*	0.00	0.00	18.80	0.00	0.00	1.30	0	0	909	0	0	67	18.80	1.30	909	67	20.10	976

Zone/Species	TXL Impacts (Ha))			WF Impacts (Ha))			TXL Credits			WF Credits			Sub-total impacts (ha)		Sub-total credits		Total	
	BBS	SWS	SB	BBS	SWS	SB	BBS	SWS	SB	BBS	SWS	SB	TXL	WF	TXL	WF	Area	Credit
Phascolarctos cinereus (Koala)*	0.00	0.00	18.80	0.00	0.00	1.30	0	0	606	0	0	45	18.80	1.30	606	45	20.10	651
Prasophyllum petilum (Tarengo Leek Orchid)*	0.00	0.00	18.80	0.00	0.00	1.30	0	0	606	0	0	45	18.80	1.30	606	45	20.10	651
Prasophyllum sp. Wybong (Prasophyllum sp. Wybong)*	0.00	0.00	18.80	0.00	0.00	1.30	0	0	909	0	0	67	18.80	1.30	909	67	20.10	976
Pteropus poliocephalus (Grey-headed Flying-fox)*	0.00	0.00	18.80	0.00	0.00	0.00	0	0	606	0	0	0	18.80	0.00	606	0	18.80	606
Tylophora linearis (Tylophora linearis)*	0.00	0.00	18.80	0.00	0.00	1.30	0	0	606	0	0	45	18.80	1.30	606	45	20.10	651
Tyto novaehollandiae (Masked Owl)*	0.00	0.00	18.80	0.00	0.00	1.30	0	0	606	0	0	45	18.80	1.30	606	45	20.10	651
Vespadelus troughtoni (Eastern Cave Bat)*	0.00	0.00	18.80	0.00	0.00	1.30	0	0	909	0	0	67	18.80	1.30	909	67	20.10	976
Total species							**626**	**0**	**13404**	**4497**	**337**	**855**	**409.76**	**200.35**	**14030**	**5689**	**610.11**	**19688**

WF = Wind Farm, TXL = Transmission Line, BBS = Brigalow Belt South, SWS = NSW South Western Slopes, SB = Sydney Basin.

* species not identified during targeted surveys, assumed present in unsurveyed areas only.

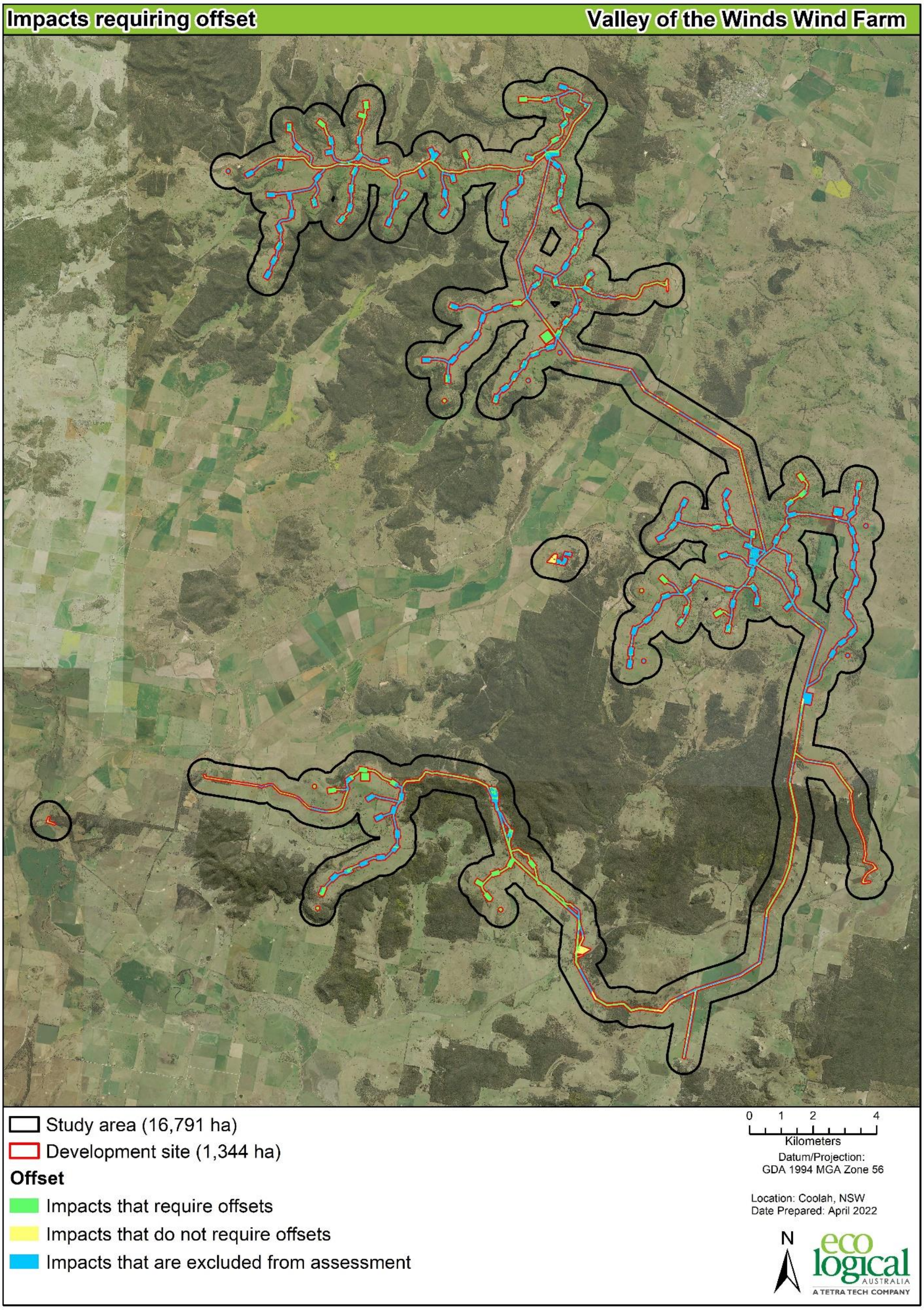


Figure 62: Impacts requiring offset, impacts not requiring offset, and impacts excluded from assessment

10. High level offset strategy

The BAM requires all biodiversity impacts to be explicitly calculated using the Biodiversity Assessment Method Calculator (BAMC), which provides a final project liability in BAM credits. BAM credits can be: ecosystem credits – whereby impacts on all native vegetation, and species habitat that are reliably predicted in that vegetation type are calculated; and species credits – whereby impacts on the extent of individual habitats (or stem counts for most threatened flora) of each species must be mapped and calculated irrespective of vegetation types.

The final ecosystem credit and species credit liability must generally be 'retired' prior to any impacts occurring. These credits can be retired by: establishing conservation agreements called Biodiversity Stewardship Agreements (BSAs) on land which generates the matching credits; or by purchase of the appropriate credits from a vendor (who has established a BSA on their own land); or by payment to the Biodiversity Conservation Fund (BCF) at the price provided in the Biodiversity Offsets Payment Calculator (BOPC).

The BAMC has been operated and the credit calculation for this project is described Section 9.5. Based on the preliminary credit calculations, the following observations are made:

- Based on the input VI data, a total of 8,966 ecosystem credits will be required for the project, at an average credit requirement of 18 credits per hectare.
- Vegetation Zones 3 and 4 are Endangered Ecological Community (EEC) credits, and any credits proposed as offsets must be from the same EEC (Inland Grey Box Woodland).
- Vegetation Zones 5-7, and 14-16 are all Critically Endangered Ecological Community (CEEC) credits, and any credits proposed as offsets must be from the same CEEC (Box Gum Woodland).
- Vegetation Zone 1 is categorised as Tier 4 from the Inland Riverine Forests (<50% cleared) trading group. Any proposed offset for these zones must be from the same Class or higher.
- Vegetation Zone 2 is categorised as Tier 4 from the Eastern Riverine Forests (<50% cleared) trading group. Any proposed offset for these zones must be from the same Class or higher.
- Vegetation Zone 8 is not impacted and requires no credits.
- Vegetation Zones 9-13 is categorised as Tier 4 from the Western Slopes Dry Sclerophyll Forests (<50% cleared) trading group. Any proposed offset for these zones must be from the same Class or higher.
- Vegetation Zone 17 is categorised as Tier 4 from the Dry Rainforests (<50% cleared) trading group. Any proposed offset for these zones must be from the same Class or higher.

Based on these offsetting requirements, the greatest requirement of the project is to achieve 7,768 credits of Box Gum Woodland and 1,019 credits of Western Slopes Dry Sclerophyll Forests, which based on an average credit yield of 5 credits/ha, corresponds to approximately 1,534 ha and 204 ha of offsets. In order to consider whether on-ground offsets could be sourced, a review was conducted to:

1. Determine to total extent of ecosystem source area (based on the BC Regulation)

2. Review availability of suitable vegetation nearby (within 50km) to the development site

In order to determine the total extent of the ecosystem credit source area, the following areas were identified as potential 'ecosystem credit source area:

- IBRA subregions in which the project occurs
- Any adjacent IBRA subregion to those in which the project occurs
- Any IBRA subregion within 100km of the project

The final ecosystem credit source area is the sum of those areas identified above, and shown on Figure 63. The total area available to source the credits from includes land from the hunter valley in the east, to Boundary Bend in the west, and from the Queensland to Victorian borders along north-south. This is a significant area that would encompass nearly all suitable vegetation that exists in NSW (with the exception of Box Gum Woodland on the New England Tablelands).

Closer to the project, a review was conducted of the areas of suitable vegetation within 50km of the development site. The review included all associated PCTs with suitable vegetation mapped within this 50km buffer, and excluded any land within existing conservation reserves. This review also excluded any land within 500m of the project. Based on this review there are large areas of suitable vegetation available within 50km of the project should the proponent seek land-based offsets (Figure 64).

Should the proponent elect to make payment to the Biodiversity Conservation Fund (BCF) to resolve their offset liability, the total value would be in excess of $20M based on current pricing in the BOPC.

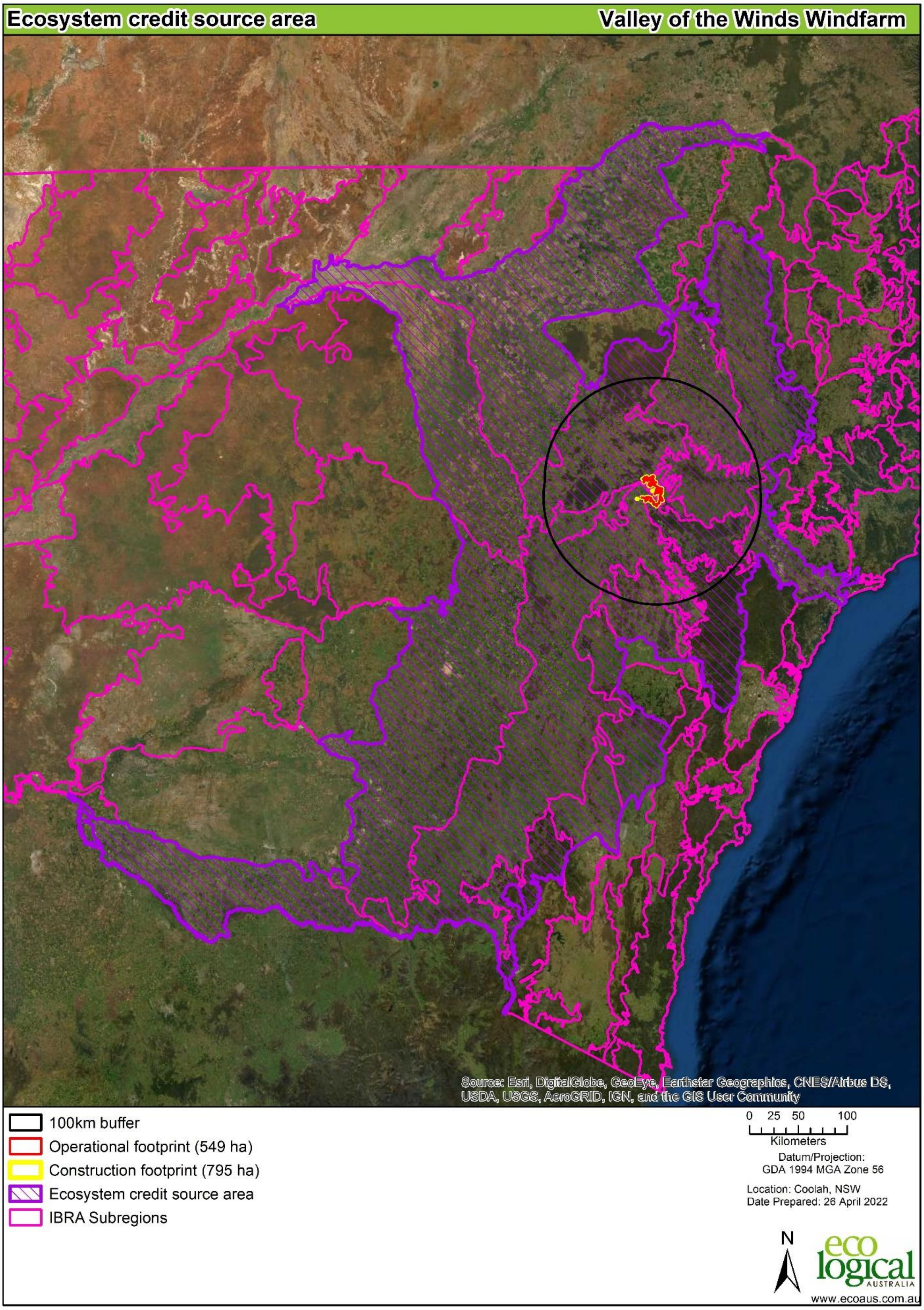


Figure 63 Ecosystem credit source area

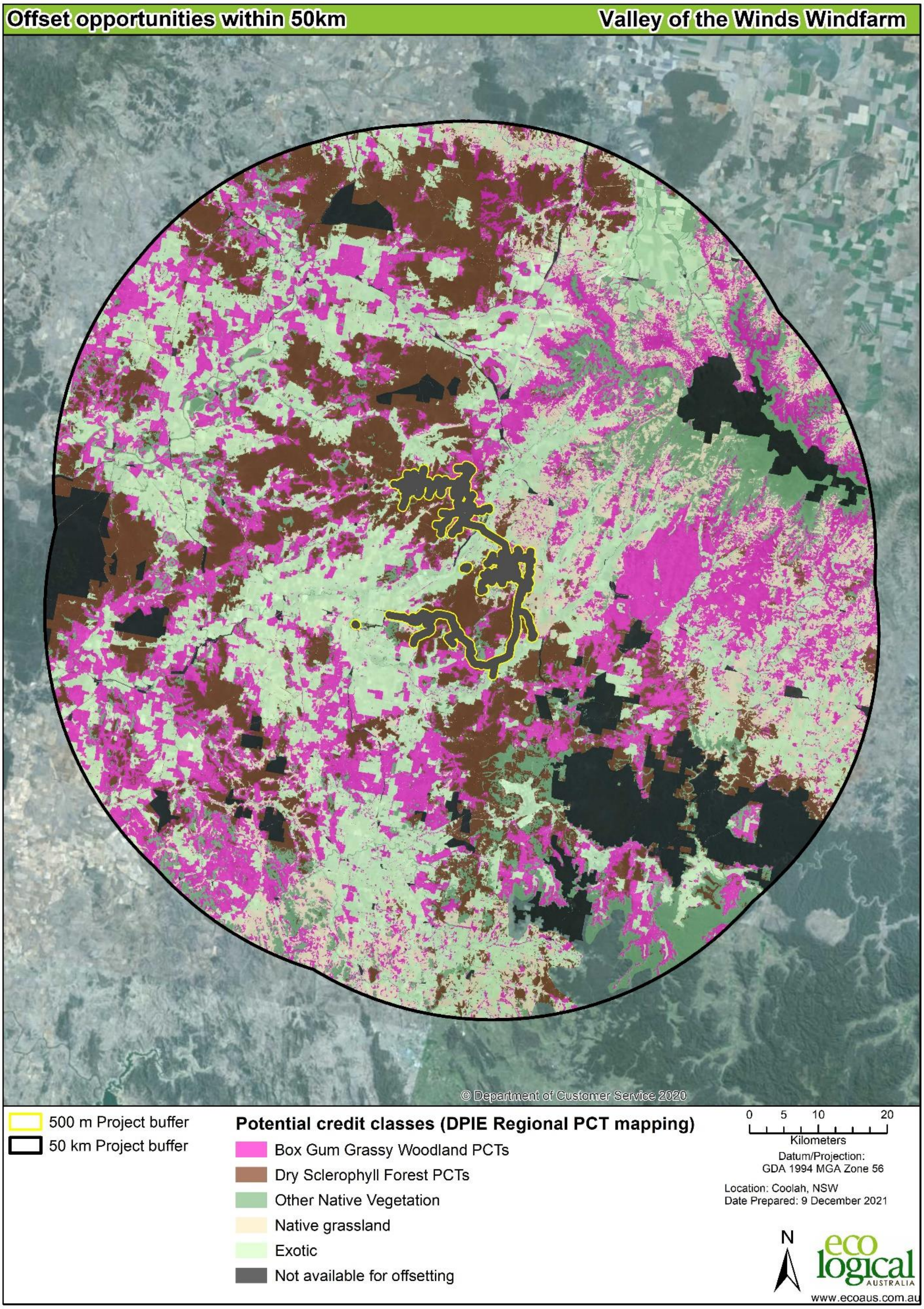


Figure 64 Suitable vegetation within 50km of the development

11. Consistency with legislation and policy

11.1. NSW State Environmental Planning Policy 44 (Koala Habitat Protection)

The State Environmental Planning Policy 44 (Koala Habitat Protection) (SEPP44) was repealed in 2019 but has been specifically identified as requiring consideration in the SEARs for this project. Generally, this policy only applies to local development, where a Council is the consent authority and wouldn't apply to a State Significant Development. Regardless, an assessment under the SEPP44 has been undertaken below to consider impacts to potential or core Koala habitat.

11.1.1. Step 1. Is the site potential Koala habitat?

Potential Koala Habitat is defined in SEPP44 as areas of native vegetation where the trees of the types listed in Schedule 2 (of the SEPP44) constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. Under Schedule 2, only one species of tree present (*Eucalyptus albens*) is present within the development site, conservatively identified as the hybrid *E. albemol*. This species occupies more than 15% of the trees in the upper strata in high and moderate condition zones of PCT483.

11.1.2. Step 2. Is the site core Koala habitat?

Core Koala habitat is defined in SEPP44 as an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.

Surveys conducted across the study area (4.2.10), including SAT surveys, spotlighting, and remote cameras, failed to identify any individual Koalas or signs thereof.

It is therefore concluded that the study area does not contain core Koala habitat, and as such a Koala plan of management is not required.

11.2. NSW Fisheries Management Act 1994

Direct impacts to aquatic habitat are associated primarily with the Transmission line crossings of the Coolaburragundy Creek and Talbragar River. Both of these waterways are Key Fish Habitat (KFH) for Eel-tailed Catfish and Purple Spotted Gudgeon. In addition, there are numerous named and unnamed drainages across the study area that are KFH for Purple-spotted Gudgeon only (Figure 65).

Potential direct impacts are associated with potential disturbance during construction of these transmission lines as well as roads and reticulation within the wind farm. All disturbance will be avoided within the watercourse itself and all transmission lines will span areas of KFH. Any crossings required will be designed and constructed in accordance with Policy and Guidelines for Fish Friendly Waterway Crossing (DPI undated), with the aim to minimise potential impacts on aquatic habitats and avoid obstruction of fish passage. The proponent will aim to avoid any obstruction of fish passage or dredging &/or reclamation. Otherwise the crossing will comply with the requirements of the FM Act (Part 7 Permit). Given the degraded nature of the aquatic habitat present and mitigation measures proposed, the direct impacts to aquatic habitat are unlikely to be significant.

Potential indirect impacts on aquatic habitat include:

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

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

The proposed development is unlikely to impact aquatic threatened species.

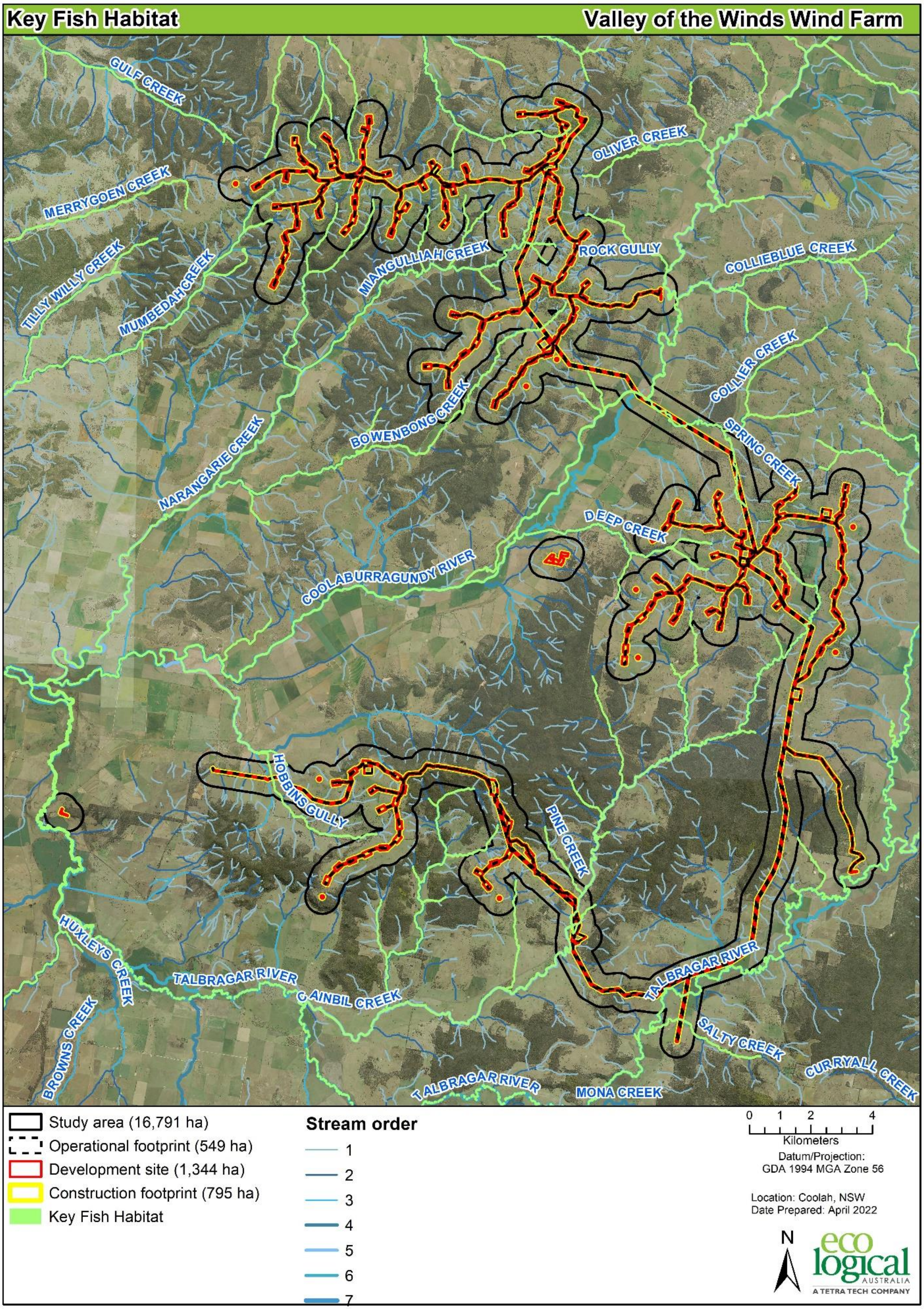


Figure 65 Key fish habitat

11.3. Commonwealth Environment Protection and Biodiversity Conservation Act 1999

This project was referred to the Commonwealth Minister for the Environment in 2020, and was declared a controlled action due to potential impacts primarily to Box Gum Woodland CEEC (Referral 2020/8668).

The referral identified potential impacts to two communities and 29 species listed under the EPBC Act. These species were derived from the project footprint identified in the referral, which has been significantly truncated through design iterations (Chapter 7). Each species has been considered throughout the development of this project, and the list of all identified MNES and whether they may be impacted is described in Table 69 below. Species that were not identified during field surveys have not been considered further.

The location of all MNES is shown on Figure 66.

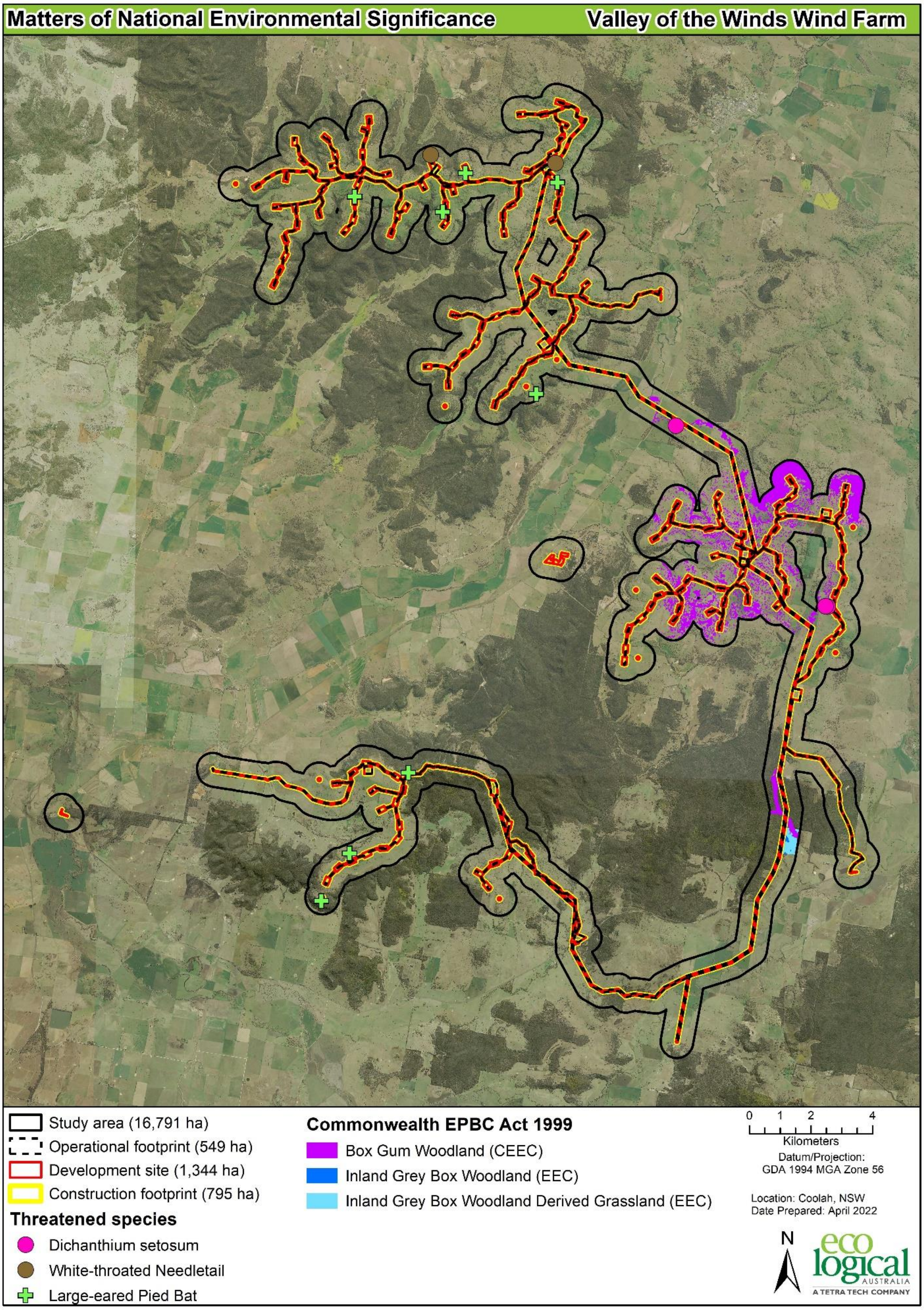


Figure 66 MNES identified in the study area

Table 69 Threatened species and communities identified by the Commonwealth for assessment

Species Name	Common Name	EPBC Act	Response	Nature	Quantum	Consequence
Species and communities identified by Commonwealth as likely to be significantly impacted						
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia		Endangered	Identified within the study area. Further assessment required	Removal of vegetation within development footprint	0.27 ha of woodland removed, 3.31 ha of derived grasslands impacted	No significant residual impact
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		Critically Endangered	Identified within the study area. Further assessment required	Removal of vegetation within development footprint	64.23 ha of woodland removed	Significant impact
Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Not identified on important area mapping or by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Grantiella picta	Painted Honeyeater	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Lathamus discolor	Swift Parrot	Critically Endangered	Not identified on important area mapping or by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A

Species Name	Common Name	EPBC Act	Response	Nature	Quantum	Consequence
Polytelis swainsonii	Superb Parrot	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Identified within the study area. Further assessment required	Removal of native vegetation which acts as foraging habitat	Removal of 180.49 ha of foraging habitat. No impacts to breeding habitat.	No significant residual impact
Nyctophilus corbeni	Corben's Long-eared Bat	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Phascolarctos cinerus	Koala (combined populations of Queensland, New South Wales and the Australian Capitol Territory)	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A

Species Name	Common Name	EPBC Act	Response	Nature	Quantum	Consequence
Hirundapus caudacutus	White-throated Needletail	CAMBA, JAMBA ROKAMBA, Vulnerable	Identified within the study area. Further assessment required	Installation of wind turbines nearby to airspace seasonally occupied by the species	Species is aerial, so the project will not remove any foraging habitat. No impacts to breeding habitat.	No significant residual impact
Species and communities identified by Commonwealth with potential to be significantly impacted						
Androcalva procumbens	Commersonia procumbens	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Thesium australe	Austral Toadflax	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Pomaderris sericea	Bent Pomaderris	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Dichanthium setosum	Bluegrass	Vulnerable	Identified within the study area. Further assessment required	No removal of any individuals or species habitat	0 ha impacted	No significant impact

Species Name	Common Name	EPBC Act	Response	Nature	Quantum	Consequence
Petauroides volans	Greater Glider	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Leucochrysum albicans subsp. *tricolor*	Hoary Sunray	Engangered	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Homoranthus darwinioides	Homoranthus darwinioides	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Indigofera efoliata	Indigofera efoliata	Engangered	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A

Species Name	Common Name	EPBC Act	Response	Nature	Quantum	Consequence
Kennedia retrorsa	Kennedia retrorsa	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Lasiopetalum longistamineum	Lasiopetalum longistamineum	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Leipoa ocellata	Malleefowl	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Prostanthera stricta	Mount Vincent Mintbush	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Ozothamnus tesselatus.	Ozothamnus tesselatus	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A

Species Name	Common Name	EPBC Act	Response	Nature	Quantum	Consequence
Androcalva rosea	Sandy Hollow Commersonia	Endangered	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Swainsona recta	Small Purple-pea	Endangered	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Pultenaea glabra	Smooth Bush-pea	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Dasyurus maculatus maculatus	Spotted-tail Quoll (SE mainland population)	Endangered	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Tylophora linearis	Tylophora linearis	Endangered	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A

Species Name	Common Name	EPBC Act	Response	Nature	Quantum	Consequence
Prostanthera cryptandroides subsp. cryptandroides	Wollemi Mint-bush	Vulnerable	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A
Apus pacificus	Fork-tailed Swift	Bonn, CAMBA, ROKAMBA	Not identified by field surveys. The species will therefore not be affected by the project, and no further assessment required.	N/A	N/A	N/A

Based on the results of the field studies, the referral notice requires the proponent to satisfy general requirements as well as identify key issues. These are detailed in Table 70 and Table 71.

Table 70 Consistency with the General Requirements of the referral notice

General Requirement	Response
Relevant regulations	
The Environmental Impact Statement (EIS) must address all matters outlined in Schedule 4 of the EPBC Regulations and all the matters outlined below in relation to the controlling provisions.	See EIS
Project description	
The title of the action, background to the action and the current status	Chapter 1
The precise location and description of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on Matters of National Environmental Significance (MNES).	Chapter 1
How the action relates to any other actions that have been, or are being taken in the region affected by the action.	Section 6.3
How the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts on MNES.	Section 7
Impacts	
The EIS must include an assessment of the relevant impacts of the action on the matters protected by the controlling provisions, including:	
i. a description and detailed assessment of the nature and extent of the likely direct, indirect and consequential impacts, including short term and long term relevant impacts;	Chapter 8
ii. a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible;	Chapter 8
iii. analysis of the significance of the relevant impacts; and	Section 11.3.1
iv. any technical data and other information used or needed to make a detailed assessment of the relevant impacts.	Chapter 12
Avoidance, mitigation and offsetting	
For each of the relevant matters protected that are likely to be significantly impacted by the action, the EIS must provide information on proposed avoidance and mitigation measures to manage the relevant impacts of the action, including:	
i. a description and an assessment of the expected or predicted effectiveness of the mitigation measures;	Section 8.6 and 8.7
ii. any statutory policy basis for the mitigation measures;	Section 8.6 and 8.7
iii. the cost of the mitigation measures;	The cost of the mitigation measures is likely to exceed $200k

General Requirement	Response
iv. an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing; v. the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program.	A BMP and BBAMP is required prior to construction The mitigation measures and monitoring program will be approved by the NSW Department of Planning, Industry and Environment (DPIE)
Where a significant residual adverse impact to a relevant protected matter is considered likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit associated with the proposed offset strategy.	Chapter 10
For each of the relevant matters likely to be impacted by the action the EIS must provide reference to, and consideration of, relevant Commonwealth guidelines and policy statements including any: i. conservation advice or recovery plan for the species of community; ii. relevant threat abatement plan for the species; iii. wildlife conservation plan for the species; and iv. any strategic assessment.	Table 72

Table 71 Consistency with Key Issues of the referral notice

Key Issue	Response
Assessment requirements	
The EIS must identify each EPBC Act listed threatened species and community and migratory species likely to be impacted by the action. For any species and communities that are likely to be impacted, the proponent must provide a description of the nature, quantum and consequences of the impacts. For species and communities potentially located in the project area or in the vicinity that are not likely to be impacted, provide evidence why they are not likely to be impacted.	Table 69
For each of the EPBC Act listed threatened species and communities and migratory species likely to be impacted by the action the EIS must provide a separate: a. description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans; b. details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements; c. description of the relevant impacts of the action having regard to the full national extent of the species or community's range; and d. description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action; e. identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account; f. description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established. g. details of how the current published NSW Biodiversity Assessment Methodology has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts; and h. details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the NSW Biodiversity Assessment Methodology and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites;	Table 72

Key Issue	Response
Any significant residual impacts not addressed by the NSW Biodiversity Assessment Methodology may need to be addressed in accordance with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy	All significant impacts are addressed by the BAM
Other approvals and conditions	
Information in relation to any other approvals of conditions required must include the information prescribed in Schedule 4 Clause 5 (a) (b) (c) and (d) of the EPBC Regulations 2000.	See EIS
Environmental Record of person proposing to take the action	
Information in relation to the environmental record of a person proposing to take action must include details as prescribed in Schedule 4 Clause 6 of the EPBC Regulations 2000.	See EIS
Information Sources	
For information given in the EIS, the EIS must state the source of the information, how recent the information is, how the reliability of the information was tested, and what uncertainties (if any) are in the information.	Chapter 12

Table 72 Detailed assessment of impacted MNES

Assessment requirement	Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Large-eared Pied Bat	White-throated Needletail	Bluegrass
a. description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans;	Section 3.6.2.1	Section 3.6.2.2	Section 4.2.6	Section 4.2.7	Section 4.2.4
b. details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements;	Section 3.6.2.1	Section 3.6.2.1	Section 3.6.2.1	Section 3.6.2.1	Section 3.6.2.1
c. description of the relevant impacts of the action having regard to the full national extent of the species or community's range; and	Section 11.3.1	Section 11.3.1	Section 11.3.1	Section 11.3.1	Section 11.3.1
d. description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action	Section 7	Section 7	Section 7	Section 7	Section 7

Assessment requirement	Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Large-eared Pied Bat	White-throated Needletail	Bluegrass
e. identification of significant residual adverse impacts likely to occur after the proposed activities to avoid	Section 9.2	Section 9.2	Section 9.2	Section 9.2	Section 9.2

11.3.1. Revised Significant Impact Criteria

11.3.1.1. Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

This community was identified in the southern portion of the development site, along the transmission line route between Girragulang Road and the CWO-REZ Transmission Line. It occurs as patches of remnant vegetation and derived grasslands. Approximately 3.58 ha of this community will be removed by the project.

Table 73 Significant Impact Criteria for Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Impact Criteria	Response
An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:	
reduce the extent of an ecological community	The project will reduce the extent of the ecological community by 3.58 ha.
fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The project involves significant development of internal access tracks and transmission lines that will fragment remnant occurrences of the community. This fragmentation however will be narrow and is unlikely to impede any genetic transfer between retained patches.
adversely affect habitat critical to the survival of an ecological community	The project will remove existing habitat, which is considered to be habitat critical to the survival of the community.
modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	The project is unlikely to affect any abiotic processes necessary for the community's survival.
cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	The project will remove 3.58 ha of the community, however it is unlikely to result in any substantial change to the community locally.
cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established, or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or	The project will not assist any invasive species, nor cause any increased mobilisation of fertilisers which would kill or inhibit the growth of species in the ecological community.
interfere with the recovery of an ecological community.	The project will not interfere with any current recovery programs within the study area.
Conclusion	The project is unlikely to significantly impact this community as the impacts are confined to small remnant patches in an existing degraded landscape.

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

This community was identified throughout the majority of the development site. It occurs as patches of remnant vegetation. Grasslands within the development site are not consistent with the EPBC Act definition of this community. Approximately 64.23 ha of this community will be removed by the project.

Table 74 Significant Impact Criteria for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Impact Criteria	Response
An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:	
reduce the extent of an ecological community	The project will reduce the extent of the ecological community by 64.23 ha.
fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The project involves significant development of internal access tracks and transmission lines that will fragment remnant occurrences of the community. This fragmentation however will be narrow and is unlikely to impede any genetic transfer between retained patches.
adversely affect habitat critical to the survival of an ecological community	The project will remove existing habitat, which is considered to be habitat critical to the survival of the community.
modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	The project is unlikely to affect any abiotic processes necessary for the community's survival.
cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	The project will remove 64.23 ha of the community, however it is unlikely to result in any substantial change to the community locally.
cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established, or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or	The project will not assist any invasive species, nor cause any increased mobilisation of fertilisers which would kill or inhibit the growth of species in the ecological community.
interfere with the recovery of an ecological community.	The project will not interfere with any current recovery programs within the study area.
Conclusion	The project will significantly impact this community due to the reduction in the extent of the community only.

11.3.1.3. Large-eared Pied Bat

This species was recorded using ultrasonic detectors across the wind farm. This species was recorded in very low numbers, indicative of a low regional population utilising the development site for foraging only. The occurrence of this species within the development site is not considered to be an important population as described in *Matters of National Environmental Significance Significant impact guidelines 1.1* (Commonwealth of Australia, 2013) as:

- The individuals recorded are not considered to be a key source population either for breeding or dispersal as no breeding habitat was identified, and detection frequency was extremely low; and
- The population lacks evidence of a breeding site, and therefore does not acutely contribute to maintaining genetic diversity; and
- The population is not near the limit of the species range.

Table 75 Significant Impact Criteria for Large-eared Pied Bat

Impact criteria	Impact criteria
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
lead to a long-term decrease in the size of an important population of a species	The project is unlikely to lead to any long-term decrease in the size of an important population
reduce the area of occupancy of an important population	The project will not reduce the area of occupancy of an important population
fragment an existing important population into two or more populations	The project will not fragment an existing important population
adversely affect habitat critical to the survival of a species	The project will remove 180.49 ha foraging habitat for the species.
disrupt the breeding cycle of an important population	The project is unlikely to disrupt any breeding, as no breeding sites were identified.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	This species is widely known throughout the central west of NSW, but only has very few known breeding sites (nearest being at Ulan, NSW). Impacts to the species are likely to be limited to removal of foraging habitat with a low local population. The project is unlikely to remove or modify habitat such that the species is likely to decline.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The project is unlikely to result in the introduction of any invasive species
introduce disease that may cause the species to decline, or	The project is unlikely to result in the introduction of any disease that may affect the species
interfere substantially with the recovery of the species.	The project will not interfere with the recovery of the species.
Conclusion	This species will not be significantly impacted.

11.3.1.4. White-throated Needletail

This species was recorded on several occasions within the Mount Hope cluster of the project. This species is a spring/summer migrant to Australia. This species is listed as both migratory and vulnerable and so has been assessed under both significant impact criteria provisions as appropriate.

The occurrence of the species within the study area is not considered to be an important population as:

- The individuals recorded are not considered to be a key source population either for breeding or dispersal as no breeding habitat was identified, and detection frequency was extremely low; and
- The population lacks evidence of a breeding site, and therefore does not acutely contribute to maintaining genetic diversity; and
- The population is not near the limit of the species range.

Table 76 Significant Impact Criteria (vulnerable species) for White-throated Needletail

Impact criteria	Impact criteria
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
lead to a long-term decrease in the size of an important population of a species	The project is unlikely to lead to any long-term decrease in the size of an important population
reduce the area of occupancy of an important population	The project will not reduce the area of occupancy of an important population
fragment an existing important population into two or more populations	The project will not fragment an existing important population
adversely affect habitat critical to the survival of a species	The project will not remove foraging habitat for the species.
disrupt the breeding cycle of an important population	The project is unlikely to disrupt any breeding, as this species does not breed in Australia.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	This species is widely known throughout the central west of NSW. Impacts to the species are likely to be limited to removal of foraging habitat with a low transient local population. The project is unlikely to remove or modify habitat such that the species is likely to decline.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The project is unlikely to result in the introduction of any invasive species
introduce disease that may cause the species to decline, or	The project is unlikely to result in the introduction of any disease that may affect the species
interfere substantially with the recovery of the species.	The project will not interfere with the recovery of the species.
Conclusion	This species will not be significantly impacted.

The development site is not considered to be important habitat for a migratory species, as:

- whilst the habitat is utilised by a migratory species occasionally, the study area does not support an ecologically significant proportion of the population of the species, and

- the habitat present in the study area is not of critical importance to the species at particular life-cycle stages, and
- the habitat utilised by the species is not at the limit of the species range, and
- the habitat to be removed is not within an area where the species is declining.

Table 77 Significant Impact Criteria (migratory species) for White-throated Needletail

Impact criteria	Impact criteria
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:	
substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The project will not modify any important habitat
result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or	The project will not result in any invasive species that would affect any important population
seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The project will not affect any ecologically significant proportion of the population.
Conclusion	The species will not be significantly impacted.

11.3.1.5. Bluegrass

This species was identified at two locations within the study area. None of these individuals will be impacted by the project. The occurrence of these individuals is considered to be an important population, as it is near the southern limit of the species range.

Table 78 Significant Impact Criteria for Bluegrass

Impact criteria	Impact criteria
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
lead to a long-term decrease in the size of an important population of a species	The project will not affect any individuals of this species.
reduce the area of occupancy of an important population	The project will not affect any individuals of this species.
fragment an existing important population into two or more populations	The project will not affect any individuals of this species.
adversely affect habitat critical to the survival of a species	The project will not affect any individuals of this species.
disrupt the breeding cycle of an important population	The project will not affect any individuals of this species.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The project will not affect any individuals of this species.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The project is unlikely to result in the introduction of any invasive species
introduce disease that may cause the species to decline, or	The project is unlikely to result in the introduction of any disease that may affect the species
interfere substantially with the recovery of the species.	The project will not interfere with the recovery of the species.
Conclusion	This species will not be significantly impacted.

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Appendix A Definitions

The following terminology has been used throughout this report for the purposes of describing the impacts of the proposal in the context of a biodiversity assessment in accordance with the NSW Biodiversity Assessment Method 2020. This terminology may or may not align with other technical documents associated with the proposed development.

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

Terminology	Definition
Multiple fragmentation impact development	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines
Operational Manual	The Operational Manual published from time to time by DPIE, which is a guide to assist assessors when using the BAM
Patch size	An area of intact native vegetation that: a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or stewardship site..
Proponent	A person who intends to apply for consent to carry out development or for approval for an activity.
Reference sites	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5 cm within a vegetation zone.
Residual impact	An impact on biodiversity values after all reasonable measures have been taken to avoid, minimise or mitigate the impacts of development. Under the BAM, an offset requirement is determined for the remaining impacts on biodiversity values.
Retirement of credits	The purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	a development other than a linear shaped development, or a multiple fragmentation impact development
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by DPIE and accessible from the BioNet website.
Threatened species	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.

Terminology	Definition
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification.
Vegetation zone	A relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Wetland	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs

Appendix B Reasonable approximation of the Native Vegetation Regulatory Map

3.5 Native Vegetation Regulatory Map and land categorisation

The transitional Native Vegetation Regulatory Map (NVR Map) displays some of the land categories established under the LLS Act that apply to land regulated by Part 5A LLS Act. Vulnerable and Sensitive category 2 - regulated land and excluded Land map layers are available on the map and are in full regulatory force. Draft category 1 - exempt land and category 2 - regulated land map layers are not published.

Land not categorised on the transitional NVR Map is still bound by provisions of the legislation.

s60F LLS Act provides the transitional arrangements that are in place until a comprehensive NVR Map with all the land categories is published. During the 'transitional period', landholders are responsible for determining the categorisation of their land. Assessors can make a reasonable approximation of land categorisation for unpublished layers, in consultation with the landholder.

The transitional arrangements require land to be designated as category 1 - exempt land if a reasonable person would determine the land to be designated as category 1 - exempt land in accordance with the LLS Act.

Determining NVR Map land categorisation

Step 1) Is the subject land mapped on the transitional NV Map?

If YES, the subject land is:

- category 2 - vulnerable, and/or
- category 2 - sensitive regulated land, or
- excluded land

If NO (all or part of the subject land), go to step 2.

Step 2) Where all or part of the subject land is not mapped on the transitional NVR Map, the assessor/landholder may make a reasonable assessment of whether remaining land as either:

- category 2 - regulated land, or
- category 1 - exempt land

The assessor/landholder must use available data and information to make a reasonable approximation, including:

- NVR Map criteria listed in the LLS Act and Regulation
- NVR Map Method Statement and it's appendices which explains how data layers are used to construct the NVR Map
- Published data layers on the SEED Portal e.g. NSW Land Use 2017, NSW Native Vegetation Extent and NSW Woody Vegetation Extent & FPC 2011.
- Other site-specific information and records e.g. high-resolution aerial photography, historical land management records and photography, survey data, previous development/clearing documentation.

Where a reasonable approximation is required, it is recommended that:

- assessors first identify whether land meets criteria for category 2 - regulated land, prior to category 1 - exempt land.
  - In some circumstances, land may meet multiple map criteria i.e. criteria for category 2 - regulated land, AND category 1 - exempt land
  - In most circumstances' category 2 - regulated land criteria will determine the categorisation of the land, rather than category 1 - exempt land criteria.
  - e.g. if the land was lawfully cleared in mid-1990 (category 1 - exempt land), but contains native vegetation grown with the assistance of public funds in 2000 (category 2 - regulated land) the land should be designated as category 2 - regulated land.
- where there is uncertainty or data are conflicting, land should be mapped as category 2 - regulated land as a precautionary approach.
- the assessor consults with LLS and/or DPIE (as early as possible).
- all supporting documentation, including a map identifying NVR Map land categories is provided to the decision-maker as part of a clearing or development application, or a BDAR waiver application.

Effect of NVR Map land categorisation on the BOS

The NVR Map is an important consideration when determining if the BOS will apply to a proposal and circumstances where there may be limited assessment requirements under the BAM.

- the presence of category 1 – exempt land will affect whether the BOS applies to a proposal for development requiring consent, major project or vegetation clearing:
- the BOS threshold cannot be exceeded on category 1 – exempt land. The test of significance is still required in these circumstances and may trigger the BOS.
- presence of category 1 – exempt land is considered in a request for a BDAR waiver.
- approval to clear native vegetation from the Native Vegetation Panel under the LLS Act is not required on category 1-exempt land.

Recall that some proposals automatically require assessment and offsetting under the BOS (e.g. biodiversity certification, biodiversity stewardship).

When the BOS applies to a proposal, there are limited BAM assessment requirements on category 1 - exempt land:

- only prescribed impacts must be assessed on category 1 – exempt land (BAM subsection 1.5.1 (d)).
- considered when determining if the Streamlined assessment module – scattered trees may be applicable (BAM Appendix B).

In Stage 3 of the BAM (Improving biodiversity values), native vegetation that is on category 1 – exempt land at the time the application for a biodiversity stewardship agreement is made is considered to have a high risk of decline in vegetation integrity.

Example - Reasonable approximation of category 2-regulated land and category 1-exempt land

An assessor has been asked to make a reasonable approximation of land categorisation on the subject land in Figure 1.

Please note that this example does not provide a comprehensive description of all information that would be used to make a reasonable approximation.

Figure 2: Subject land with NSW imagery.

1. Is the subject land mapped on the transitional NVR Map?

Yes, partially. The subject land contains areas mapped as excluded land, category 2 – sensitive regulated land and category 2 – vulnerable regulated land (Figure 2).

Figure 3: Transitional NVR Map displaying Excluded land (grey), category 2 - sensitive regulated land (pink) and category 2 - vulnerable regulated land (orange).

2. Is the subject land category 2 – regulated land?

Yes, partially. For criteria identified in the LLS Act and regulation, the subject land contains land that was not cleared of native vegetation at 1 January 1990 and areas of native ground cover (that are not grasslands or low conservation value groundcover).

These outcomes were supported by analysis of the NVR map method, associated data layers (e.g. land mapped as grazing native vegetation in Figure 3, land mapped as tree cover in Figure 4), historical aerial imagery and land management records.

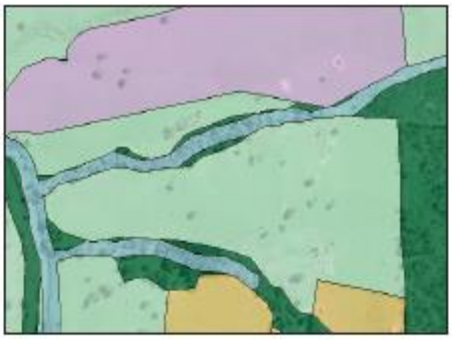


Figure 4: NSW Landuse 2017 displaying 2.1.0 Grazing native vegetation (dark green), 3.2.0 Grazing modified pastures (light green), 3.3.0 Cropping (purple), 5.4.0 Residential and farm infrastructure (orange) and 6.3.0 River (blue).

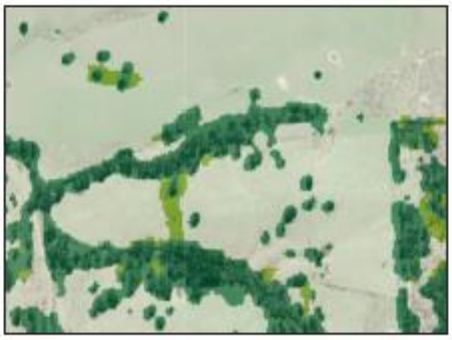


Figure 5: NSW Native Vegetation Extent displaying tree cover (dark green) and woodland matrix (light green).

3. Is the subject land category 1 – exempt land?

Yes, partially. For the criteria identified in the LLS Act and regulation, the subject land contains land that was cleared of native vegetation at 1 January 1990 and areas of low conservation groundcover (not being grasslands).

These outcomes were supported by analysis of the NVR map method, associated data layers (e.g. land mapped as grazing modified pastures in Figure 3, land not mapped as tree cover or woodland matrix in Figure 4), historical aerial imagery and land management records.

Figure 5 depicts the reasonable approximation of category 2-regulated land and category 1-exempt land on the subject land.

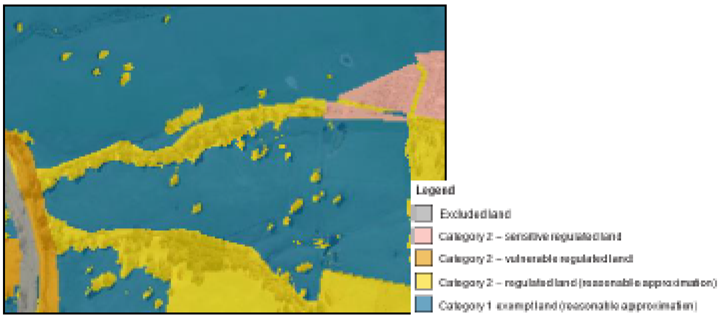


Figure 6: Reasonable approximation of category 2 - regulated land and category 1 - exempt land displayed with published transitional NVR Map layers on NSW Imagery.

Criteria for Category 2 – regulated land

- The land was not cleared of native vegetation as at 1 January 1990 (unless section 60H (2) or (3) requires the land to be designated as category 1-exempt land)
- The land was unlawfully cleared of native vegetation after 1 January 1990
- The land contains native vegetation that was grown or preserved with the assistance of public funds (other than funds for forestry purposes)
- The land contains grasslands that are not low conservation value grasslands (or low conservation grassland beneath the canopy/drip-line of woody native vegetation)
- The land is (or was previously) subject to a private native forestry plan approved under Part 5B of the LLS Act,
- The land is a travelling stock reserve (unless the land is in the Western Division of the State)
- The land is identified as "proximity area for coastal wetlands" or "proximity area for littoral rainforest" by State Environmental Planning Policy (Coastal Management) 2018 if that land is in the coastal wetlands and littoral rainforests area of the coastal zone referred to in the *Coastal Management Act 2016*

Please note that this list does not include criteria for the designation of category 2 – sensitive or vulnerable regulated land.

Criteria for Category 1 – exempt land

- Land cleared of native vegetation as at 1 January 1990, or lawfully cleared between 1 January 1990 and the commencement of the LLS Act,
- Land that contains grassland or other non-woody vegetation that have been significantly disturbed or modified, therefore taken to be cleared (criteria established in the LLS Reg),
- Land that contains low conservation value grasslands or groundcover,
- Land that contains native vegetation identified as regrowth in a property vegetation plan,
- Land that is Biodiversity Certified,
- Land authorised to be recategorised e.g. certificate authorising clearing under the LMC.

When considering the criteria for Category 1 – exempt land and Category 2 – regulated land, native vegetation that comprises grasslands or other non-woody vegetation is taken to have been cleared if the native vegetation was significantly disturbed or modified (s60J LLS Act). Refer to criteria listed in cl 114 LLS Reg for determining whether native vegetation has been

significantly disturbed or modified between 1 January 1990 and date of commencement of Part 5A of the Act (25 August 2017).

Appendix C Vegetation Floristic Plot Data

Provided as digital attachment

Appendix D Vegetation Integrity Plot Data

Provided as digital attachment

Appendix E Plant Community Type Profiles

Table 79: Zone 1 PCT 42 Moderate Condition

42 - River Red Gum / River Oak riparian woodland wetland in the Hunter Valley				
Conservation status	NSW BC Act	Not listed	EPBC Act	Not listed
Description	Occurs as a narrow band of vegetation fringing creeks on lower alluvial plains where there is an accumulation of black alluvial soils. Dominated by *Eucalyptus camaldulensis* with occasional *Casuarina cunninghamii. Eucalyptus melliodora* (Yellow Box) may also occur on elevated sites. The shrub layer is very sparse and there is a high proportion of exotic species in the ground layer, likely due to high disturbance from flood events, grazing and recruitment from adjacent cropped areas.			
Characteristic canopy trees	Eucalyptus camaldulensis			
Characteristic mid-storey	Casuarina cunninghamii			
Characteristic groundcovers	--			
Exotic species	Lolium perenne, Medicago sp., Hydrochaeris radicata, Conyza sp.			
Condition	Moderate			
Variation and disturbance	Periodic physical disturbance from flood events. Likely to be prone to short-term variation in ground layer species in response to seasonal conditions. Located adjacent to cultivated areas with incursions of exotic species.			
No. sites sampled	0			
Fauna habitats	Potential for hollow bearing trees.			

Table 80: Zone 2PCT 85 Moderate Condition

85 - River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion				
Conservation status	NSW BC Act	Not listed	EPBC Act	Not listed
Description	Occurs as a narrow band of vegetation fringing creeks on lower alluvial plains where there is an accumulation of black alluvial soils but may also occur on sandy or rocky sites. These sites may be occupied by *Casuarina cunninghamii* (River Oak) due to the water table conditions, frequent waterlogging of soils, and periodic physical disturbance through flooding (Charmers et al. 2012; Erskine et al. 2013). *Eucalyptus melliodora* (Yellow Box) may also occur on slightly elevated sites. The shrub layer is very sparse and there is a high proportion of exotic species in the ground layer due to high disturbance from flood events, grazing and recruitment from adjacent cropped areas.			
Characteristic canopy trees	Casuarina cunninghamii, Eucalyptus melliodora			
Characteristic mid-storey	Generally absent			
Characteristic groundcovers	Einadia hastata, Urtica incisa, Paspalidium distans			
Exotic species	Lolium perenne, Amaranthus powellii, Chenopodium album, Hirschfeldia incana, Hydrochaeris radicata, Conyza sp., Malva parviflora, Polygonum arenastrum, Silybum marianum, Solanum nigrum, Sonchus oleraceus, Xanthium spinosum, Datura stramonium			
Condition	Moderate			
Variation and disturbance	Periodic physical disturbance from flood events. Likely to be prone to short-term variation in ground layer species in response to seasonal conditions. May be grazed by livestock, native and feral fauna. Located adjacent to cultivated areas with incursions of exotic species.			
No. sites sampled	2			
Fauna habitats	Amphibian habitat in streams. Potential for small hollow bearing trees.			

Table 81: Zone 3 PCT 272 Moderate condition

272 - White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes				
Conservation status	NSW BC Act	Endangered	EPBC Act	Endangered
Description	This community occurs primarily on sandstone derived soils on lower slopes at the southern end of the study area. It is dominated by *Eucalyptus microcarpa* (Inland Grey Box) with Eucalyptus crebra (Narrow-leaved Ironbark) occurring less frequently. A sparse shrub layer is maintained in a low-moderate condition by sheep grazing and includes *Cassinia sifton* (Sifton Bush) and *Bursaria spinosa* (Sweet Bursaria). The ground layer includes species typical of a disturbed grassy understorey including *Austrostipa scabra* subsp. *scabra* (Spear Grass), *Calotis cuneifolia* (Purple Burr-daisy), *Eragrostis brownii* (Brown's Lovegrass), *Sporobolus elongatus* (Slender Rat's Tail Grass), *Echinopogon caespitosus* var. *caespitosus* (Bushy Hedgehog-grass), *Aristida ramosa* (Purple Wiregrass), *Hypochaeris radicata* (Catsear) and *Sorghum halepense* (Johnson Grass).			
Characteristic canopy trees	Eucalyptus microcarpa, Eucalyptus crebra			
Characteristic mid-storey	Cassinia sifton, Epacris sp., Bursaria spinosa subsp. spinosa, Hibbertia obtusifolia			
Characteristic groundcovers	Aristida ramosa, Austrostipa scabra, Calotis cuneifolia, Cymbonotus lawsonianus, Cynodon dactylon, Echinopogon caespitosus, Einadia hastata, Einadia nutans, Eragrostis brownii, Goodenia hederacea, Laxmannia gracilis, Lomandra multiflora, Sporobolus elongatus, Wahlenbergia communis			
Exotic species	Sorghum halepense, Hypochaeris radicata, Lysimachia arvense, Soliva sessilis, Paronychia brasiliana			
Condition	Moderate			
Variation and disturbance	Heavy grazing by sheep maintains low cover in shrub and ground layers. Likely to be some minor variation in canopy species across the entire community.			
No. sites sampled	2			
Fauna habitats	Potential for small hollow bearing trees.			

Table 82: Zone 4 PCT 272 Low condition – Derived native grassland

272 - White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes				
Conservation status	NSW BC Act	Endangered	EPBC Act	Endangered
Description	This community occurs primarily on sandstone derived soils on lower slopes at the southern end of the study area on the Goodman property. It occurs adjacent to 272 Moderate but lacks tree cover presumably due to clearing for sheep grazing. The canopy and mid-storey layers are absent, however *Cassinia sifton* may occur particularly where grazing is excluded. The ground layer is variable but is often dominated by *Cynodon dactylon* (Couch), *Eragrostis brownii* (Brown's Lovegrass), *Sporobolus elongatus* (Slender Rat's Tail Grass) and exotic species including *Eragrostis cilianensis* (Stinkgrass), *Eragrostis curvula* (African Lovegrass), *Agrostis capillaris* (Browntop Bent), *Lolium perenne* (Perennial Ryegrass)			
Characteristic canopy trees	Absent			
Characteristic mid-storey	Absent from sites surveyed but scattered *Cassinia sifton* may occur in low numbers across the community particularly where grazing is excluded			
Characteristic groundcovers	Cynodon dactylon, Eragrostis brownii, Sporobolus elongatus, Juncus subsecundus, Lomandra confertifolia, Rytidosperma fulvum, Calotis lappulacea, Cheilanthes sieberi, Cymbonotus lawsonianus, Dichondra repens			
Exotic species	Eragrostis cilianensis, Eragrostis curvula, Agrostis capillaris, Lolium perenne, Trifolium repens, Agrostis capillaris, Dactylis glomerata, Acetosella vulgaris, Soliva sessilis, Gamochaeta calviceps, Xanthium spinosum			
Condition	Low - Derived native grassland			
Variation and disturbance	Grazed by sheep. Likely to be variation in grass, forb, shrub and other species composition and cover across the entire community depending on grazing history and current regime, microtopography and seasonality.			
No. sites sampled	3			
Fauna habitats				

Table 83: Zone 5 PCT 281 Good condition

281 - Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion				
Conservation status	NSW BC Act	Critically Endangered	EPBC Act	Critically Endangered
Description	This community typically occurs on the banks of creeks where there is an accumulation of recently deposited black alluvial and colluvial sediments derived from basalt and sandstone parent materials producing high to moderate soil fertility and high to moderate water holding capabilities. Small patches of remnant vegetation exist primarily on the creek banks with communities dominated by Eucalyptus melliodora (Yellow Box), Angophora floribunda (Rough-barked Apple), Eucalyptus blakelyi (Blakely's Red Gum). The land use history is a major determinate of vegetation condition and composition in this community, and the shrub layer is typically very sparse with occasional Acacia species and Brachychiton populneus (Kurrajong).			
Characteristic canopy trees	Angophora floribunda, Eucalyptus melliodora, Eucalyptus blakelyi			
Characteristic mid-storey	Brachychiton populneus, Leptospermum polygalifolium, Persoonia linearis, Acacia species, Hibbertia obtusifolia			
Characteristic groundcovers	Lomandra longifolia, Cynodon dactylon, Cheilanthes sieberi subsp. sieberi, Pomax umbellata, Lomandra multiflora subsp. multiflora, Wahlenbergia communis, Cyperus gracilis, Macrozamia spiralis			
Exotic species	Hypochaeris radicata			
Condition	Good			
Variation and disturbance				
No. sites sampled	3			
Fauna habitats	Potential for small hollow bearing trees.			

Table 84: Zone 6 PCT 281 Moderate condition

281 - Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion				
Conservation status	NSW BC Act	Critically Endangered	EPBC Act	Critically Endangered
Description	This community typically occurs on the banks of creeks where there is an accumulation of recently deposited black alluvial and colluvial sediments derived from basalt and sandstone parent materials producing high to moderate soil fertility and high to moderate water holding capabilities. Small patches of remnant vegetation exist primarily on the creek banks with communities dominated by Eucalyptus melliodora (Yellow Box), Angophora floribunda (Rough-barked Apple), Eucalyptus blakelyi (Blakely's Red Gum). The land use history is a major determinate of vegetation condition and composition in this community, and the shrub layer is typically very sparse with occasional Acacia species and Brachychiton populneus (Kurrajong).			
Characteristic canopy trees	Eucalyptus melliodora, Angophora floribunda, Eucalyptus blakelyi, Eucalyptus 'albemol'			
Characteristic mid-storey	Brachychiton populneus, Solanum cinereum, Acacia species			
Characteristic groundcovers	Austrostipa verticillata, Chloris truncata, Austrostipa scabra subsp. scabra, Einadia hastata, Aristida ramosa, Bothriochloa macra, Microlaena stipoides var. stipoides, Einadia nutans subsp. linifolia, Sigesbeckia australiensis, Urtica incisa			
Exotic species	Paspalum dilatatum, Lolium perenne, Cyperus Eragrostis, Hordeum spp., Malva parviflora, Plantago lanceolata, Medicago spp., Brassica juncea, Marrubium vulgare, Rosa rubiginosa, Salvia verbenaca, Solanum nigrum, Amaranthus powellii, Bidens subalternans, Conyza spp., Lepidium africanum, Schinus spp., Sonchus oleraceus, Vicia sativa subsp. sativa			
Condition	Moderate			
Variation and disturbance	Grazed by sheep and cattle. Likely to be variation in grass, forb, shrub and other species composition and cover across the entire community depending on grazing history and current regime, microtopography and seasonality.			
No. sites sampled	5			
Fauna habitats	Potential for small hollow bearing trees.			

Table 85: Zone 7 PCT 281 Low condition – Derived native grassland

281 - Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion				
Conservation status	NSW BC Act	Critically Endangered	EPBC Act	Critically Endangered
Description	This community typically occurs on the banks of creeks where there is an accumulation of recently deposited black alluvial and colluvial sediments derived from basalt and sandstone parent materials producing high to moderate soil fertility and high to moderate water holding capabilities. Small patches of remnant vegetation exist primarily on the creek banks with communities dominated by Eucalyptus melliodora (Yellow Box), Angophora floribunda (Rough-barked Apple), Eucalyptus blakelyi (Blakely's Red Gum). This community is mapped between those vegetated patches, where there is no canopy or mid storeys and the ground layer is dominated by exotic or native grasses.			
Characteristic canopy trees	Absent			
Characteristic mid-storey	Generally absent. Scattered immature *Brachychiton populneus, Acacia* species may be present			
Characteristic groundcovers	Austrostipa verticillata, Chloris truncata, Austrostipa scabra subsp. scabra, Einadia hastata, Aristida ramosa, Bothriochloa macra, Microlaena stipoides var. stipoides, Einadia nutans subsp. linifolia, Sigesbeckia australiensis, Urtica incisa			
Exotic species	Paspalum dilatatum, Lolium perenne, Cyperus Eragrostis, Hordeum spp., Malva parviflora, Plantago lanceolata, Medicago spp., Brassica juncea, Marrubium vulgare, Rosa rubiginosa, Salvia verbenaca, Solanum nigrum, Amaranthus powellii, Bidens subalternans, Conyza spp., Lepidium africanum, Schinus spp., Sonchus oleraceus, Vicia sativa subsp. sativa			
Condition	Low – derived native grassland			
Variation and disturbance	Grazed by sheep and cattle. There is variation in native grass and forb species composition and cover, and proportion of exotic species across the community depending on grazing history and current regime, microtopography and seasonality.			
No. sites sampled	3			
Fauna habitats				

Table 86: Zone 8 PCT 461 Burnt condition

461 - Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion				
Conservation status	NSW BC Act	Not listed	EPBC Act	Not listed
Description	The soil is rocky and shallow which is characteristic habitat for Eucalyptus dealbata (Tumbledown Red Gum). Eucalyptus dealbata (Tumbledown Red Gum) is the dominant canopy tree in this community with Eucalyptus macrorhyncha (Red Stringybark) also occurring. The understorey is very sparse due to heavy sheep grazing.			
Characteristic canopy trees	Eucalyptus dealbata, Eucalyptus macrorhyncha			
Characteristic mid-storey	*Callitris endlicheri* (Black Cypress), *Brachychiton populneus* (Kurrajong) and *Acacia* species make up a very sparse mid-layer			
Characteristic groundcovers	Goodenia heterophylla, Calotis lappulacea, Dichondra repens, Wurmbea dioica, Gonocarpus teucrioides			
Exotic species	Conyza species, Hypochaeris radicata, Petrorhagia dubia, Arctotheca calendula			
Condition	Burnt			
Variation and disturbance	Heavily grazed by sheep and cattle			
No. sites sampled	0			
Fauna habitats	Potential for small hollow bearing trees			

Table 87: Zone 9 PCT 461 Moderate condition

461 - Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion				
Conservation status	NSW BC Act	Not listed	EPBC Act	Not listed
Description	The soil is rocky and shallow which is characteristic habitat for Eucalyptus dealbata (Tumbledown Red Gum). Eucalyptus dealbata (Tumbledown Red Gum) is the dominant canopy tree in this community with Eucalyptus macrorhyncha (Red Stringybark) and Angophora floribunda (Rough-barked Apple) also occurring. The understorey is very sparse and weedy, being located nearby to the Golden Highway.			
Characteristic canopy trees	Eucalyptus dealbata, Eucalyptus macrorhyncha, Angophora floribunday			
Characteristic mid-storey	*Callitris endlicheri* (Black Cypress), *Brachychiton populneus* (Kurrajong) and *Acacia* species make up a very sparse mid-layer			
Characteristic groundcovers				
Exotic species	Conyza species, Hypochaeris radicata, Hyparrhenia hirta, Eragrostis curvula			
Condition	Moderate			
Variation and disturbance	Weedy understorey nearby to rest area			
No. sites sampled	0			
Fauna habitats	Potential for small hollow bearing trees			

Table 88: Zone 10 PCT 478 Good condition

478 - Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion				
Conservation status	NSW BC Act	Not listed	EPBC Act	Not listed
Description	Occurs in small areas generally on slopes adjacent to 479 where it has been excluded from fire or burnt at low intensity. The canopy is unburnt or showing strong recovery.			
Characteristic canopy trees	Eucalyptus rossii, Eucalyptus sparsifolia, occasional Angophora floribunda and Eucalyptus blakelyi			
Characteristic mid-storey	Acacia buxifolia subsp. buxifolia, Persoonia linearis, Podolobium ilicifolium, Acacia falciformis, Acacia ixodes Cassinia quinquefaria, Dampiera lanceolata, Hovea sp., Acacia gladiiformis, Dodonaea viscosa subsp. cuneata, Allocasuarina sp., Xanthorrhoea sp.			
Characteristic groundcovers	Stypandra glauca, Lomandra species, Phyllanthus hirtellus, Pomax umbellata, Wahlenbergia communis, Poranthera microphylla, Podolobium ilicifolium, Hardenbergia violacea, Goodenia hederacea, Einadia nutans, Calotis cuneifolia			
Exotic species	None recorded			
Condition	Good			
Variation and disturbance	A low amount of variation in understorey species and minor, small-scale patchiness of vegetation that is unburnt or burnt at low intensity			
No. sites sampled	2			
Fauna habitats	Potential for small hollow bearing trees			

Table 89: Zone 11 PCT 479 Burnt condition

479 - Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion				
Conservation status	NSW BC Act	Not listed	EPBC Act	Not listed
Description	The sandstone derived soils on undulating slopes are largely unutilised by grazing or cropping and contain intact remnant vegetation. This community was severely impacted by high intensity fire in 2017 and is still in relatively early stages of recovery.			
Characteristic canopy trees	Eucalyptus crebra, Eucalyptus rossii			
Characteristic mid-storey	Acacia decora, Acacia gladiiformis, Acacia caroleae, Dampiera lanceolata			
Characteristic groundcovers	Aristida vagans, Chrysocephalum apiculatum, Gonocarpus elatus, , Stypandra glauca, Allocasuarina sp., Poranthera microphylla, Cheilanthes sieberi, Digitaria ramularis, Persoonia linearis, Pomax umbellata, Wahlenbergia communis, Cynodon dactylon, Dichondra repens, Eragrostis brownii, Geranium solanderi, Sporobolus creber			
Exotic species	Lysimachia arvensis, Trifolium arvense			
Condition	Burnt with poor regeneration			
Variation and disturbance	Regeneration is variable but mostly consists of Acacia shrubland with remnant canopy trees showing low levels of post-fire epicormic regrowth			
No. sites sampled	4			
Fauna habitats	Dense low vegetation for small birds. Acacia blossom provides forage resource for birds and invertebrates			

Table 90: Zone 12 PCT 479 Moderate condition

Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion				
Conservation status	NSW BC Act	Not listed	EPBC Act	Not listed
Description	Eucalyptus crebra dominated forest with sparse degraded shrubby regrowth in the midstorey, or midstorey may be absent. Occurs on sandy soils derived from sandstone and many areas are actively grazed by sheep and cattle			
Characteristic canopy trees	Eucalyptus crebra, occasionally Angophora floribunda			
Characteristic mid-storey	Generally absent			
Characteristic groundcovers	Aristida spp., Dichondra repens, Austrostipa aristiglumis, Calotis lappulacea, Cotula australis, Juncus filicaulis, Einadia nutans subsp. linifolia			
Exotic species	Lolium spp., Acetosella vulgaris, Trifolium spp., Hypochaeris radicata, Trifolium angustifolium, Conyza spp., Erodium moschatum, Hypericum perforatum, Verbena bonariensis			
Condition	Moderate			
Variation and disturbance	Midstorey may be degraded shrubby regrowth, or midstorey may be absent. Grazed by sheep and cattle.			
No. sites sampled	7			
Fauna habitats				

Table 91: Zone 13 PCT 479 Post-fire Regeneration

479 - Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion				
Conservation status	NSW BC Act	Not listed	EPBC Act	Not listed
Description	The sandstone derived soils on undulating slopes are largely unutilised by grazing or cropping and contain intact remnant vegetation. This community was severely impacted by high intensity fire in 2017 and shows a high amount of post-fire regeneration compared to the 'burnt' condition community.			
Characteristic canopy trees	Eucalyptus spp. seedlings			
Characteristic mid-storey	Acacia gladiiformis, Cassinia spp., Brachyloma daphnoides subsp. daphnoides, Stypandra glauca, Dodonaea viscosa subsp. cuneata, Dillwynia hispida, Acacia spp., Persoonia linearis, Casuarina spp., Lomatia silaifolia, Acacia ulicifolia			
Characteristic groundcovers	Aristida ramosa, Cheilanthes sieberi subsp. sieberi, Eragrostis brownii, Gonocarpus elatus, Panicum spp., Goodenia paniculata, Gahnia aspera, Lomandra multiflora subsp. multiflora			
Exotic species	Absent			
Condition	Regenerating			
Variation and disturbance	Moderate. Generally dominated by dense regrowth of *Acacia* species with variable shrubby regeneration			
No. sites sampled	4			
Fauna habitats	Dense low vegetation for small birds. Acacia blossom provides forage resource for birds and invertebrates			

Table 92: Zone 14 PCT 483 Good condition

483 - Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley				
Conservation status	NSW BC Act	Critically Endangered	EPBC Act	Critically Endangered
Description	Good condition Eucalyptus 'albemol' woodland with a higher proportion of native grasses and forbs in the ground layer comparted to the equivalent 'moderate' condition.			
Characteristic canopy trees	Eucalyptus 'albemol', Brachychiton populneus			
Characteristic mid-storey	Generally absent			
Characteristic groundcovers	Dichanthium sericeum, Aristida species, Austrostipa aristiglumis, Austrostipa scabra, Microlaena stipoides var. stipoides, Bothriochloa macra, Calotis lappulacea, Oxalis perennans, Dichondra repens, Erodium crinitum			
Exotic species	Medicago polymorpha, Silybum marianum, Marrubium vulgare, Xanthium spinosum, Tagetes minuta, Malva parviflora			
Condition	Good			
Variation and disturbance	Ground layer varies depending on site microtopography, grazing management, fire history and seasonality. Ground layer directly under trees is generally poorer condition due to livestock camping and increased sheltered favouring annual exotic species.			
No. sites sampled	2			
Fauna habitats	Potential for small-medium sized hollows (5-15 cm). Large hollows (>20cm) generally absent.			

Table 93: Zone 15 483 Moderate condition

483 - Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley				
Conservation status	NSW BC Act	Critically Endangered	EPBC Act	Critically Endangered
Description	Moderate condition *Eucalyptus* 'albemol' woodland with a high proportion of exotic species as well as some native grasses and forbs in the ground layer			
Characteristic canopy trees	Eucalyptus 'albemol', occasionally Angophora floribunda			
Characteristic mid-storey	Generally absent			
Characteristic groundcovers	Dichelachne micrantha, Erodium crinitum, Austrostipa verticillata, Oxalis perennans, Cotula australis, Dichondra spp., Calotis lappulacea, Einadia nutans subsp. nutans, Chenopodium glaucum, Geranium solanderi var. solanderi, Calotis cuneifolia, Rumex brownii, Geranium retrorsum, Geranium spp.			
Exotic species	Silybum marianum, Medicago minim, Trifolium spp., Lolium spp., Hordeum spp., Echium plantagineum, Medicago polymorpha, Lysimachia arvensis, Torilis nodosa, Erodium cicutarium, Carthamus lanatus, Urtica urens, Malva parviflora, Brassica juncea, Brassica rapa subsp. campestris, Bidens spp., Capsella bursa-pastoris, Stellaria media, Erodium moschatum, Rorippa palustris, Agrostis capillaris, Cirsium spp., Marrubium vulgare			
Condition	Moderate			
Variation and disturbance	Canopy species may vary depending on clearing history of site e.g. where only *Brachychiton populneus* remains in an otherwise cleared paddock. Ground layer varies significantly depending on site microtopography, grazing management, fire history and seasonality but is generally weedy			
No. sites sampled	12			
Fauna habitats	Potential for small-medium sized hollows (5-15 cm). Large hollows (>20cm) generally absent.			

Table 94: Zone 16 Low Condition – Derived Native Grasslands

483 - Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley				
Conservation status	NSW BC Act	Critically Endangered	EPBC Act	Critically Endangered
Description	Derived native grassland on basalt derived soils, generally adjacent to *Eucalyptus 'albemol'* woodland which likely occurred pre-clearing.			
Characteristic canopy trees	Not recorded			
Characteristic mid-storey	Generally absent			
Characteristic groundcovers	Erodium crinitum, Einadia nutans subsp. nutans, Salvia spp., Dichelachne micrantha, Rumex brownii, Austrostipa verticillata, Crassula sieberiana, Vittadinia sulcata, Lomandra spp., Calotis lappulacea, Oxalis perennans, Aristida ramosa, Rytidosperma spp., Solanum cinereum, Dichondra spp., Einadia hastata, Dichondra repens			
Exotic species	Trifolium subterraneum, Echium plantagineum, Cirsium spp., Eragrostis cilianensis, Erodium cicutarium, Silybum marianum, Carthamus lanatus, Medicago minima, Lolium spp., Capsella bursa-pastoris, Agrostis capillaris, Lepidium africanum, Sonchus oleraceus, Trifolium spp., Medicago polymorpha, Lysimachia arvensis, Brassica juncea, Arctotheca calendula, Brassica rapa subsp. campestris, Hordeum spp., Trifolium arvense			
Condition	Low – derived native grassland			
Variation and disturbance	Ground layer varies significantly depending on site microtopography, grazing management, fire history and seasonality			
No. sites sampled	5			
Fauna habitats				

Table 95: Zone 17 PCT 616 Moderate condition

616 - Grey Myrtle - Rusty Fig dry rainforest in sandstone gorges of the upper Hunter Valley				
Conservation status	NSW BC Act	Not listed	EPBC Act	Not listed
Description	On sites sheltered by steep slopes or rocky outcrops, small, restricted pockets of dry rainforest vegetation occur dominated by *Ficus rubiginosa* (Rusty Fig) with *Angophora floribunda* (Rough-leaved Apple) and *Brachychiton populneus*. This community is mapped in small areas on the Belang, Orana, Alambi, Red Hilll and Bald Ridge properties. Sheep and cattle graze the understorey, maintaining it in a low-moderate condition.			
Characteristic canopy trees	Ficus rubiginosa, Brachychiton populneus			
Characteristic mid-storey	Generally absent, may include low cover of *Acacia* species or juvenile *Brachychiton populneus*.			
Characteristic groundcovers	Calotis lappulacea, Microlaena stipoides var. stipoides, Cheilanthes sieberi subsp. sieberi, Austrostipa scabra subsp. scabra, Cotula australis, Dichondra repens, Sigesbeckia australiensis, Sporobolus creber, Crassula sieberiana, Vittadinia spp., Cymbopogon refractus, Wahlenbergia communis, Arthropodium milleflorum, Desmodium varians, Einadia hastata, Solanum cinereum, Veronica plebeia			
Exotic species	Arctotheca calendula, Anagallis spp., Sonchus oleraceus, Lepidium didymum, Solanum nigrum			
Condition	Moderate			
Variation and disturbance	Condition is generally consistent across the study area. Understorey is grazed by sheep, cattle, and native herbivores.			
No. sites sampled	1			
Fauna habitats	Potential for small hollows. Sheltered rocky areas.			

Appendix F EPBC Act Box Gum Woodland assessment

Table 96 EPBC Act Box Gum Woodland assessment

Plot	PCT Code	Condition	Correct overstorey species?	>50% perennial groundcover	Patch > 0.1 ha	>12 non-grass native	Important species present	Patch >2 ha	20+ trees per ha OR natural regen
Plot 1	479	Burnt	NO	Not the listed ecological community					
Plot 2	483	Low	YES	NO - 13%	Not the listed ecological community				
Plot 3	483	Low	YES	NO - 16%	Not the listed ecological community				
Plot 4	483	Cat1	Not the listed ecological community						
Plot 5	483	Cat1	Not the listed ecological community						
Plot 6	483	Moderate	YES	NO - 41%	Not the listed ecological community				
Plot 7	483	Moderate	YES	NO - 14%	Not the listed ecological community				
Plot 8	479	Burnt	NO	Not the listed ecological community					
Plot 9	483	Cat1	Not the listed ecological community						
Plot 10	483	Moderate	YES	NO - 5%	Not the listed ecological community				
Plot 11	483	Moderate	YES	NO - 9%	Not the listed ecological community				
Plot 12	483	Moderate	YES	NO - 15%	Not the listed ecological community				
Plot 13	483	Moderate	YES	NO - 5%	Not the listed ecological community				
Plot 14	483	Moderate	YES	NO - 2%	Not the listed ecological community				
Plot 15	483	Moderate	YES	NO - 5%	Not the listed ecological community				
Plot 16	483	Moderate	YES	NO - 29%	Not the listed ecological community				
Plot 17	483	Moderate	YES	NO - 11%	Not the listed ecological community				
Plot 18	483	Moderate	YES	NO - 3%	Not the listed ecological community				
Plot 19	479	Moderate	NO	Not the listed ecological community					
Plot 20	478	Good	NO	Not the listed ecological community					

Plot	PCT Code	Condition	Correct overstorey species?	>50% perennial groundcover	Patch > 0.1 ha	>12 non-grass native	Important species present	Patch >2 ha	20+ trees per ha OR natural regen
Plot 21	281	Good	YES	YES - 96%	YES	YES - 19	YES – *G. tabacina*	The listed ecological community	
Plot 22	483	Cat1	Not the listed ecological community						
Plot 23	483	Moderate	YES	YES - 63%	YES	NO - 8	Not the listed ecological community		
Plot 24	84	Moderate	NO	Not the listed ecological community					
Plot 25	281	Moderate	YES	YES - 92%	YES	YES - 19	YES - *C. lappulacea*	The listed ecological community	
Plot 26	281	Moderate	YES	YES - 75%	YES	YES - 17	YES – *D. varians*	The listed ecological community	
Plot 27	483	Moderate	YES	YES - 98%	YES	YES - 21	YES – *C. lappulacea*	The listed ecological community	
Plot 28	483	Cat1	Not the listed ecological community						
Plot 29	281	Moderate	YES	YES - 99%	YES	YES - 12	YES – *C. lappulacea*	The listed ecological community	
Plot 30	84	Moderate	NO	Not the listed ecological community					
Plot 31	281	Moderate	YES	YES - 91%	YES	YES - 21	YES – *C. lappulacea*	The listed ecological community	
Plot 32	281	Moderate	YES	NO - 23%	Not the listed ecological community				
Plot 33	479	Regen	NO	Not the listed ecological community					
Plot 34	479	Regen	NO	Not the listed ecological community					
Plot 35	479	Regen	NO	Not the listed ecological community					
Plot 36	479	Regen	NO	Not the listed ecological community					
Plot 37	479	Burnt	NO	Not the listed ecological community					
Plot 38	281	Good	YES	YES - 99%	YES	YES - 18	YES – *H. obtusifolia*	The listed ecological community	
Plot 39	281	Good	YES	YES - 94%	YES	18	YES – *C. lappulacea*	The listed ecological community	
Plot 40	479	Moderate	NO	Not the listed ecological community					
Plot 41	479	Moderate	NO	Not the listed ecological community					
Plot 42	272	Moderate	NO	Not the listed ecological community					
Plot 43	272	Low	NO	Not the listed ecological community					

Plot	PCT Code	Condition	Correct overstorey species?	>50% perennial groundcover	Patch > 0.1 ha	>12 non-grass native	Important species present	Patch >2 ha	20+ trees per ha OR natural regen
Plot 44	272	Low	NO	Not the listed ecological community					
Plot 45	281	Cat1	Not the listed ecological community						
Plot 46	483	Moderate	YES	NO - 40%	Not the listed ecological community				
Plot 47	479	Moderate	NO	Not the listed ecological community					
Plot 48	478	Good	NO	Not the listed ecological community					
Plot 49	479	Burnt	NO	Not the listed ecological community					
Plot 50	483	Low	YES	NO - 24%	Not the listed ecological community				
Plot 51	272	Moderate	NO	Not the listed ecological community					
Plot 52	272	Low	NO	Not the listed ecological community					
Plot 53	479	Moderate	NO	Not the listed ecological community					
Plot 54	479	Low	NO	Not the listed ecological community					
Plot 55	479	Moderate	NO	Not the listed ecological community					
Plot 56	479	Low	NO	Not the listed ecological community					
Plot 57	479	Low	NO	Not the listed ecological community					
Plot 58	616	Moderate	NO	Not the listed ecological community					
Plot 59	483	Low	YES	NO - 23%	Not the listed ecological community				
Plot 60	483	Low	YES	YES - 77%	YES	NO -9	Not the listed ecological community		
Plot 61	479	Moderate	NO	Not the listed ecological community					

Appendix G Predicted species reports

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021959/BAAS17021/22/00032036	VoW BBS - TxL	24/11/2021
Assessor Name	Report Created	BAM Data version *
Alexander Pursche	27/04/2022	50
Assessor Number	Assessment Type	BAM Case Status
BAAS17021	Major Projects	Finalised
Assessment Revision		Date Finalised
2		27/04/2022

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

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

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Black Falcon	Falco subniger	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Corben's Long-eared Bat	Nyctophilus corbeni	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
Diamond Firetail	Stagonopleura guttata	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
Flame Robin	Petroica phoenicea	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Gilbert's Whistler	Pachycephala inornata	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Koala	Phascolarctos cinereus	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Large Bent-winged Bat	Miniopterus orianae oceanensis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Little Eagle	Hieraaetus morphnoides	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Little Lorikeet	Glossopsitta pusilla	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Little Pied Bat	Chalinolobus picatus	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Masked Owl	Tyto novaehollandiae	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Painted Honeyeater	Grantiella picta	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

Powerful Owl	Ninox strenua	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Regent Honeyeater	Anthochaera phrygia	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Scarlet Robin	Petroica boodang	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Speckled Warbler	Chthonicola sagittata	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Spotted Harrier	Circus assimilis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Square-tailed Kite	Lophoictinia isura	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Superb Parrot	Polytelis swainsonii	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Swift Parrot	Lathamus discolor	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Turquoise Parrot	Neophema pulchella	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Varied Sittella	Daphoenositta chrysoptera	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

White-bellied Sea-Eagle	Haliaeetus leucogaster	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
White-throated Needletail	Hirundapus caudacutus	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Threatened species Manually Added

None added

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

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021959/BAAS17021/20/00021962	VoW BBS - WF	24/11/2021

Assessor Name	Report Created	BAM Data version *
Alexander Pursche	27/04/2022	50

Assessor Number	Assessment Type	BAM Case Status
BAAS17021	Major Projects	Finalised

Assessment Revision		Date Finalised
3		27/04/2022

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

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

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Black Falcon	Falco subniger	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Black-breasted Buzzard	Hamirostra melanosternon	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Black-necked Stork	Ephippiorhynchus asiaticus	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Corben's Long-eared Bat	Nyctophilus corbeni	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
Diamond Firetail	Stagonopleura guttata	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion

Flame Robin	Petroica phoenicea	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Grey Falcon	Falco hypoleucos	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Koala	Phascolarctos cinereus	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Large Bent-winged Bat	Miniopterus orianae oceanensis	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Little Eagle	Hieraaetus morphnoides	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Little Lorikeet	Glossopsitta pusilla	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Little Pied Bat	Chalinolobus picatus	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Major Mitchell's Cockatoo	Lophochroa leadbeateri	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
Masked Owl	Tyto novaehollandiae	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Painted Honeyeater	Grantiella picta	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion

Painted Honeyeater	Grantiella picta	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Powerful Owl	Ninox strenua	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Regent Honeyeater	Anthochaera phrygia	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Scarlet Robin	Petroica boodang	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Speckled Warbler	Chthonicola sagittata	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion

Speckled Warbler	Chthonicola sagittata	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Spotted Harrier	Circus assimilis	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Square-tailed Kite	Lophoictinia isura	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Superb Parrot	Polytelis swainsonii	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Swift Parrot	Lathamus discolor	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Turquoise Parrot	Neophema pulchella	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion

Turquoise Parrot	Neophema pulchella	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Varied Sittella	Daphoenositta chrysoptera	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
White-bellied Sea-Eagle	Haliaeetus leucogaster	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
White-throated Needletail	Hirundapus caudacutus	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion

Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Threatened species Manually Added

None added

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

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021959/BAAS17021/21/00028366	VoW SBB - TxL	24/11/2021
Assessor Name	**Report Created**	**BAM Data version ***
Alexander Pursche	27/04/2022	50
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS17021	Major Projects	Finalised
Assessment Revision		**Date Finalised**
1		27/04/2022

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

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

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Black Falcon	Falco subniger	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes

Black Falcon	Falco subniger	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Corben's Long-eared Bat	Nyctophilus corbeni	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
Diamond Firetail	Stagonopleura guttata	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Dusky Woodswallow	Artamus cyanopterus cyanopterus	479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
Eastern False Pipistrelle	Falsistrellus tasmaniensis	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
Flame Robin	Petroica phoenicea	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Freckled Duck	Stictonetta naevosa	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
Gang-gang Cockatoo	Callocephalon fimbriatum	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Glossy Black-Cockatoo	Calyptorhynchus lathami	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
Greater Broad-nosed Bat	Scoteanax rueppellii	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley

Grey-headed Flying-fox	Pteropus poliocephalus	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Koala	Phascolarctos cinereus	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Large Bent-winged Bat	Miniopterus orianae oceanensis	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Little Bent-winged Bat	Miniopterus australis	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
Little Eagle	Hieraaetus morphnoides	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Little Lorikeet	Glossopsitta pusilla	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Masked Owl	Tyto novaehollandiae	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Painted Honeyeater	Grantiella picta	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Powerful Owl	Ninox strenua	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Regent Honeyeater	Anthochaera phrygia	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Rosenberg's Goanna	Varanus rosenbergi	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Scarlet Robin	Petroica boodang	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Speckled Warbler	Chthonicola sagittata	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Spotted Harrier	Circus assimilis	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley

Spotted Harrier	Circus assimilis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Square-tailed Kite	Lophoictinia isura	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Swift Parrot	Lathamus discolor	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Turquoise Parrot	Neophema pulchella	272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

Varied Sittella	Daphoenositta chrysoptera	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
White-bellied Sea-Eagle	Haliaeetus leucogaster	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
White-throated Needletail	Hirundapus caudacutus	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes
		281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	42-River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
		272-White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes

Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Threatened species Manually Added

None added

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

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021959/BAAS17021/20/00021960	VoW SBB - WIND FARM	24/11/2021
Assessor Name	Report Created	BAM Data version *
Alexander Pursche	27/04/2022	50
Assessor Number	Assessment Type	BAM Case Status
BAAS17021	Major Projects	Finalised
Assessment Revision		Date Finalised
2		27/04/2022

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

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

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Black Falcon	Falco subniger	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Diamond Firetail	Stagonopleura guttata	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
Flame Robin	Petroica phoenicea	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Gang-gang Cockatoo	Callocephalon fimbriatum	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Koala	Phascolarctos cinereus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Large Bent-winged Bat	Miniopterus orianae oceanensis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Little Eagle	Hieraaetus morphnoides	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Little Lorikeet	Glossopsitta pusilla	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Masked Owl	Tyto novaehollandiae	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Painted Honeyeater	Grantiella picta	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Powerful Owl	Ninox strenua	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Regent Honeyeater	Anthochaera phrygia	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

Rosenberg's Goanna	Varanus rosenbergi	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Scarlet Robin	Petroica boodang	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Speckled Warbler	Chthonicola sagittata	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Spotted Harrier	Circus assimilis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Square-tailed Kite	Lophoictinia isura	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Swift Parrot	Lathamus discolor	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Turquoise Parrot	Neophema pulchella	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Varied Sittella	Daphoenositta chrysoptera	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

White-bellied Sea-Eagle	Haliaeetus leucogaster	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
White-throated Needletail	Hirundapus caudacutus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Threatened species Manually Added

None added

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

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021959/BAAS17021/20/00021961	VoW SWS - WIND FARM	24/11/2021
Assessor Name	Report Created	BAM Data version *
Alexander Pursche	27/04/2022	50
Assessor Number	Assessment Type	BAM Case Status
BAAS17021	Major Projects	Finalised
Assessment Revision		Date Finalised
1		28/03/2022

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

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

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		478-Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Black Falcon	Falco subniger	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Diamond Firetail	Stagonopleura guttata	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		478-Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
Flame Robin	Petroica phoenicea	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Gang-gang Cockatoo	Callocephalon fimbriatum	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Koala	Phascolarctos cinereus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Large Bent-winged Bat	Miniopterus orianae oceanensis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Little Eagle	Hieraaetus morphnoides	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Little Lorikeet	Glossopsitta pusilla	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		478-Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Little Pied Bat	Chalinolobus picatus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Masked Owl	Tyto novaehollandiae	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Painted Honeyeater	Grantiella picta	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		478-Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion

Painted Honeyeater	Grantiella picta	479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Powerful Owl	Ninox strenua	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Regent Honeyeater	Anthochaera phrygia	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Rosenberg's Goanna	Varanus rosenbergi	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Scarlet Robin	Petroica boodang	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Speckled Warbler	Chthonicola sagittata	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Spotted Harrier	Circus assimilis	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Square-tailed Kite	Lophoictinia isura	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Superb Parrot	Polytelis swainsonii	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Swift Parrot	Lathamus discolor	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Turquoise Parrot	Neophema pulchella	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		478-Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion
		479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Varied Sittella	Daphoenositta chrysoptera	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
White-bellied Sea-Eagle	Haliaeetus leucogaster	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
White-throated Needletail	Hirundapus caudacutus	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
		478-Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion

White-throated Needletail	Hirundapus caudacutus	479-Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion
		483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Threatened species Manually Added

None added

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

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

Appendix H Candidate species reports

BAM Candidate Species Report

Proposal Details

Assessment Id 00021959/BAAS17021/22/00032036	Proposal Name VoW BBS - TxL	BAM data last updated * 24/11/2021
Assessor Name Alexander Pursche	Report Created 27/04/2022	BAM Data version * 50
Assessor Number BAAS17021	Assessment Type Major Projects	BAM Case Status Finalised
Assessment Revision 2	Date Finalised 27/04/2022	

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

List of Species Requiring Survey

Name	Presence	Survey Months
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Cercartetus nanus Eastern Pygmy-possum	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Chalinolobus dwyeri Large-eared Pied Bat	Yes (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Commersonia procumbens Commersonia procumbens	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Dichanthium setosum Bluegrass	No (surveyed)	☑ Jan ☑ Feb ☑ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Monotaxis macrophylla Large-leafed Monotaxis	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox connivens Barking Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox strenua Powerful Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider	Yes (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Petrogale penicillata Brush-tailed Rock-wallaby	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Polytelis swainsonii Superb Parrot	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Prasophyllum sp. Wybong Prasophyllum sp. Wybong	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Swainsona sericea Silky Swainson-pea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tylophora linearis Tylophora linearis	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Tyto novaehollandiae Masked Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Vespadelus troughtoni Eastern Cave Bat	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Little Eagle	Hieraaetus morphnoides	Refer to BAR
Pink-tailed Legless Lizard	Aprasia parapulchella	Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Square-tailed Kite	Lophoictinia isura	Refer to BAR
Swift Parrot	Lathamus discolor	Refer to BAR
White-bellied Sea-Eagle	Haliaeetus leucogaster	Refer to BAR

BAM Candidate Species Report

Proposal Details

Assessment Id 00021959/BAAS17021/20/00021962	Proposal Name VoW BBS - WF	BAM data last updated * 24/11/2021
Assessor Name Alexander Pursche	Report Created 27/04/2022	BAM Data version * 50
Assessor Number BAAS17021	Assessment Type Major Projects	BAM Case Status Finalised
Assessment Revision 3	Date Finalised 27/04/2022	

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

List of Species Requiring Survey

Name	Presence	Survey Months
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Chalinolobus dwyeri Large-eared Pied Bat	Yes (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Commersonia procumbens Commersonia procumbens	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

BAM Candidate Species Report

Dichanthium setosum Bluegrass	No (surveyed)	☑ Jan ☑ Feb ☑ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lophochroa leadbeateri Major Mitchell's Cockatoo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Monotaxis macrophylla Large-leafed Monotaxis	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox connivens Barking Owl	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox strenua Powerful Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider	Yes (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Petrogale penicillata Brush-tailed Rock-wallaby	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Polytelis swainsonii Superb Parrot	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pomaderris queenslandica Scant Pomaderris	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Prasophyllum sp. Wybong Prasophyllum sp. Wybong	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Swainsona sericea Silky Swainson-pea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Tylophora linearis Tylophora linearis	No (surveyed)	☑ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tyto novaehollandiae Masked Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Vespadelus troughtoni Eastern Cave Bat	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Black-breasted Buzzard	Hamirostra melanosternon	Refer to BAR
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Little Eagle	Hieraaetus morphnoides	Refer to BAR
Pale-headed Snake	Hoplocephalus bitorquatus	Habitat degraded
Pink-tailed Legless Lizard	Aprasia parapulchella	Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Square-tailed Kite	Lophoictinia isura	Refer to BAR

Swift Parrot	Lathamus discolor	Habitat constraints
White-bellied Sea-Eagle	Haliaeetus leucogaster	Refer to BAR

BAM Candidate Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021959/BAAS17021/21/00028366	VoW SBB - TxL	24/11/2021
Assessor Name	Report Created	BAM Data version *
Alexander Pursche	27/04/2022	50
Assessor Number	Assessment Type	BAM Case Status
BAAS17021	Major Projects	Finalised
Assessment Revision	Date Finalised	
1	27/04/2022	

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

List of Species Requiring Survey

Name	Presence	Survey Months
Acacia ausfeldii Ausfeld's Wattle	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Callocephalon fimbriatum Gang-gang Cockatoo	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Calyptorhynchus lathami Glossy Black-Cockatoo	Yes (assumed present)	☐ **Jan** ☐ **Feb** ☐ **Mar** ☐ **Apr** ☐ **May** ☐ **Jun** ☐ **Jul** ☐ **Aug** ☐ **Sep** ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Cercartetus nanus Eastern Pygmy-possum	Yes (assumed present)	☐ **Jan** ☐ **Feb** ☐ **Mar** ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ **Oct** ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?
Chalinolobus dwyeri Large-eared Pied Bat	Yes (surveyed)	☑ **Jan** ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?
Commersonia procumbens Commersonia procumbens	Yes (assumed present)	☐ **Jan** ☐ **Feb** ☐ **Mar** ☐ **Apr** ☐ **May** ☐ Jun ☐ Jul ☐ **Aug** ☐ **Sep** ☐ **Oct** ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?
Cynanchum elegans White-flowered Wax Plant	Yes (assumed present)	☐ **Jan** ☐ **Feb** ☐ **Mar** ☐ **Apr** ☐ **May** ☐ **Jun** ☐ **Jul** ☐ **Aug** ☐ **Sep** ☐ **Oct** ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?
Hoplocephalus bitorquatus Pale-headed Snake	Yes (assumed present)	☐ **Jan** ☐ **Feb** ☐ **Mar** ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?

Hoplocephalus stephensii Stephens' Banded Snake	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lophoictinia isura Square-tailed Kite	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Monotaxis macrophylla Large-leafed Monotaxis	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox connivens Barking Owl	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Petauroides volans Greater Glider	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Petrogale penicillata Brush-tailed Rock-wallaby	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Prasophyllum petilum Tarengo Leek Orchid	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Prasophyllum sp. Wybong Prasophyllum sp. Wybong	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pteropus poliocephalus Grey-headed Flying-fox	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tylophora linearis Tylophora linearis	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Tyto novaehollandiae Masked Owl	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Vespadelus troughtoni Eastern Cave Bat	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Brush-tailed Phascogale	Phascogale tapoatafa	Refer to BAR
Eucalyptus camaldulensis population in the Hunter catchment	Eucalyptus camaldulensis - endangered population	Refer to BAR
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Little Eagle	Hieraaetus morphnoides	Habitat constraints
Pink-tailed Legless Lizard	Aprasia parapulchella	Habitat constraints Geographic limitations
Powerful Owl	Ninox strenua	Habitat degraded Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Striped Legless Lizard	Delma impar	Refer to BAR
Swift Parrot	Lathamus discolor	Habitat constraints
White-bellied Sea-Eagle	Haliaeetus leucogaster	Habitat constraints

BAM Candidate Species Report

Proposal Details

Assessment Id 00021959/BAAS17021/20/00021960	Proposal Name VoW SBB - WIND FARM	BAM data last updated * 24/11/2021
Assessor Name Alexander Pursche	Report Created 27/04/2022	BAM Data version * 50
Assessor Number BAAS17021	Assessment Type Major Projects	BAM Case Status Finalised
Assessment Revision 2	Date Finalised 27/04/2022	

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

List of Species Requiring Survey

Name	Presence	Survey Months
Acacia ausfeldii Ausfeld's Wattle		☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ **Aug** ☐ **Sep** ☐ **Oct** ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox connivens Barking Owl		☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ **May** ☐ **Jun** ☐ **Jul** ☐ **Aug** ☐ **Sep** ☐ **Oct** ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?
Petrogale penicillata Brush-tailed Rock-wallaby		☐ **Jan** ☐ **Feb** ☐ **Mar** ☐ **Apr** ☐ **May** ☐ **Jun** ☐ **Jul** ☐ **Aug** ☐ **Sep** ☐ **Oct** ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?

Burhinus grallarius Bush Stone-curlew		☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Commersonia procumbens Commersonia procumbens		☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Vespadelus troughtoni Eastern Cave Bat		☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Callocephalon fimbriatum Gang-gang Cockatoo		☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala		☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Chalinolobus dwyeri Large-eared Pied Bat		☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Monotaxis macrophylla Large-leafed Monotaxis		☐ **Jan** ☐ **Feb** ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ **Aug** ☐ **Sep** ☐ **Oct** ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?
Tyto novaehollandiae Masked Owl		☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ **May** ☐ **Jun** ☐ **Jul** ☐ **Aug** ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Prasophyllum sp. Wybong Prasophyllum sp. Wybong		☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ **Sep** ☐ **Oct** ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider		☑ **Jan** ☐ **Feb** ☐ **Mar** ☐ **Apr** ☐ **May** ☐ **Jun** ☑ **Jul** ☐ **Aug** ☐ **Sep** ☐ **Oct** ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?
Prasophyllum petilum Tarengo Leek Orchid		☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ **Sep** ☐ **Oct** ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?
Tylophora linearis Tylophora linearis		☐ **Jan** ☐ **Feb** ☐ **Mar** ☐ **Apr** ☐ **May** ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ **Oct** ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Brush-tailed Phascogale	Phascogale tapoatafa	Refer to BAR
Grey-headed Flying-fox	Pteropus poliocephalus	Refer to BAR
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Little Eagle	Hieraaetus morphnoides	Habitat constraints
Pink-tailed Legless Lizard	Aprasia parapulchella	Habitat constraints Geographic limitations
Powerful Owl	Ninox strenua	Habitat degraded Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Square-tailed Kite	Lophoictinia isura	Refer to BAR
Striped Legless Lizard	Delma impar	Refer to BAR
Swift Parrot	Lathamus discolor	Habitat constraints
White-bellied Sea-Eagle	Haliaeetus leucogaster	Refer to BAR

BAM Candidate Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021959/BAAS17021/20/00021961	VoW SWS - WIND FARM	24/11/2021
Assessor Name	Report Created	BAM Data version *
Alexander Pursche	27/04/2022	50
Assessor Number	Assessment Type	BAM Case Status
BAAS17021	Major Projects	Finalised
Assessment Revision	Date Finalised	
1	28/03/2022	

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

List of Species Requiring Survey

Name	Presence	Survey Months
Acacia ausfeldii Ausfeld's Wattle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Callocephalon fimbriatum Gang-gang Cockatoo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Chalinolobus dwyeri Large-eared Pied Bat	Yes (surveyed)	☑ **Jan** ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?
Dichanthium setosum Bluegrass	No (surveyed)	☐ **Jan** ☑ **Feb** ☐ **Mar** ☐ **Apr** ☑ **May** ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ **Nov** ☑ **Dec** ☐ Survey month outside the specified months?
Lophoictinia isura Square-tailed Kite	No (surveyed)	☐ **Jan** ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ **Sep** ☐ **Oct** ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?
Ninox connivens Barking Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ **May** ☑ **Jun** ☐ **Jul** ☐ **Aug** ☐ **Sep** ☐ **Oct** ☐ **Nov** ☑ **Dec** ☐ Survey month outside the specified months?
Persoonia marginata Clandulla Geebung	No (surveyed)	☑ **Jan** ☐ **Feb** ☐ **Mar** ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider	Yes (surveyed)	☑ **Jan** ☐ **Feb** ☐ **Mar** ☐ **Apr** ☐ **May** ☐ **Jun** ☑ **Jul** ☐ **Aug** ☑ **Sep** ☐ **Oct** ☐ **Nov** ☐ **Dec** ☐ Survey month outside the specified months?

BAM Candidate Species Report

Petrogale penicillata Brush-tailed Rock-wallaby	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Polytelis swainsonii Superb Parrot	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Prasophyllum sp. Wybong Prasophyllum sp. Wybong	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Swainsona sericea Silky Swainson-pea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tylophora linearis Tylophora linearis	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

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

Threatened species Manually Added

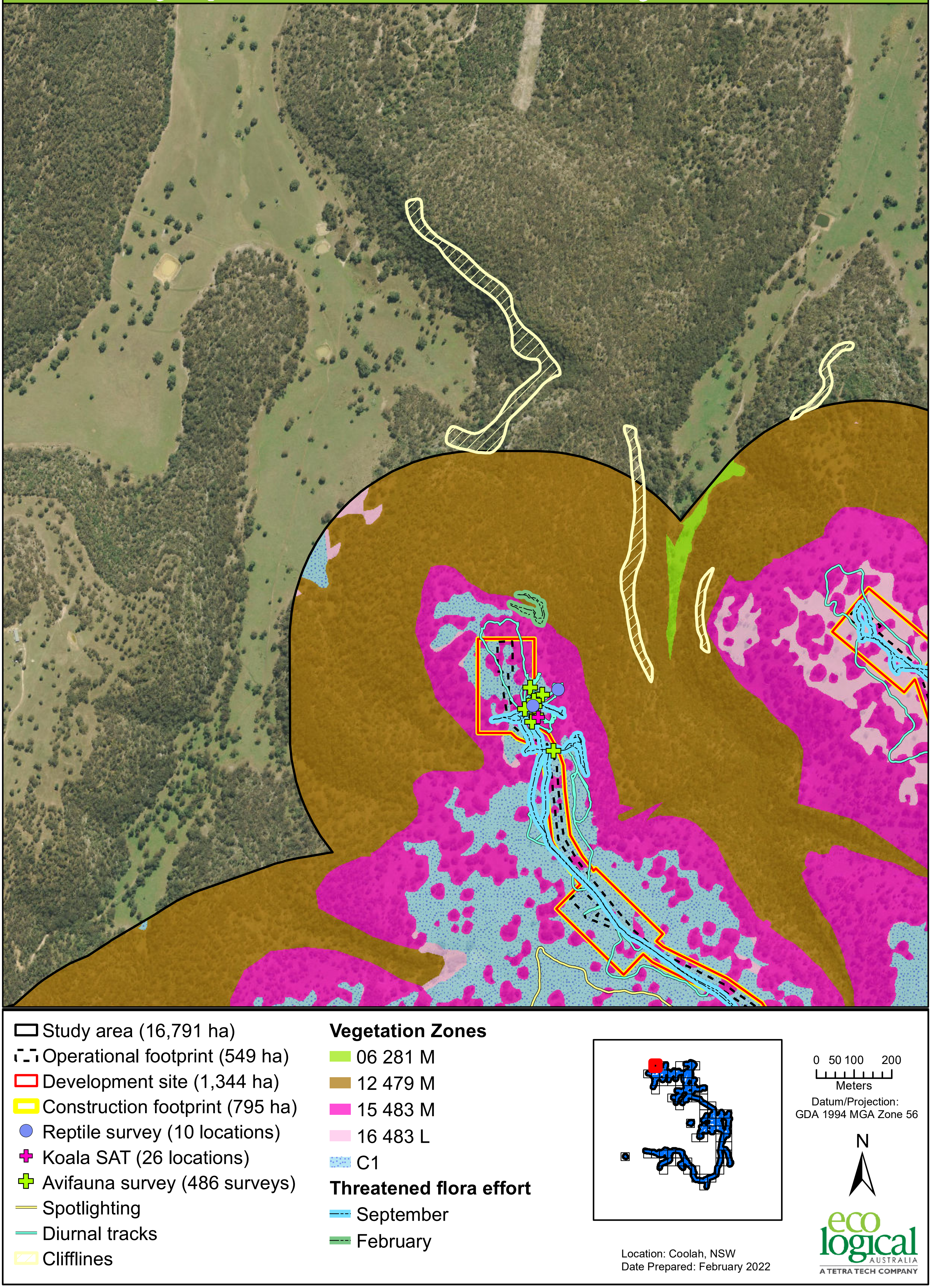
None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

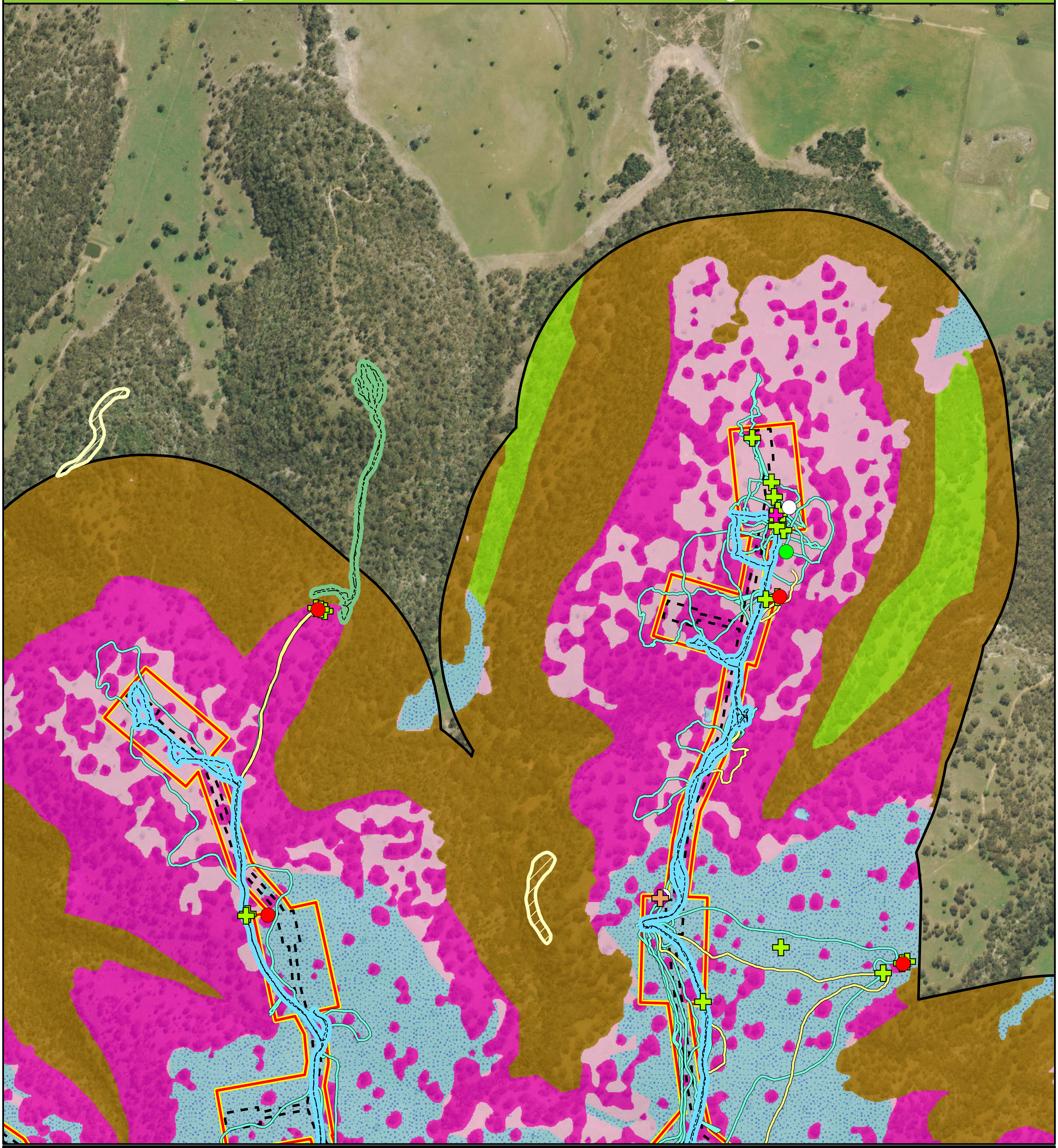
Common name	Scientific name	Justification in the BAM-C
Booroolong Frog	Litoria booroolongensis	Refer to BAR
Brush-tailed Phascogale	Phascogale tapoatafa	Refer to BAR
Euphrasia arguta	Euphrasia arguta	Refer to BAR
Grey-headed Flying-fox	Pteropus poliocephalus	Refer to BAR
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Little Eagle	Hieraaetus morphnoides	Refer to BAR
Pink-tailed Legless Lizard	Aprasia parapulchella	Habitat constraints
Powerful Owl	Ninox strenua	Refer to BAR
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Striped Legless Lizard	Delma impar	Refer to BAR
Swift Parrot	Lathamus discolor	Habitat constraints
Tarengo Leek Orchid	Prasophyllum petilum	Refer to BAR
White-bellied Sea-Eagle	Haliaeetus leucogaster	Refer to BAR

Appendix I Detailed survey effort maps


Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Reptile survey (10 locations)
Koala SAT (26 locations)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Clifflines
Vegetation Zones
06 281 M
12 479 M
15 483 M
16 483 L
C1
Threatened flora effort
September
February
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022
eco logical AUSTRALIA
A TETRA TECH COMPANY

Detailed survey maps

Valley of the Winds Wind Farm

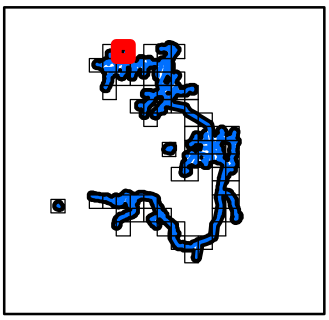


Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Call playback (17 locations, twice each)
Koala SAT (26 locations)
Harp trap (64 trap nights)
Songmeter (Ultrasonic - 613 unit nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Clifflines

Vegetation Zones
06 281 M
12 479 M
15 483 M
16 483 L
C1
X2 Dam

Threatened flora effort
September
February

Threatened species
Yellow-bellied Sheathtail Bat

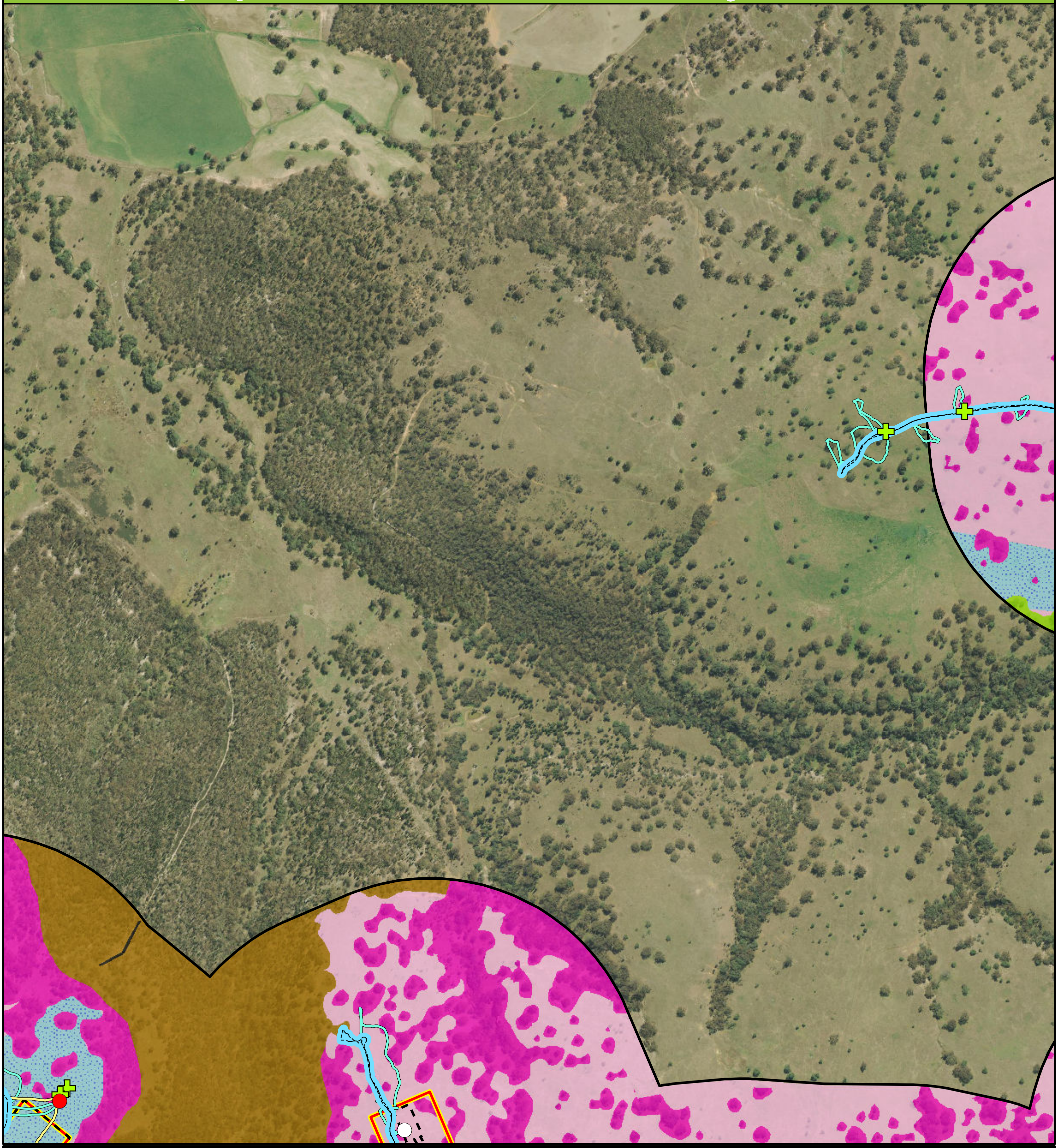


Location: Coolah, NSW
Date Prepared: February 2022

0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

eco logical AUSTRALIA
A TETRA TECH COMPANY



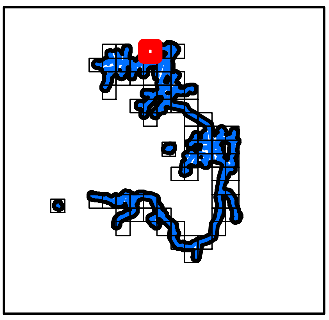
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Harp trap (64 trap nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks

Vegetation Zones

06 281 M
12 479 M
15 483 M
16 483 L
C1
X5 Road

Threatened flora effort

September



Location: Coolah, NSW
Date Prepared: February 2022

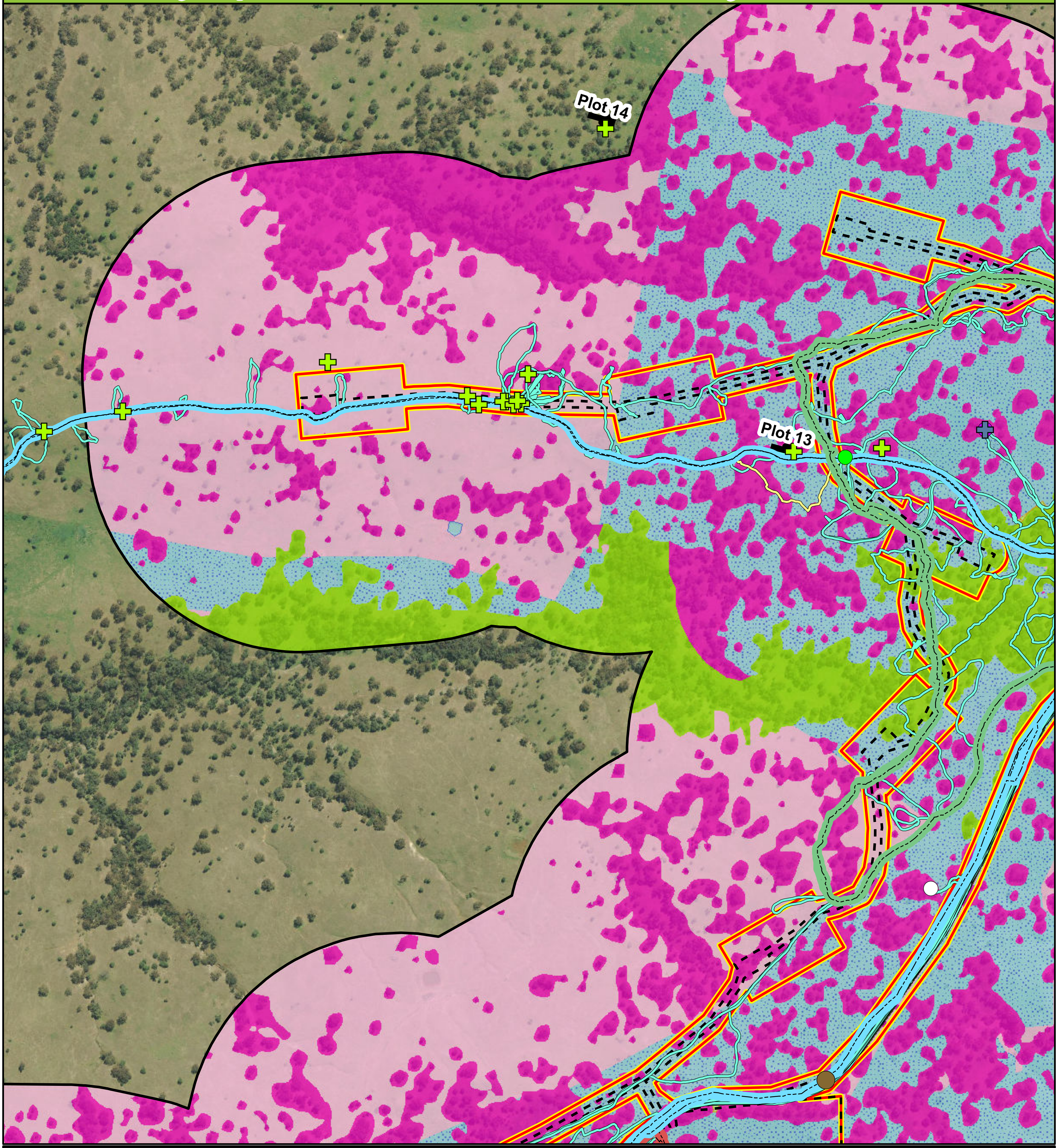
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

eco logical AUSTRALIA
A TETRA TECH COMPANY

Detailed survey maps

Valley of the Winds Wind Farm



Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Call playback (17 locations, twice each)
Songmeter (Ultrasonic - 613 unit nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
BAM Plots (64)

Vegetation Zones

06 281 M
15 483 M
16 483 L
C1
X1 Crop
X2 Dam
X5 Road

Threatened flora effort

September
February
May

Threatened species

White-throated Needletail
Large Bentwing-bat

Location: Coolah, NSW
Date Prepared: February 2022

eco logical AUSTRALIA
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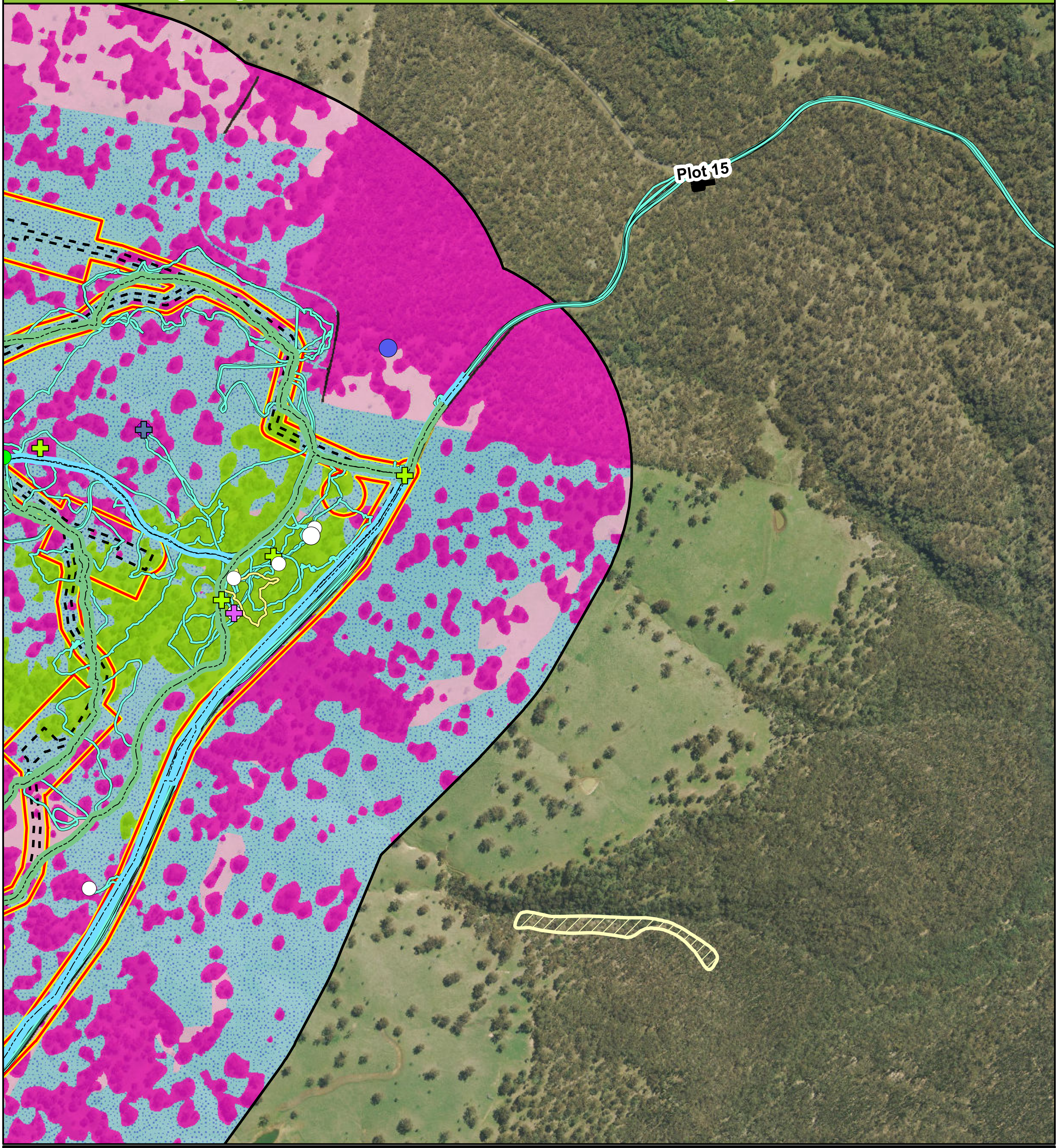


Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Call playback (17 locations, twice each)
Songmeter (Audio - 167 nights)
Songmeter (Ultrasonic - 613 unit nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Clifflines
BAM Plots (64)

Vegetation Zones

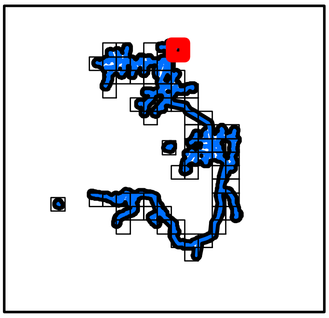
06 281 M
15 483 M
16 483 L
C1
X1 Crop
X5 Road

Threatened flora effort

September
February

Threatened species

Barking Owl
Dusky Woodswallow
Large Bentwing-bat
Squirrel Glider



Location: Coolah, NSW
Date Prepared: February 2022

0 50 100 200
Meters

Datum/Projection:
GDA 1994 MGA Zone 56

N

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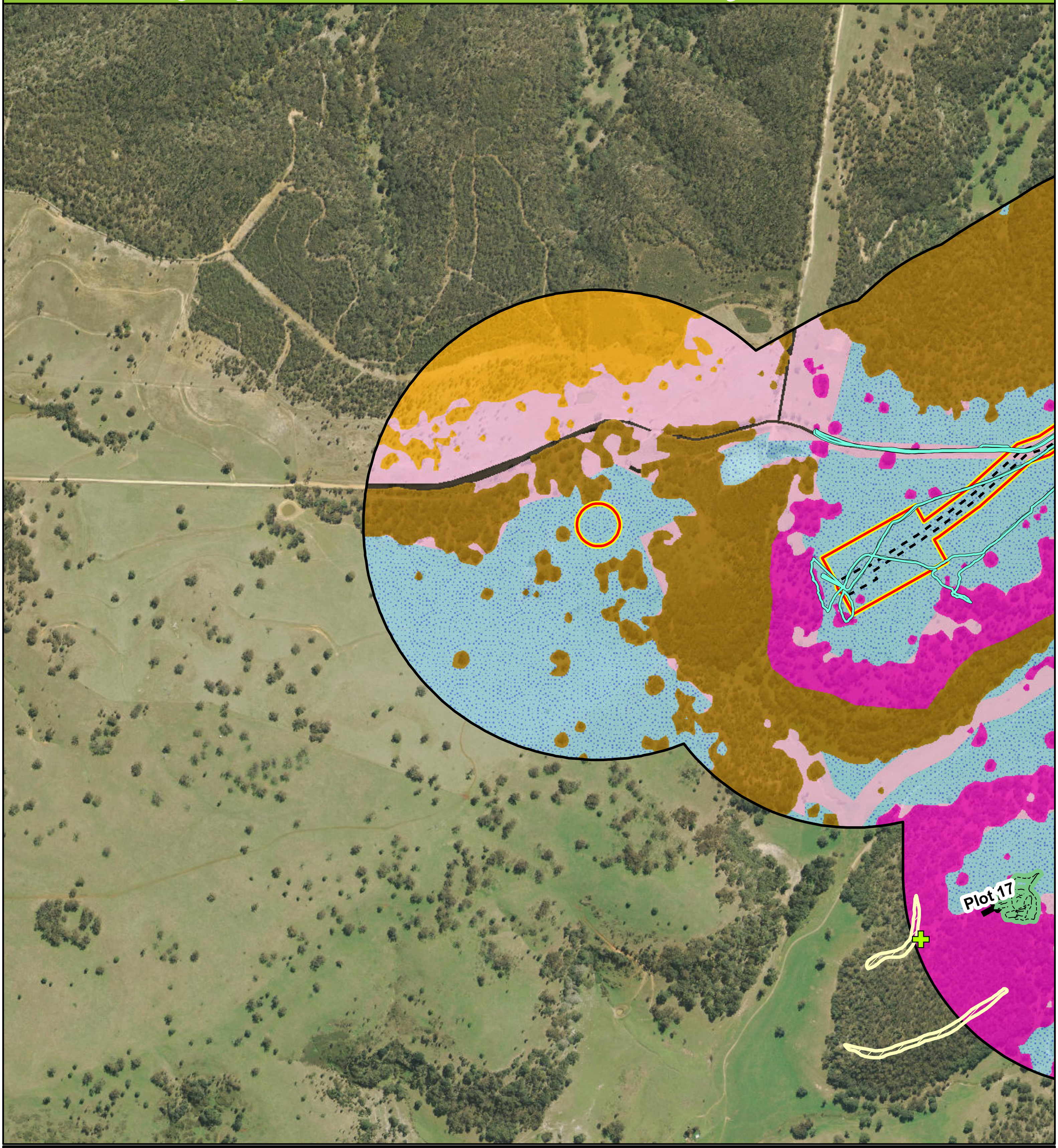


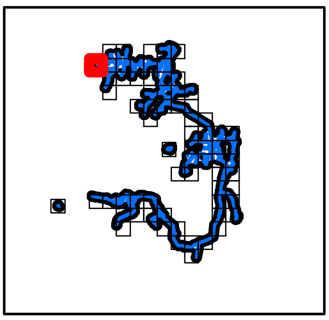
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Avifauna survey (486 surveys)
Diurnal tracks
Clifflines
BAM Plots (64)

Vegetation Zones

12 479 M
13 479 Reg
15 483 M
16 483 L
C1
X5 Road

Threatened flora effort

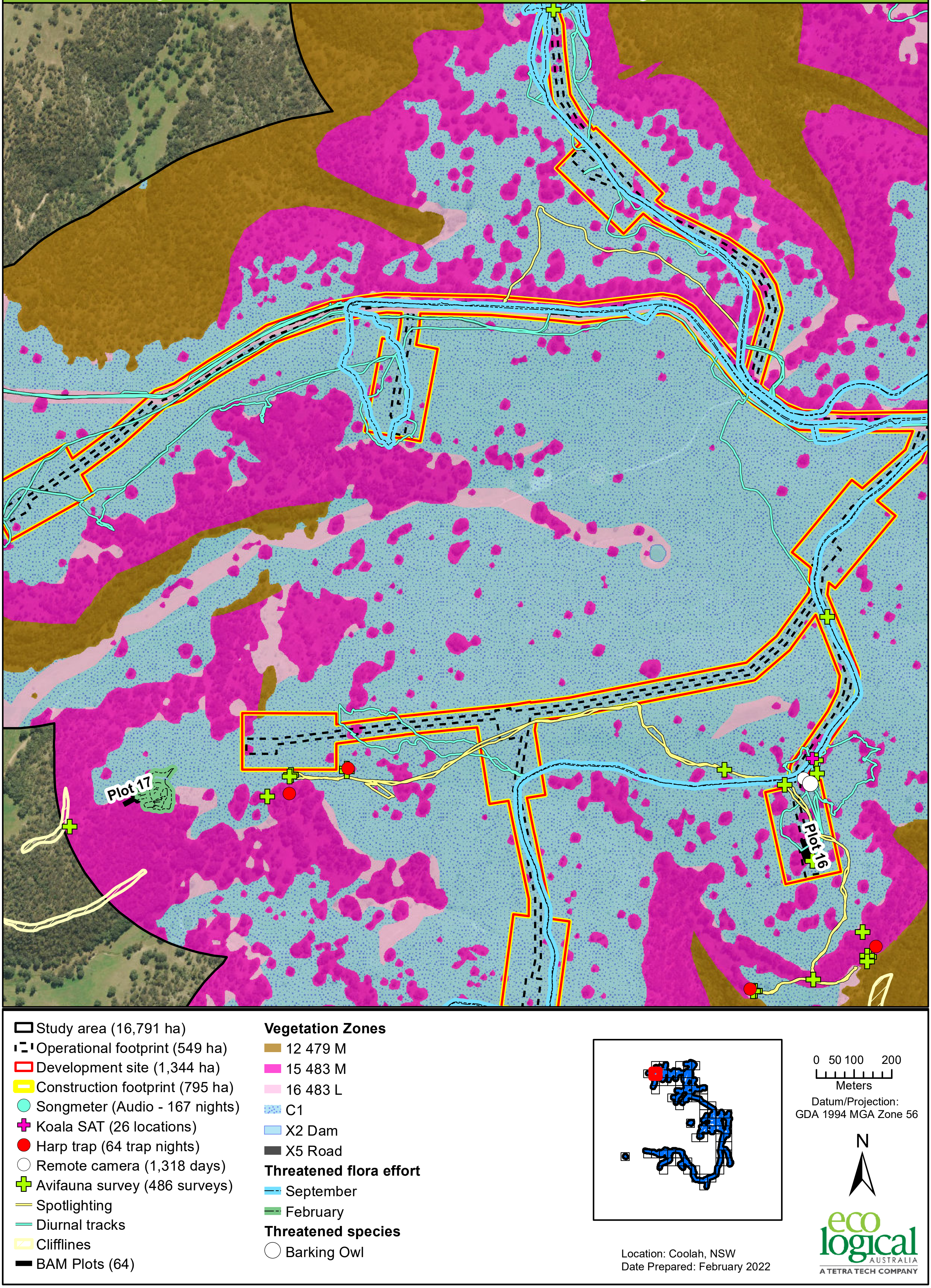
February

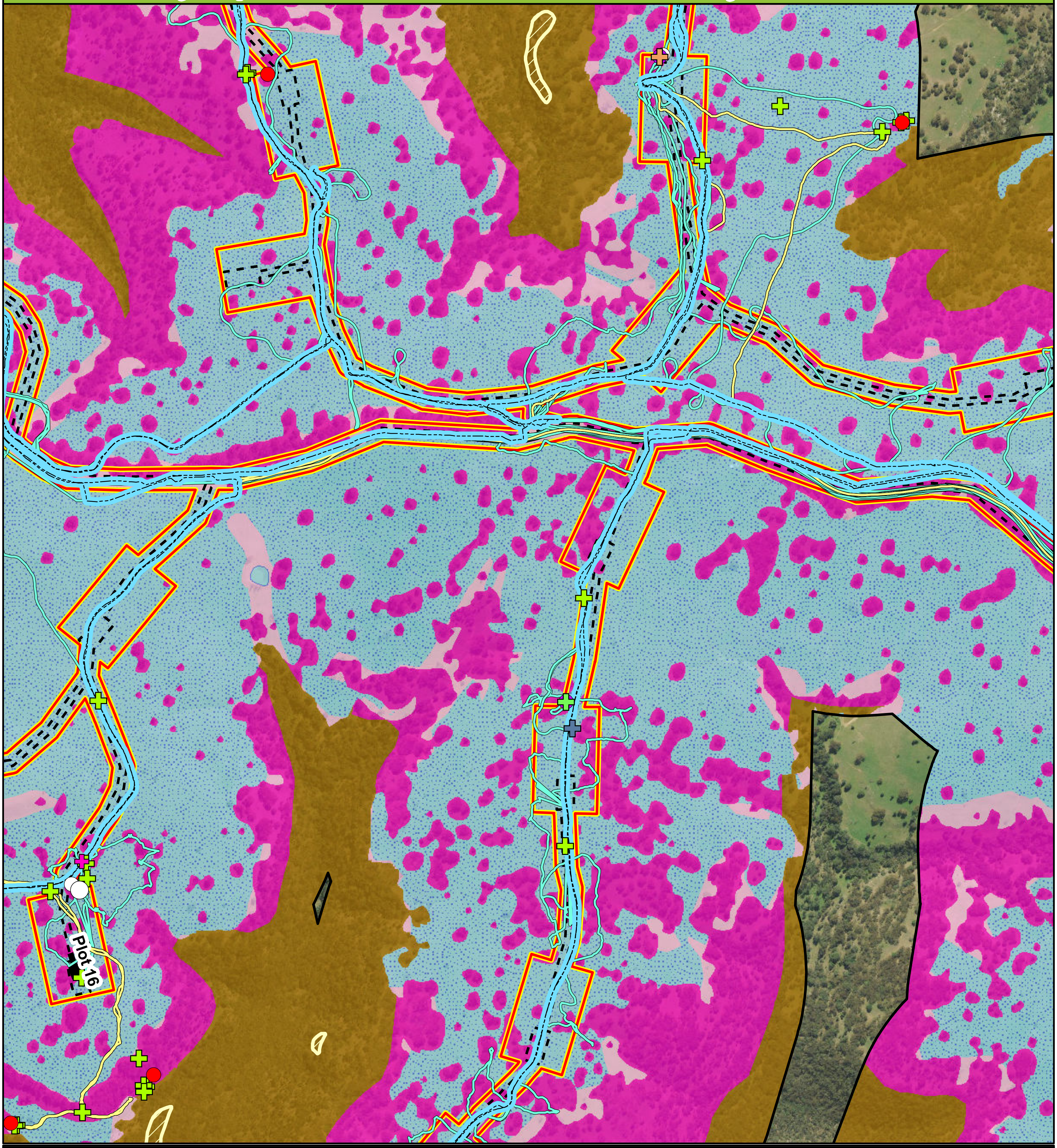


0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022


Plot 17
Plot 16
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Songmeter (Audio - 167 nights)
Koala SAT (26 locations)
Harp trap (64 trap nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Clifflines
BAM Plots (64)
Vegetation Zones
12 479 M
15 483 M
16 483 L
C1
X2 Dam
X5 Road
Threatened flora effort
September
February
Threatened species
Barking Owl
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022



- Study area (16,791 ha)
- Operational footprint (549 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Songmeter (Audio - 167 nights)
- Koala SAT (26 locations)
- Harp trap (64 trap nights)
- Songmeter (Ultrasonic - 613 unit nights)
- Remote camera (1,318 days)
- Avifauna survey (486 surveys)
- Spotlighting
- Diurnal tracks
- Clifflines
- BAM Plots (64)

Vegetation Zones

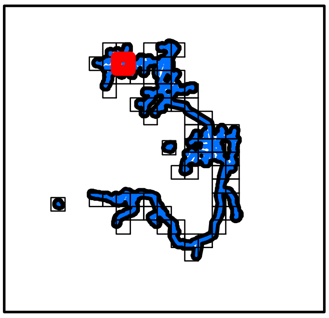
- 12 479 M
- 15 483 M
- 16 483 L
- C1
- X2 Dam
- X5 Road

Threatened flora effort

- September

Threatened species

- Barking Owl
- Large Bentwing-bat
- Large-eared Pied Bat
- Yellow-bellied Sheathtail Bat



0 50 100 200

Meters

Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

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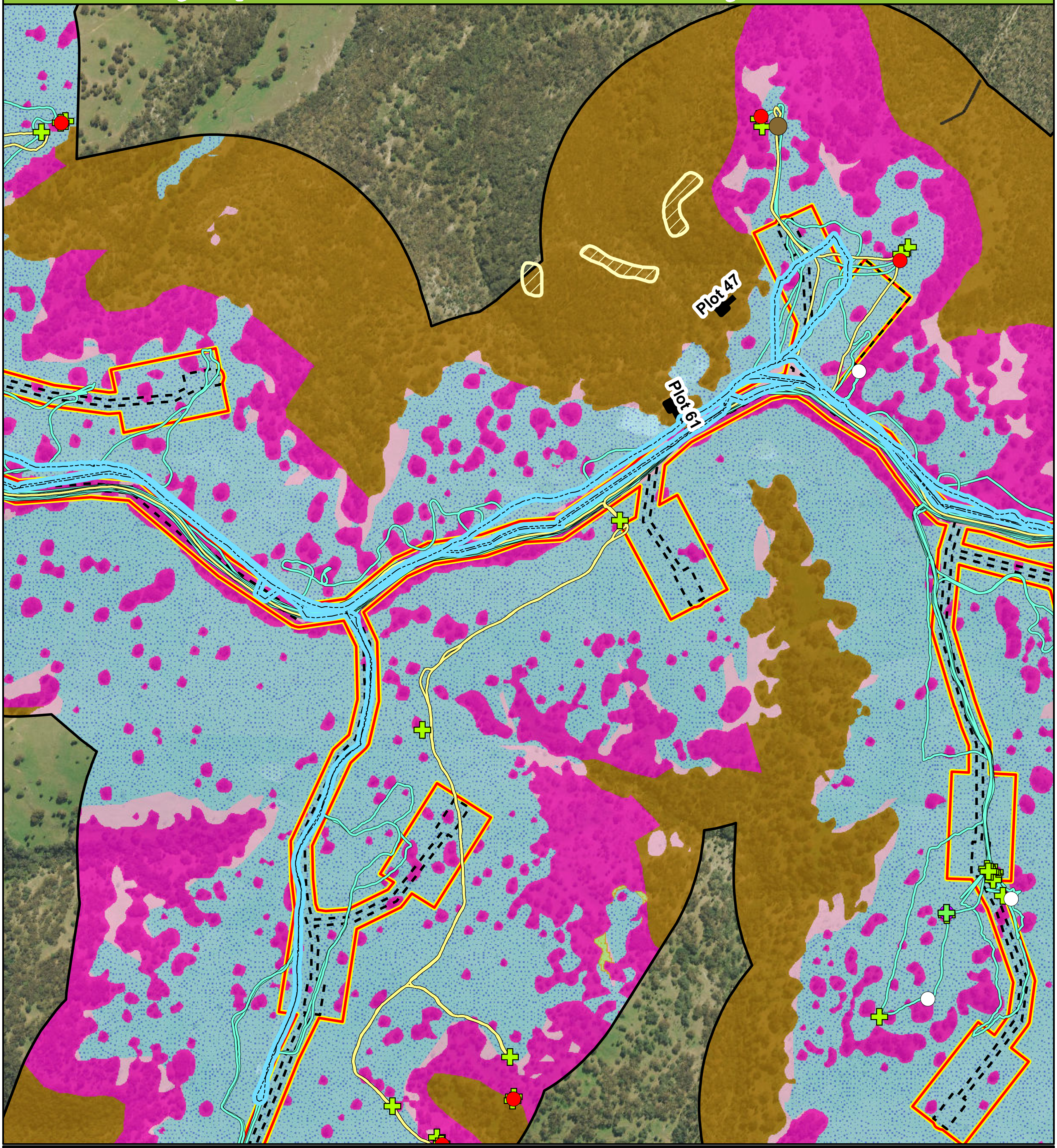


Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Harp trap (64 trap nights)
Songmeter (Ultrasonic - 613 unit nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Clifflines
BAM Plots (64)

Vegetation Zones

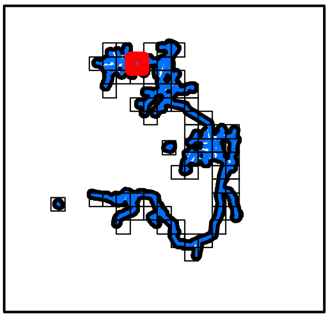
12 479 M
15 483 M
16 483 L
C1
X1 Crop
X2 Dam
X5 Road

Threatened flora effort

September

Threatened species

White-throated Needletail
Large Bentwing-bat
Large-eared Pied Bat



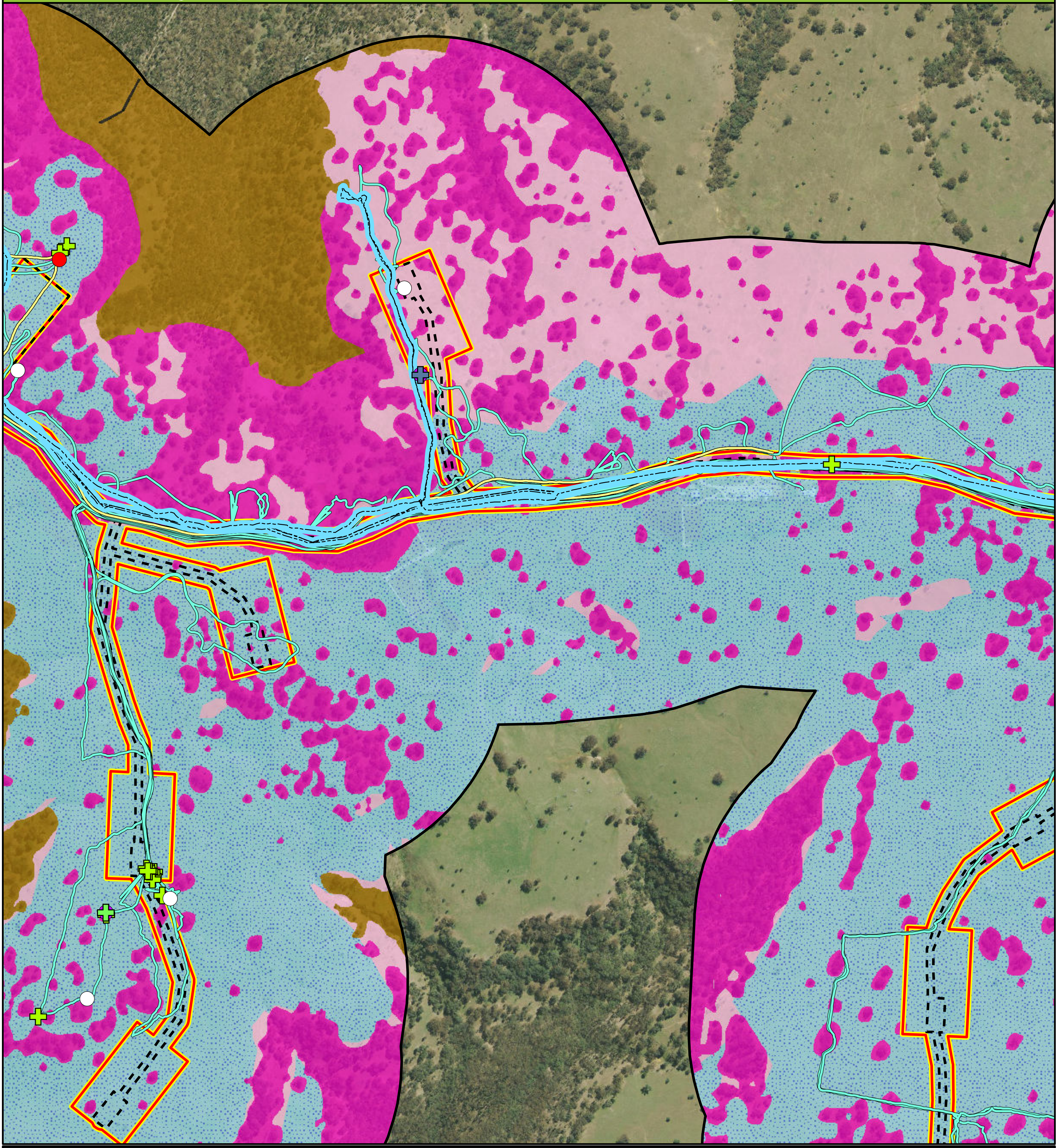
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

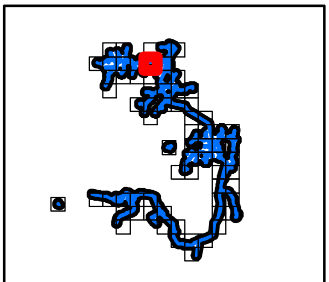
N

Location: Coolah, NSW
Date Prepared: February 2022

Detailed survey maps

Valley of the Winds Wind Farm





Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Harp trap (64 trap nights)
Songmeter (Ultrasonic - 613 unit nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks

Vegetation Zones

12 479 M
15 483 M
16 483 L
C1
X4 Residential
X5 Road

Threatened flora effort

September

Threatened species

Large Bentwing-bat
Large-eared Pied Bat

0 50 100 200
Meters

Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

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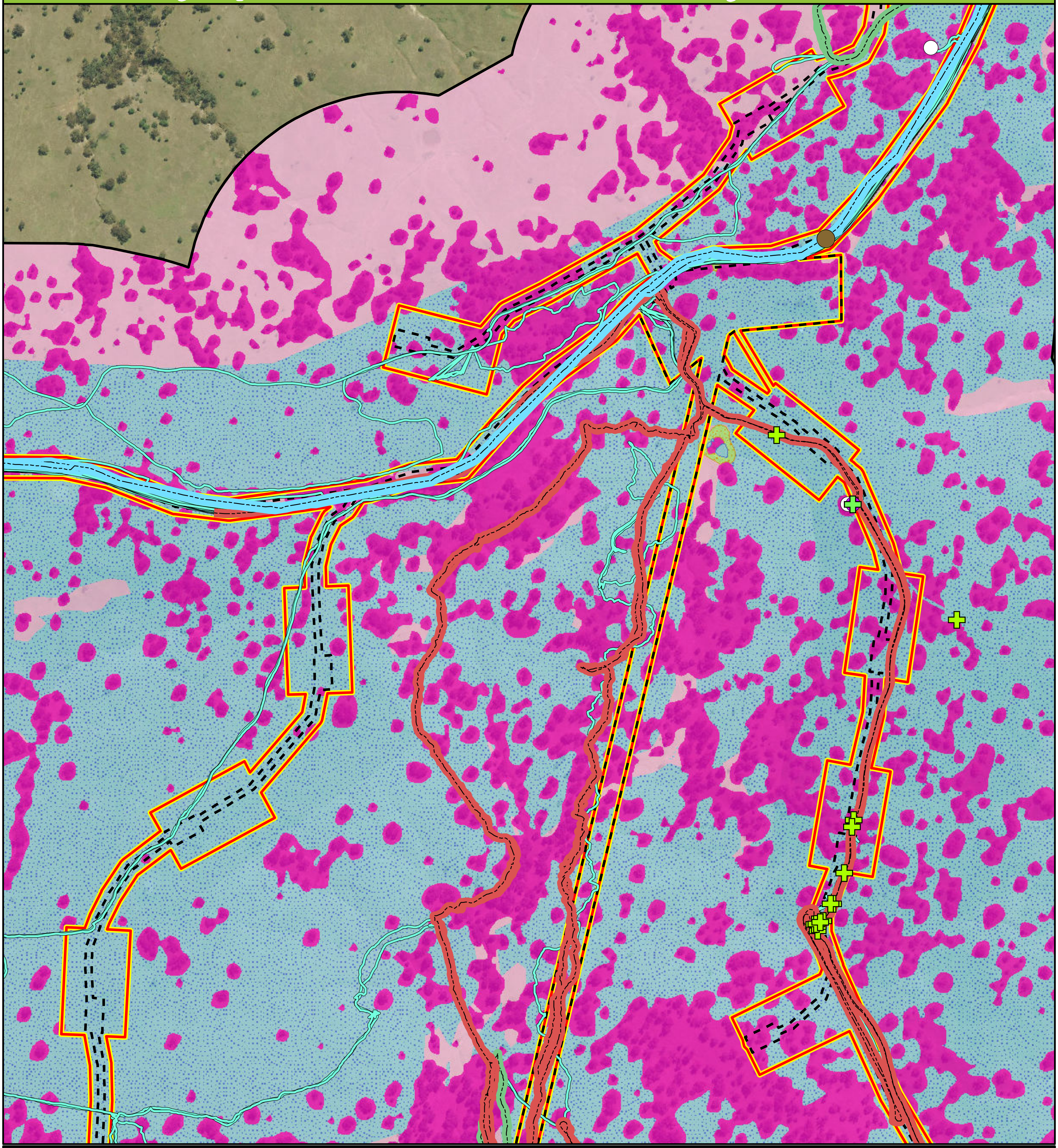
Detailed survey maps

Valley of the Winds Wind Farm



- Study area (16,791 ha)
- Operational footprint (549 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Songmeter (Ultrasonic - 613 unit nights)
- Remote camera (1,318 days)
- Avifauna survey (486 surveys)
- Diurnal tracks

Vegetation Zones

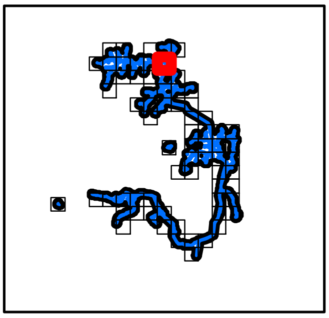
- 15 483 M
- 16 483 L
- C1
- X1 Crop
- X2 Dam
- X5 Road

Threatened flora effort

- September
- February
- May

Threatened species

- White-throated Needletail
- Large-eared Pied Bat
- Yellow-bellied Sheathtail Bat



Location: Coolah, NSW
Date Prepared: February 2022

0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

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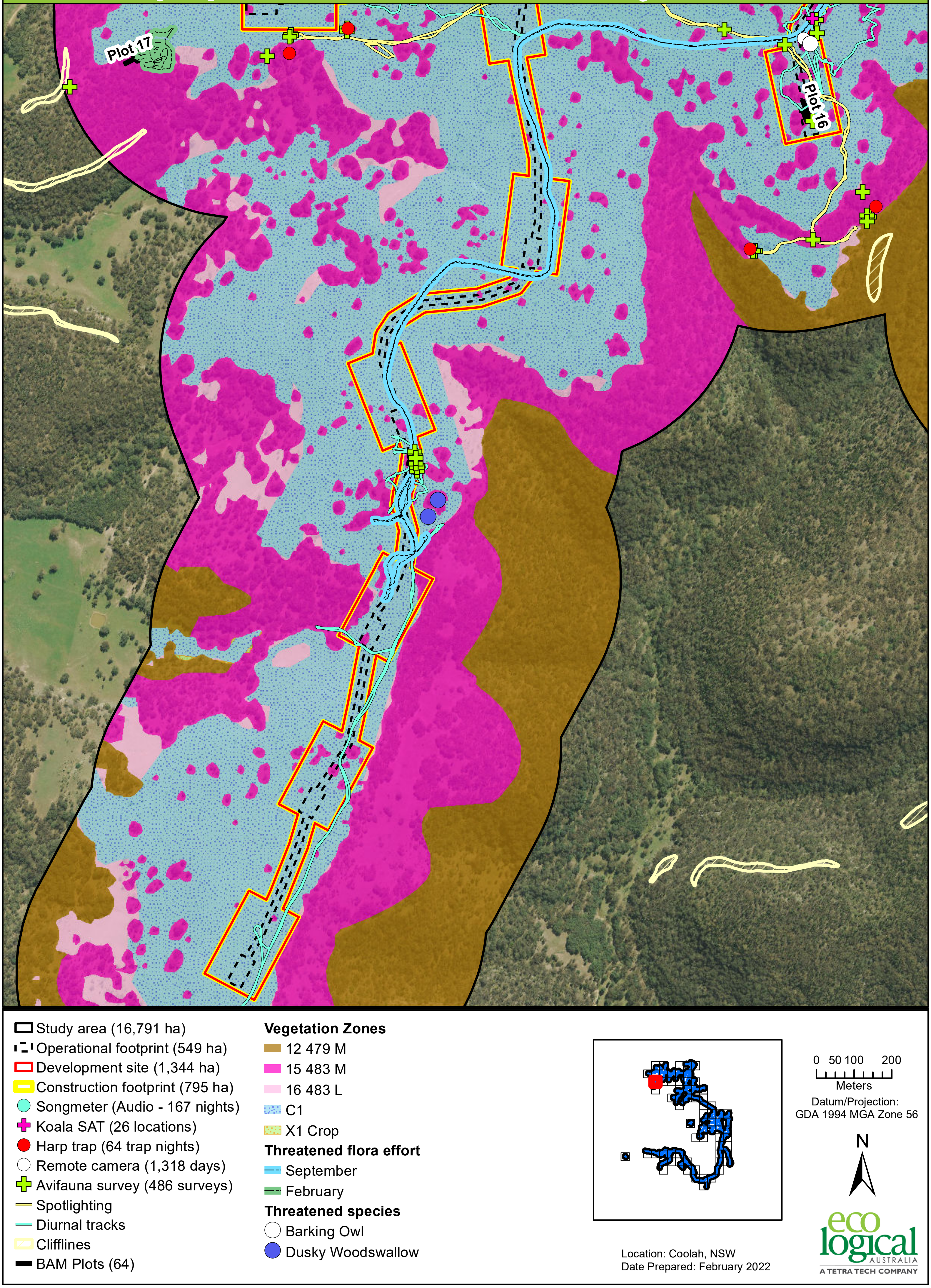

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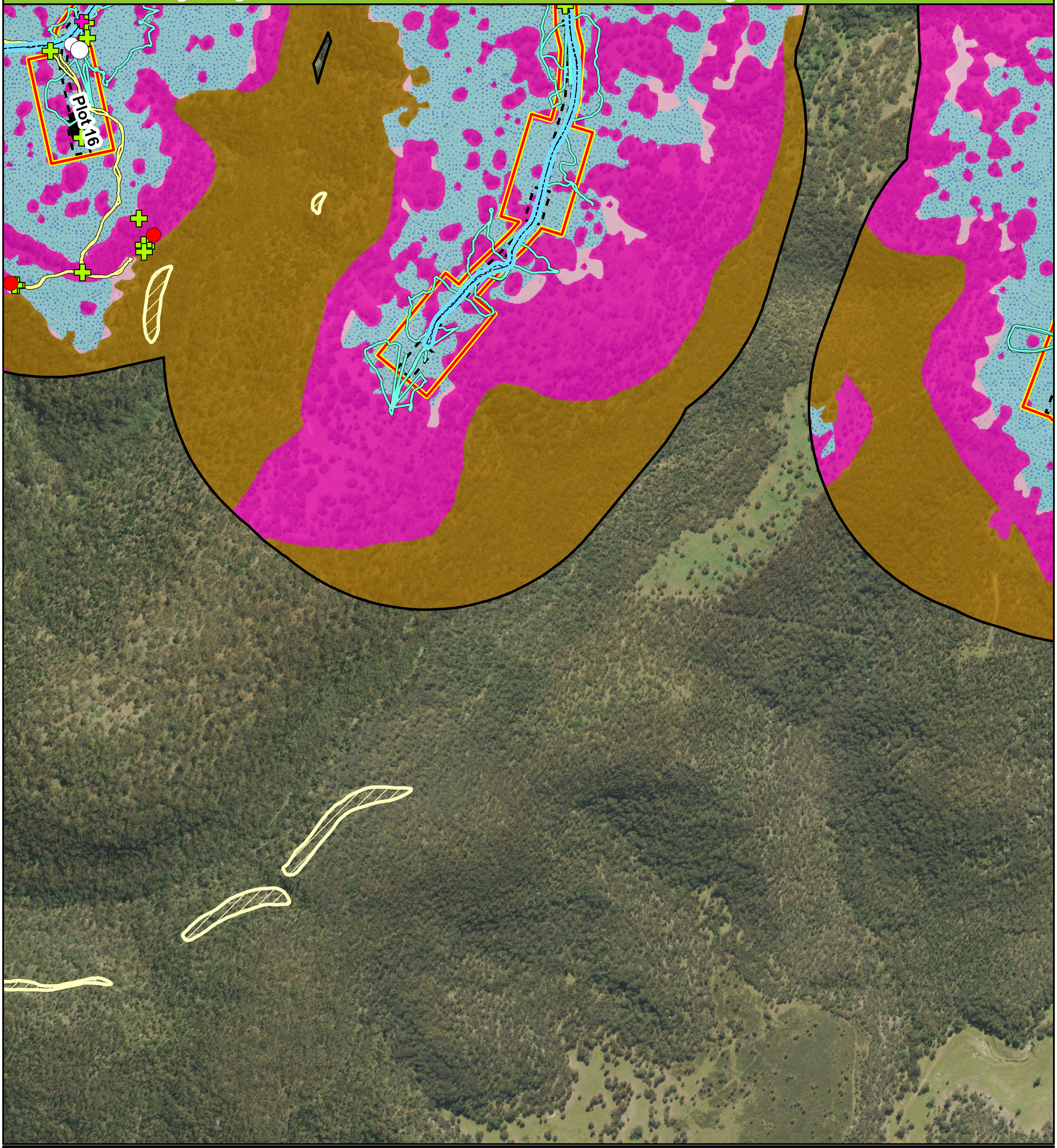
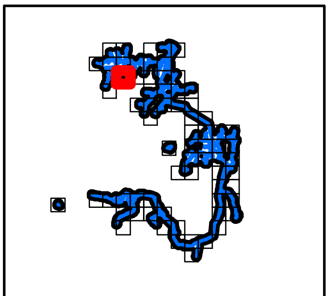


Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Songmeter (Audio - 167 nights)
Koala SAT (26 locations)
Harp trap (64 trap nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Clifflines
BAM Plots (64)

Vegetation Zones
12 479 M
15 483 M
16 483 L
C1

Threatened flora effort
September

Threatened species
Barking Owl



0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

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Location: Coolah, NSW
Date Prepared: February 2022

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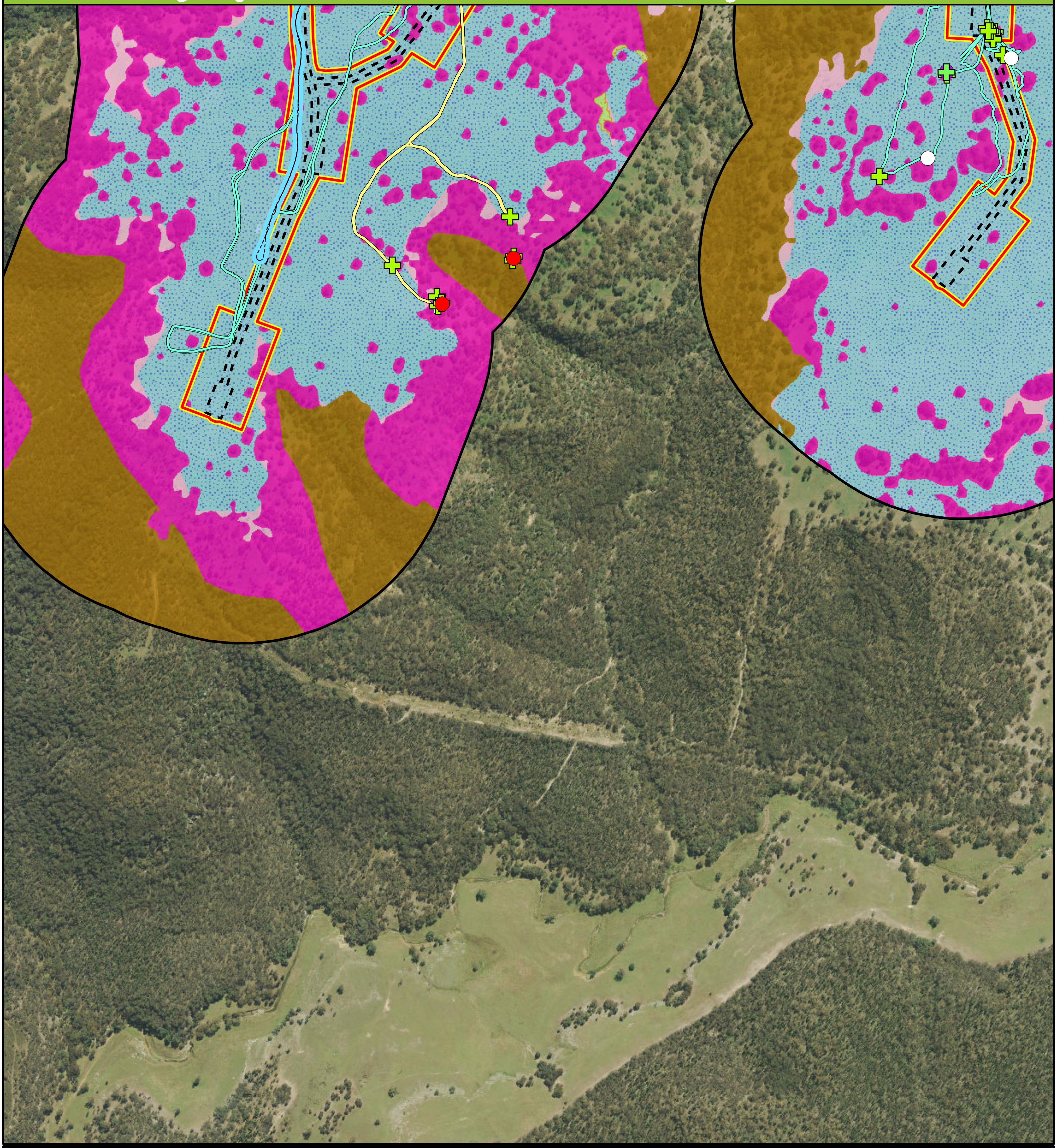
Detailed survey maps **Valley of the Winds Wind Farm**



- Study area (16,791 ha)
- Operational footprint (549 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Harp trap (64 trap nights)
- Songmeter (Ultrasonic - 613 unit nights)
- Remote camera (1,318 days)
- Avifauna survey (486 surveys)
- Spotlighting
- Diurnal tracks

Vegetation Zones

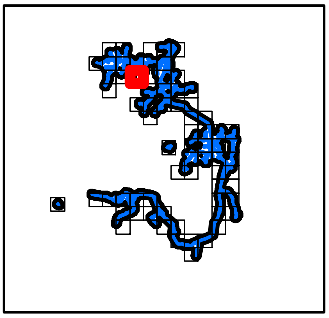
- 12 479 M
- 15 483 M
- 16 483 L
- C1
- X1 Crop

Threatened flora effort

- September

Threatened species

- Large Bentwing-bat
- Large-eared Pied Bat



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Meters

Datum/Projection: GDA 1994 MGA Zone 56

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Location: Coolah, NSW
Date Prepared: February 2022

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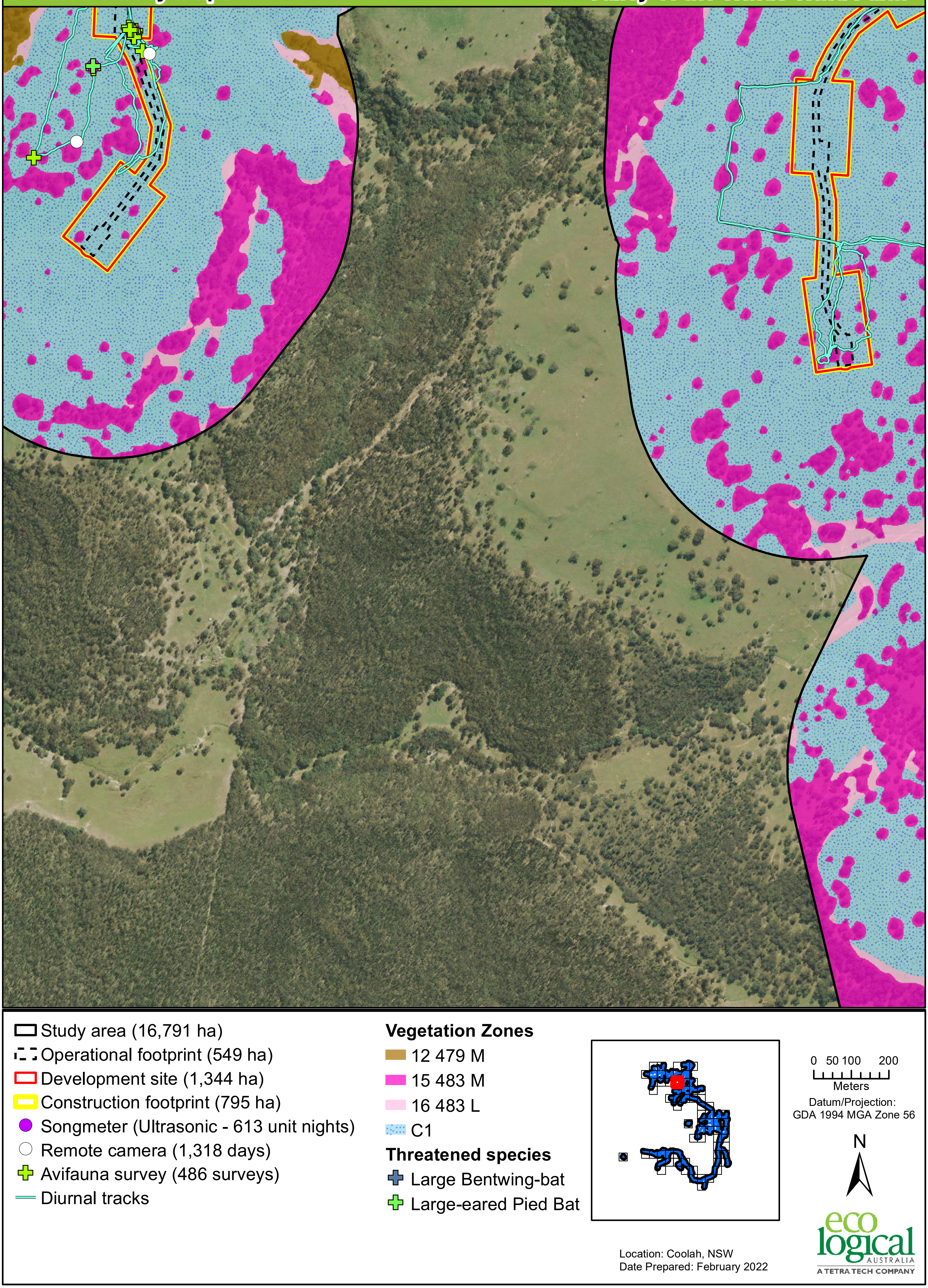

Location: Coolah, NSW
Date Prepared: February 2022

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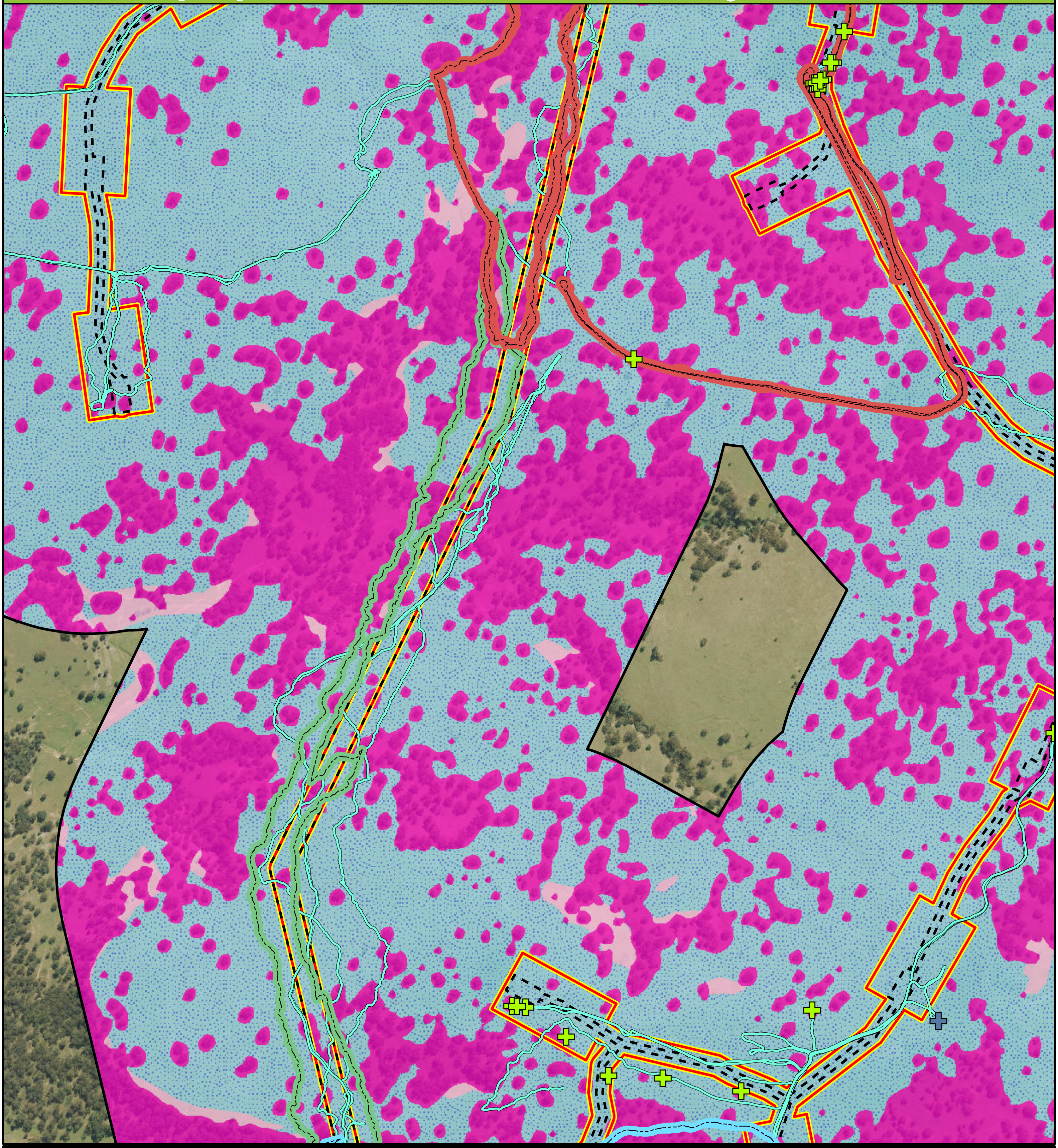
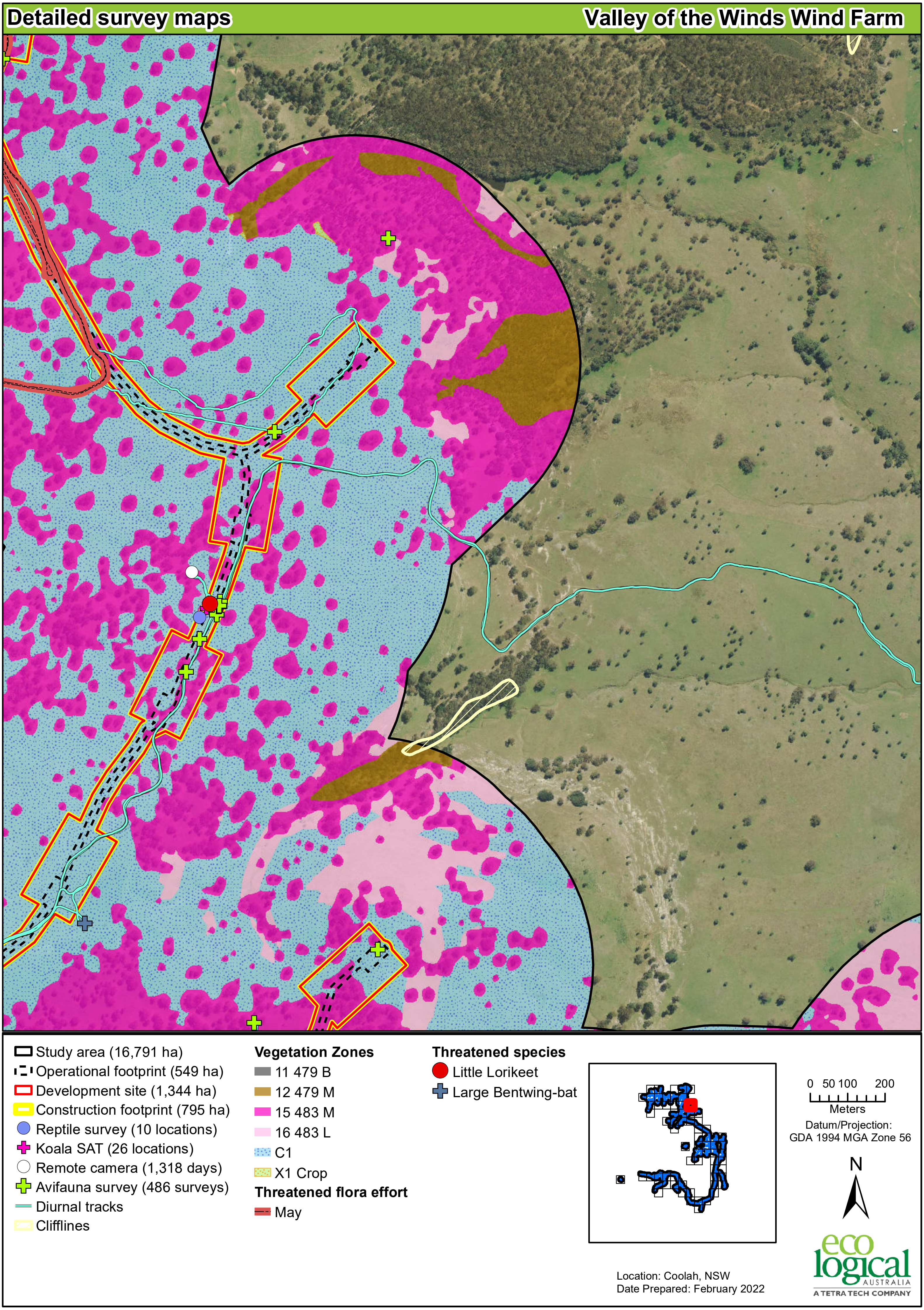
Detailed survey maps — Valley of the Winds Wind Farm





Detailed survey maps
Valley of the Winds Wind Farm
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Reptile survey (10 locations)
Koala SAT (26 locations)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Diurnal tracks
Clifflines
Vegetation Zones
11 479 B
12 479 M
15 483 M
16 483 L
C1
X1 Crop
Threatened flora effort
May
Threatened species
Little Lorikeet
Large Bentwing-bat
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022
eco logical AUSTRALIA
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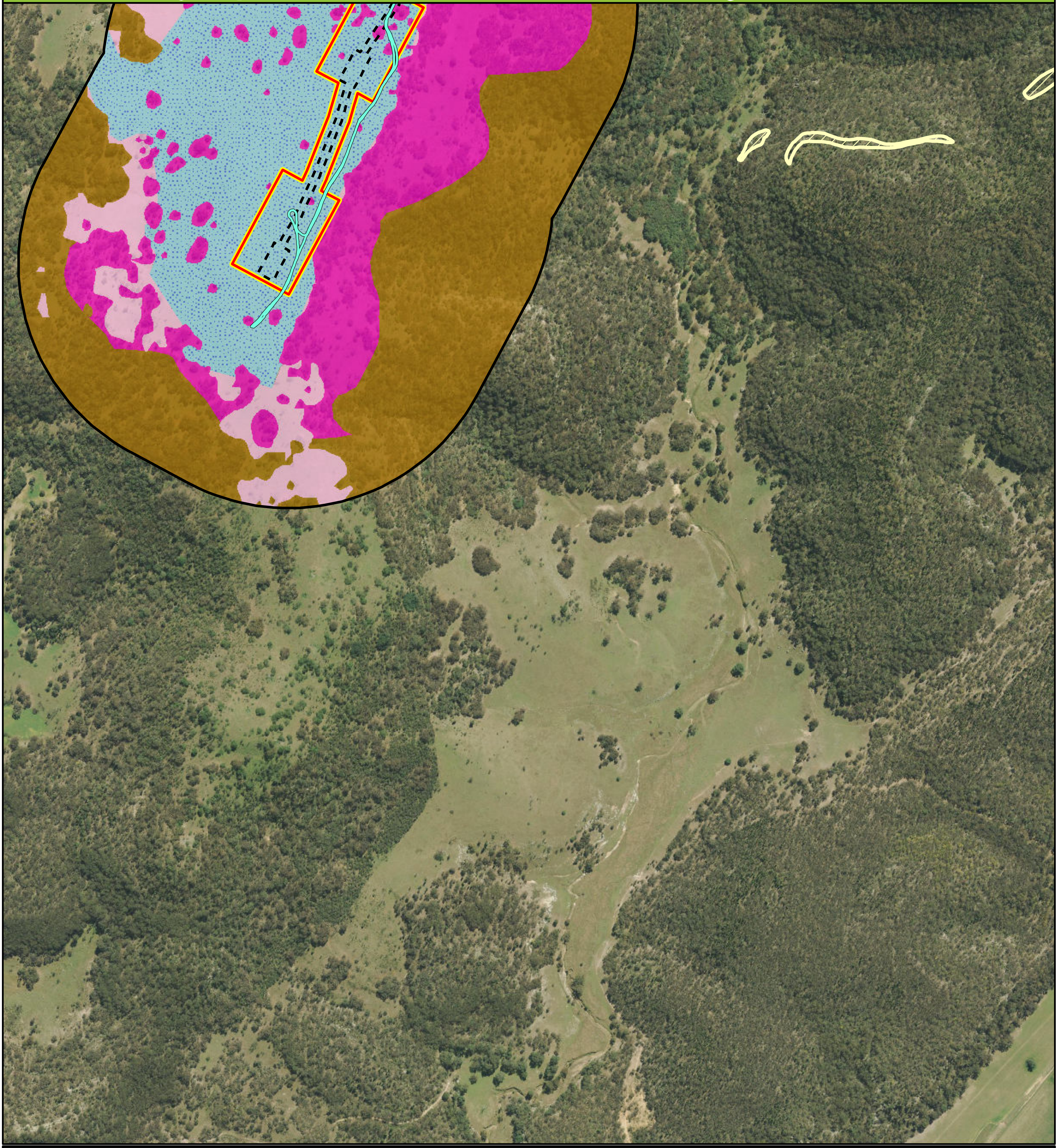
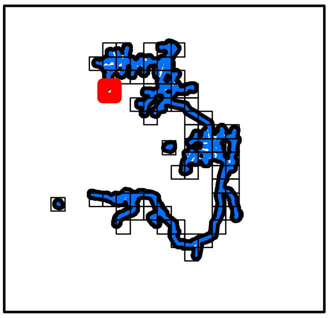


- Study area (16,791 ha)
- Operational footprint (549 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Diurnal tracks
- Clifflines
- C1

Vegetation Zones

- 12 479 M
- 15 483 M
- 16 483 L



0 50 100 200
Meters

Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

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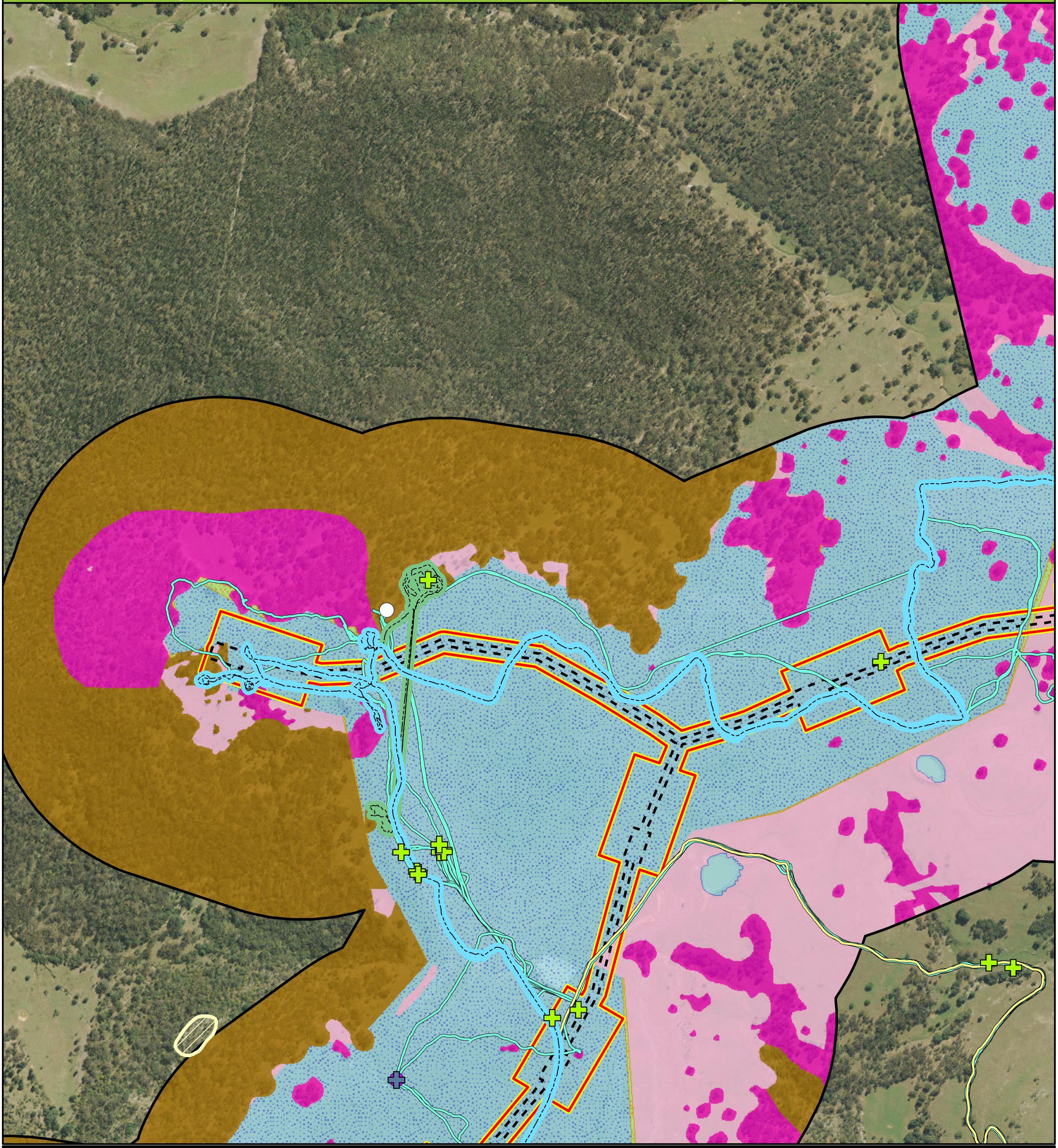
Detailed survey maps

Valley of the Winds Wind Farm



- Study area (16,791 ha)
- Operational footprint (549 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Songmeter (Ultrasonic - 613 unit nights)
- Remote camera (1,318 days)
- Avifauna survey (486 surveys)
- Spotlighting
- Diurnal tracks
- Clifflines

Vegetation Zones

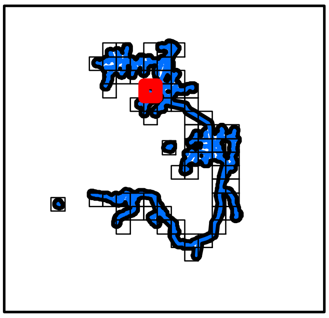
- 12 479 M
- 15 483 M
- 16 483 L
- C1
- X1 Crop
- X2 Dam

Threatened flora effort

- September
- February

Threatened species

- Large Bentwing-bat



0 50 100 200
Meters

Datum/Projection:
GDA 1994 MGA Zone 56

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Location: Coolah, NSW
Date Prepared: February 2022

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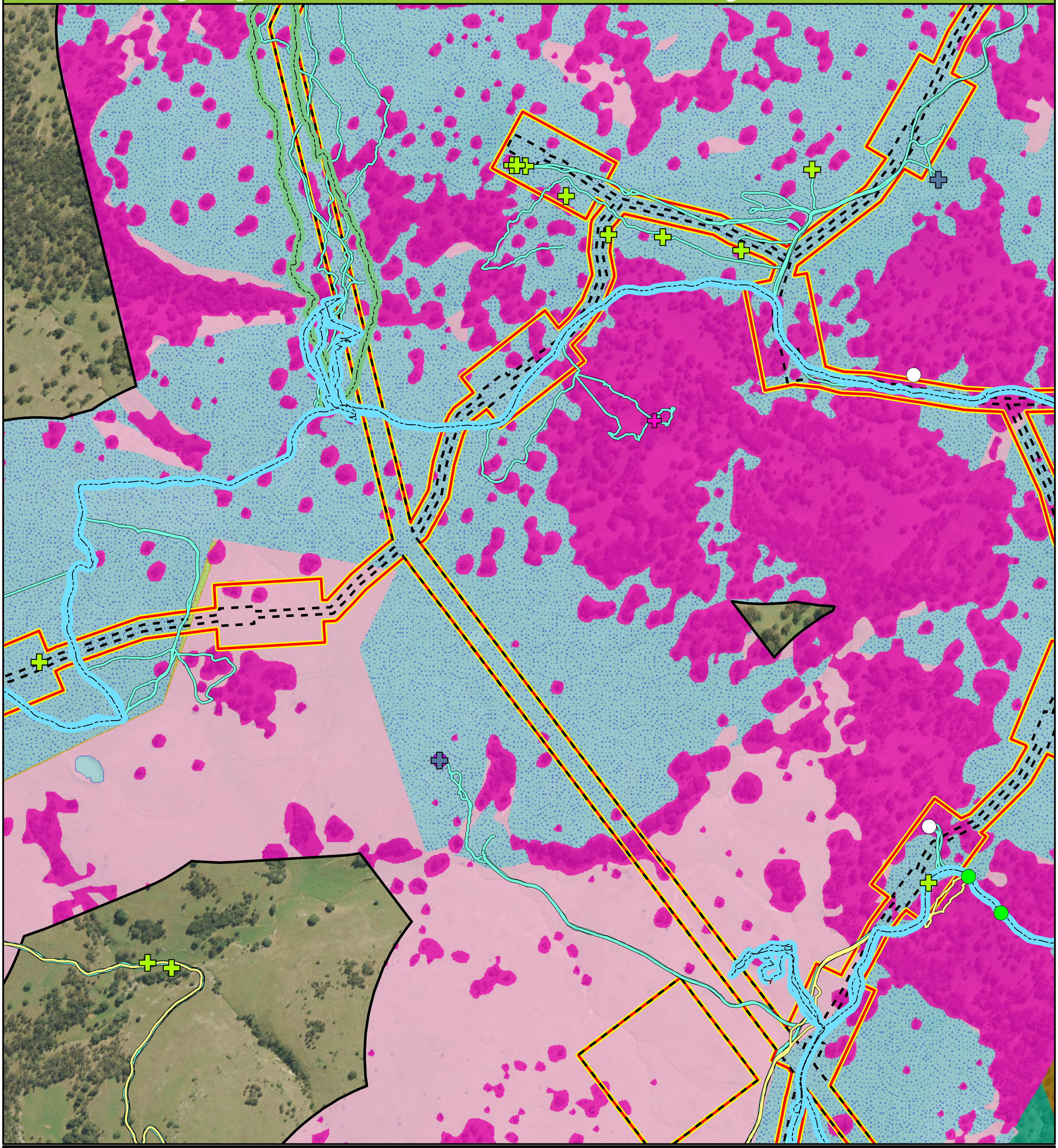


- Study area (16,791 ha)
- Operational footprint (549 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Call playback (17 locations, twice each)
- Koala SAT (26 locations)
- Songmeter (Ultrasonic - 613 unit nights)
- Remote camera (1,318 days)
- Avifauna survey (486 surveys)
- Spotlighting
- Diurnal tracks

Vegetation Zones

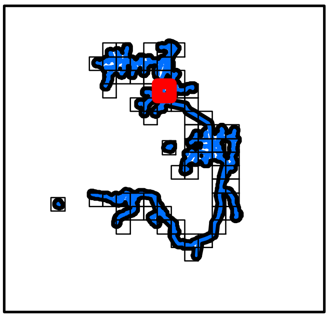
- 12 479 M
- 15 483 M
- 16 483 L
- 17 616 M
- C1
- X1 Crop
- X2 Dam

Threatened flora effort

- September
- February

Threatened species

- Large Bentwing-bat



Location: Coolah, NSW
Date Prepared: February 2022

0 50 100 200
Meters

Datum/Projection:
GDA 1994 MGA Zone 56

N

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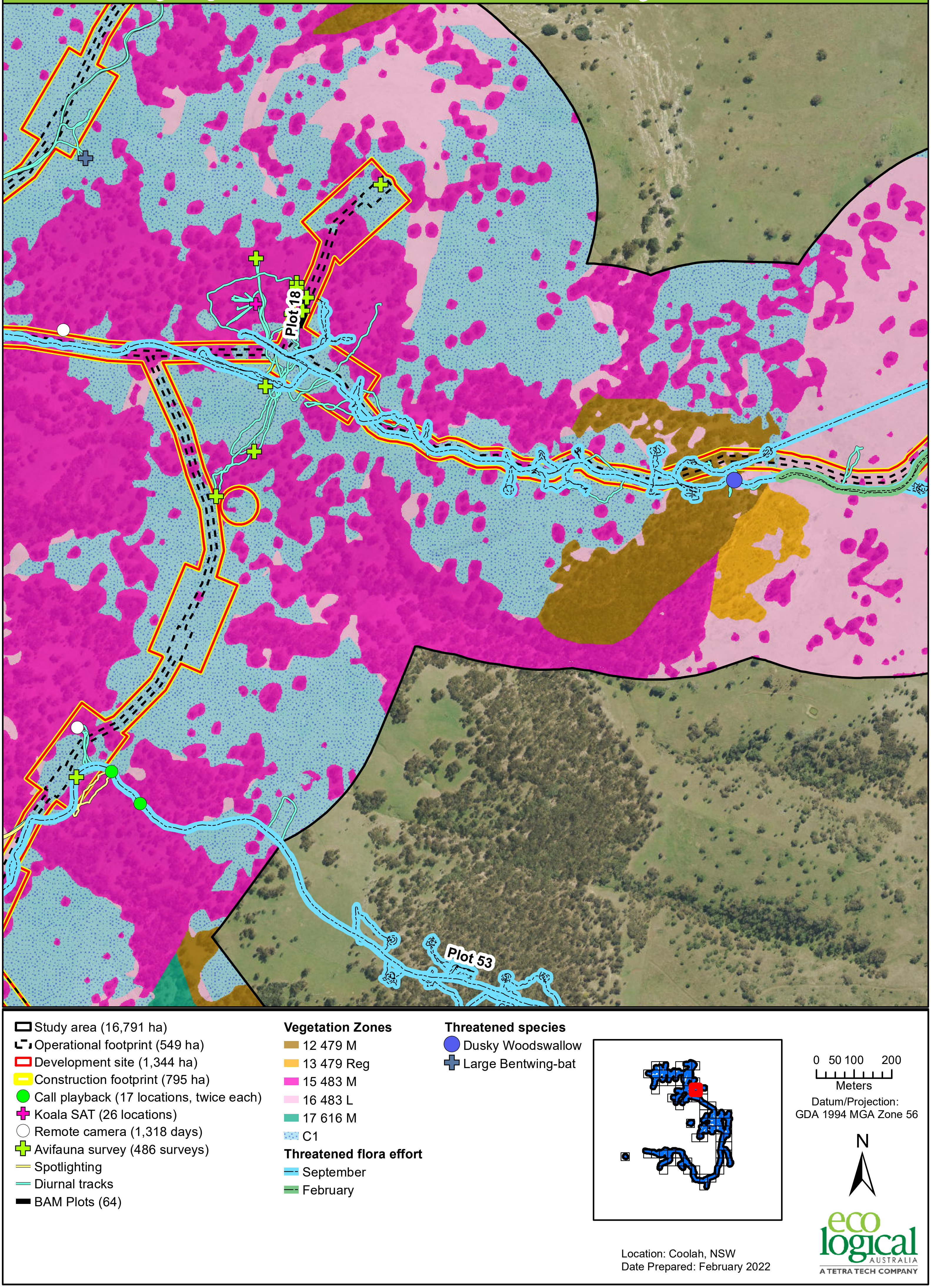
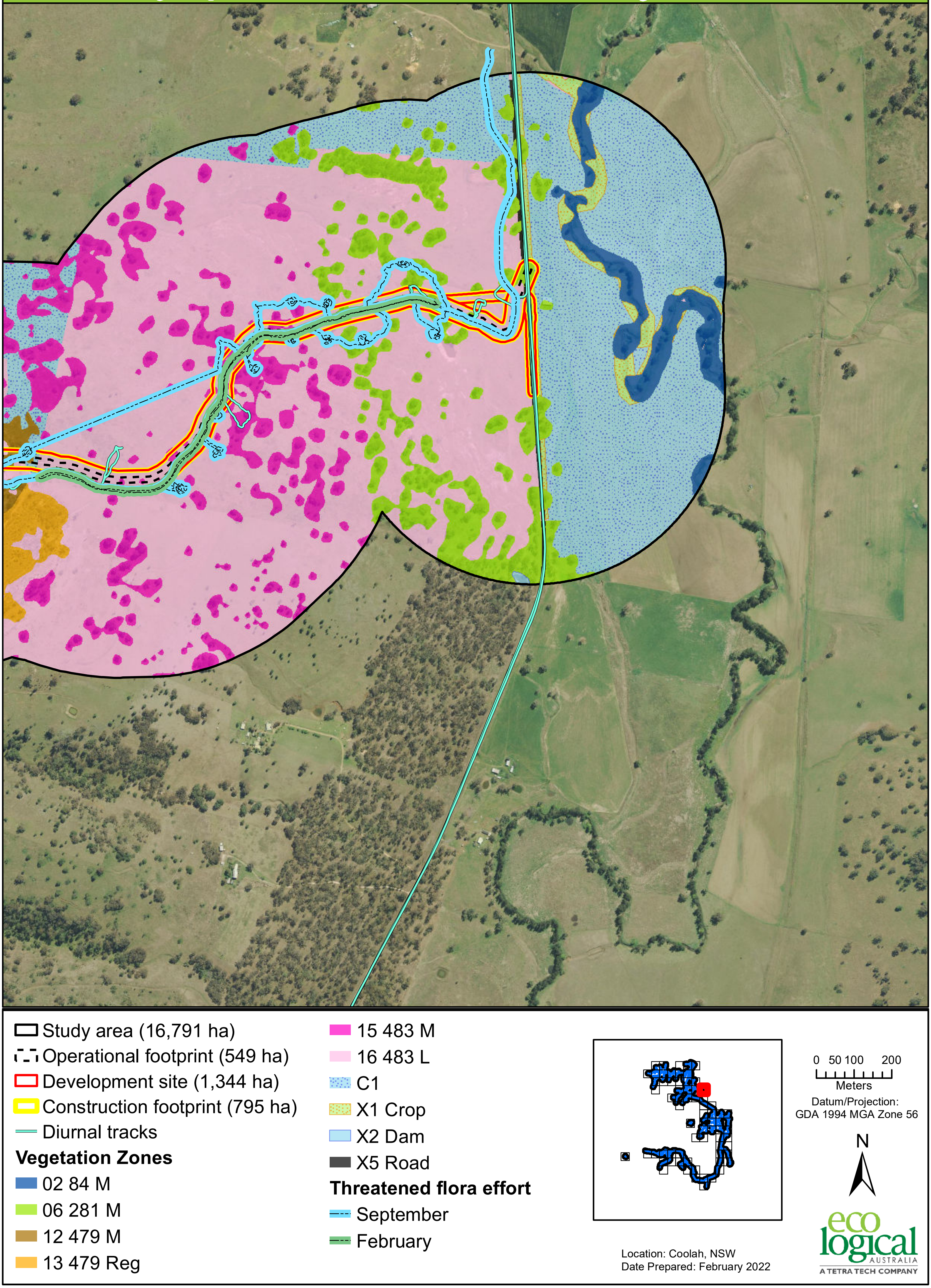
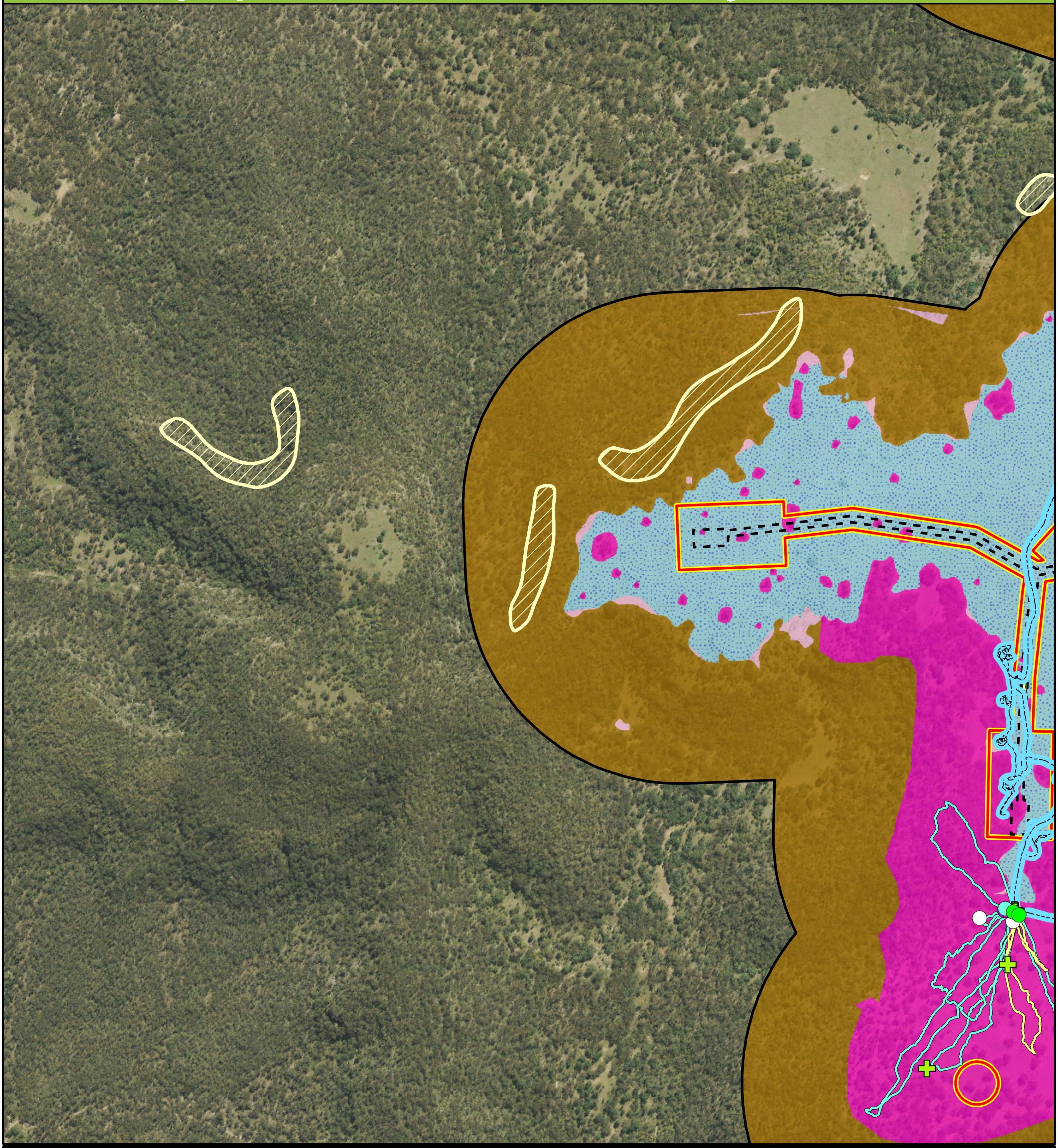
Detailed survey maps — Valley of the Winds Wind Farm



Detailed survey maps

Valley of the Winds Wind Farm





- Study area (16,791 ha)
- Operational footprint (549 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Call playback (17 locations, twice each)
- Songmeter (Audio - 167 nights)
- Koala SAT (26 locations)
- Songmeter (Ultrasonic - 613 unit nights)
- Remote camera (1,318 days)
- Avifauna survey (486 surveys)
- Spotlighting
- Diurnal tracks
- Clifflines

Vegetation Zones

- 12 479 M
- 15 483 M
- 16 483 L
- C1

Threatened flora effort

- September

Location: Coolah, NSW
Date Prepared: February 2022

0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

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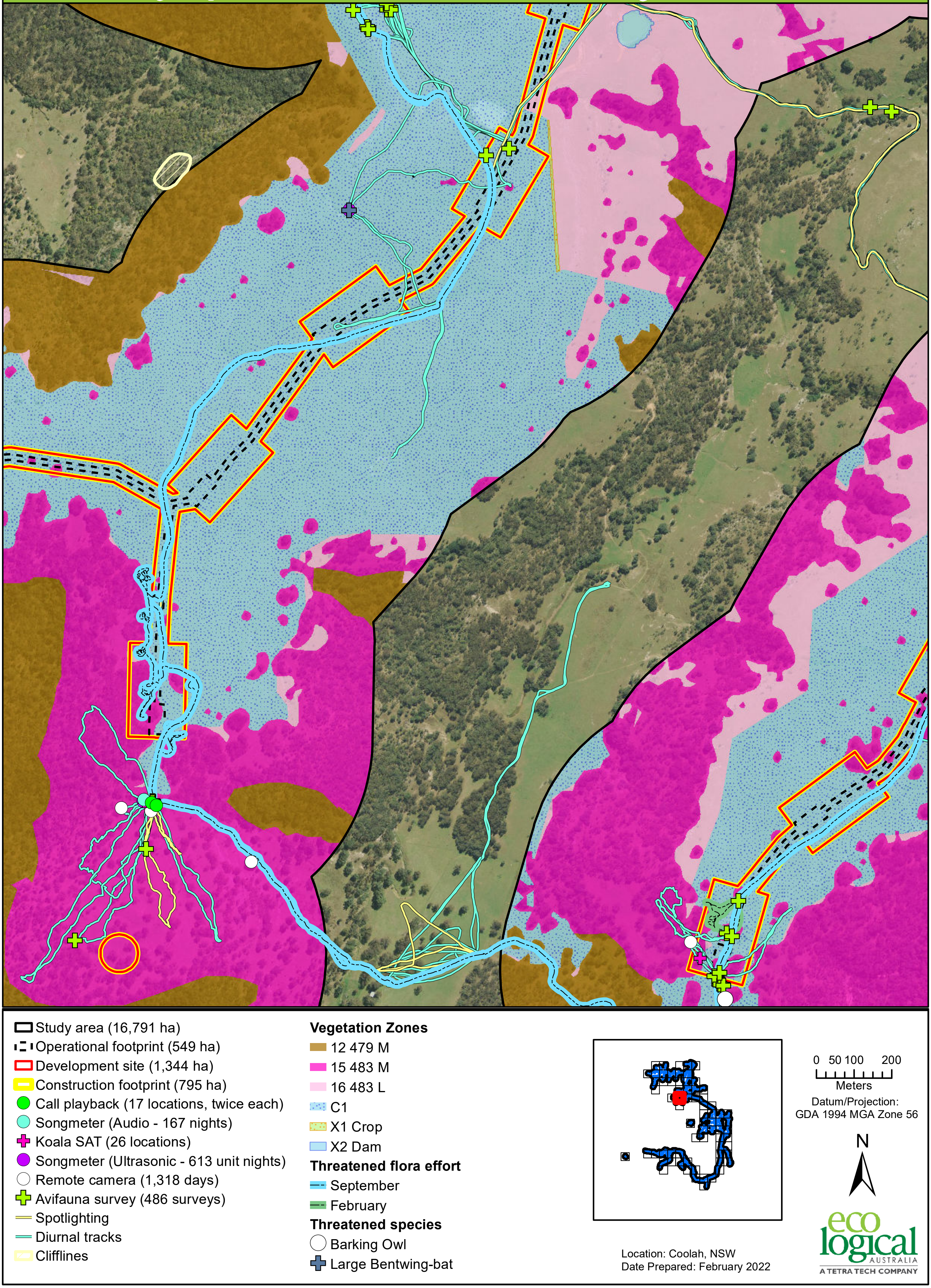
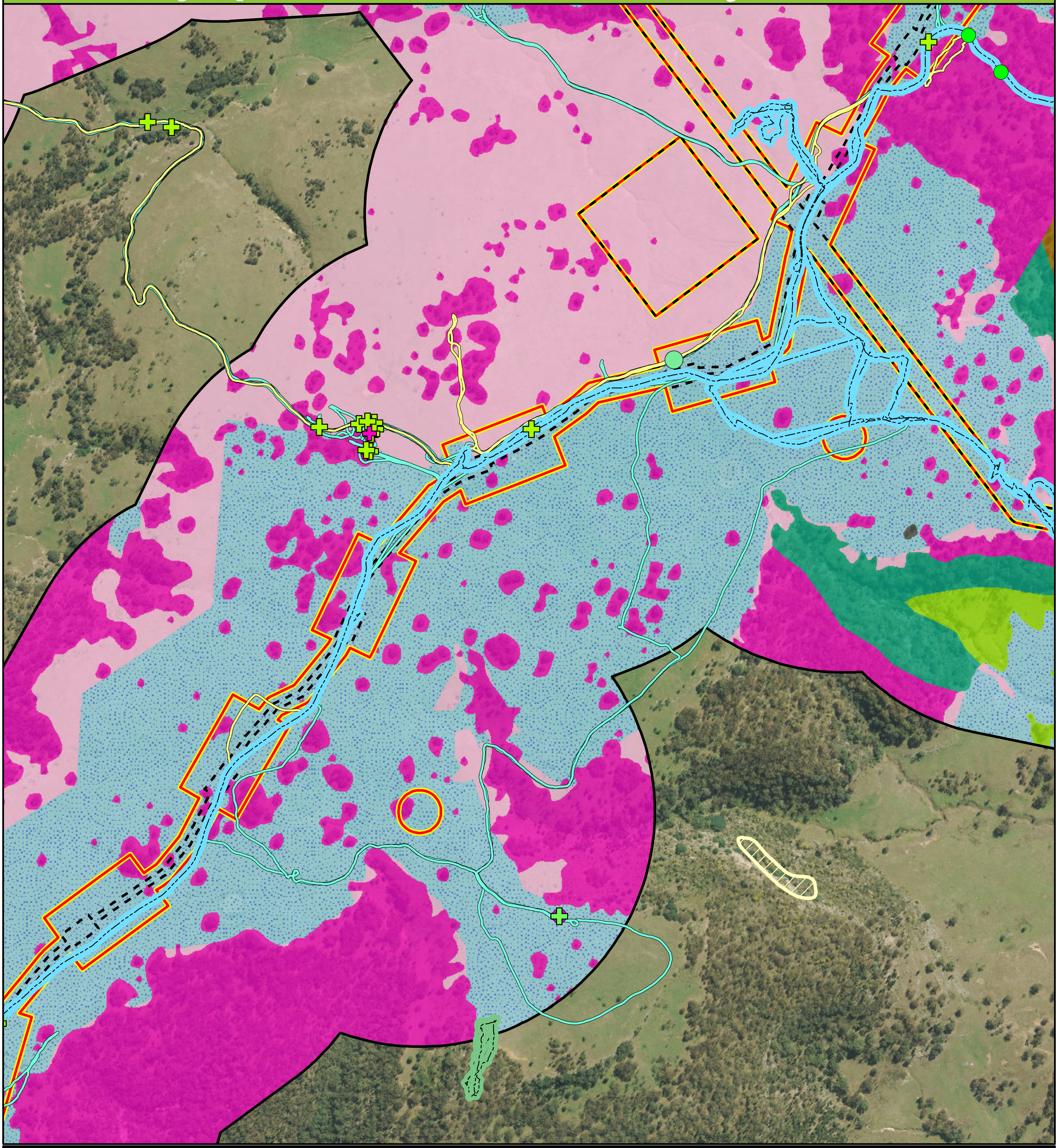
Detailed survey maps — Valley of the Winds Wind Farm



Detailed survey maps

Valley of the Winds Wind Farm



- Study area (16,791 ha)
- Operational footprint (549 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Call playback (17 locations, twice each)
- Koala SAT (26 locations)
- Songmeter (Ultrasonic - 613 unit nights)
- Avifauna survey (486 surveys)
- Spotlighting
- Diurnal tracks
- Clifflines

Vegetation Zones

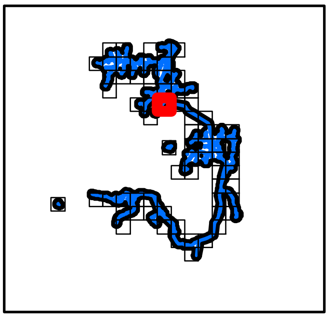
- 06 281 M
- 11 479 B
- 12 479 M
- 15 483 M
- 16 483 L
- 17 616 M
- C1

Threatened flora effort

- September
- February

Threatened species

- Spotted Harrier
- Large-eared Pied Bat



0 50 100 200
Meters

Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

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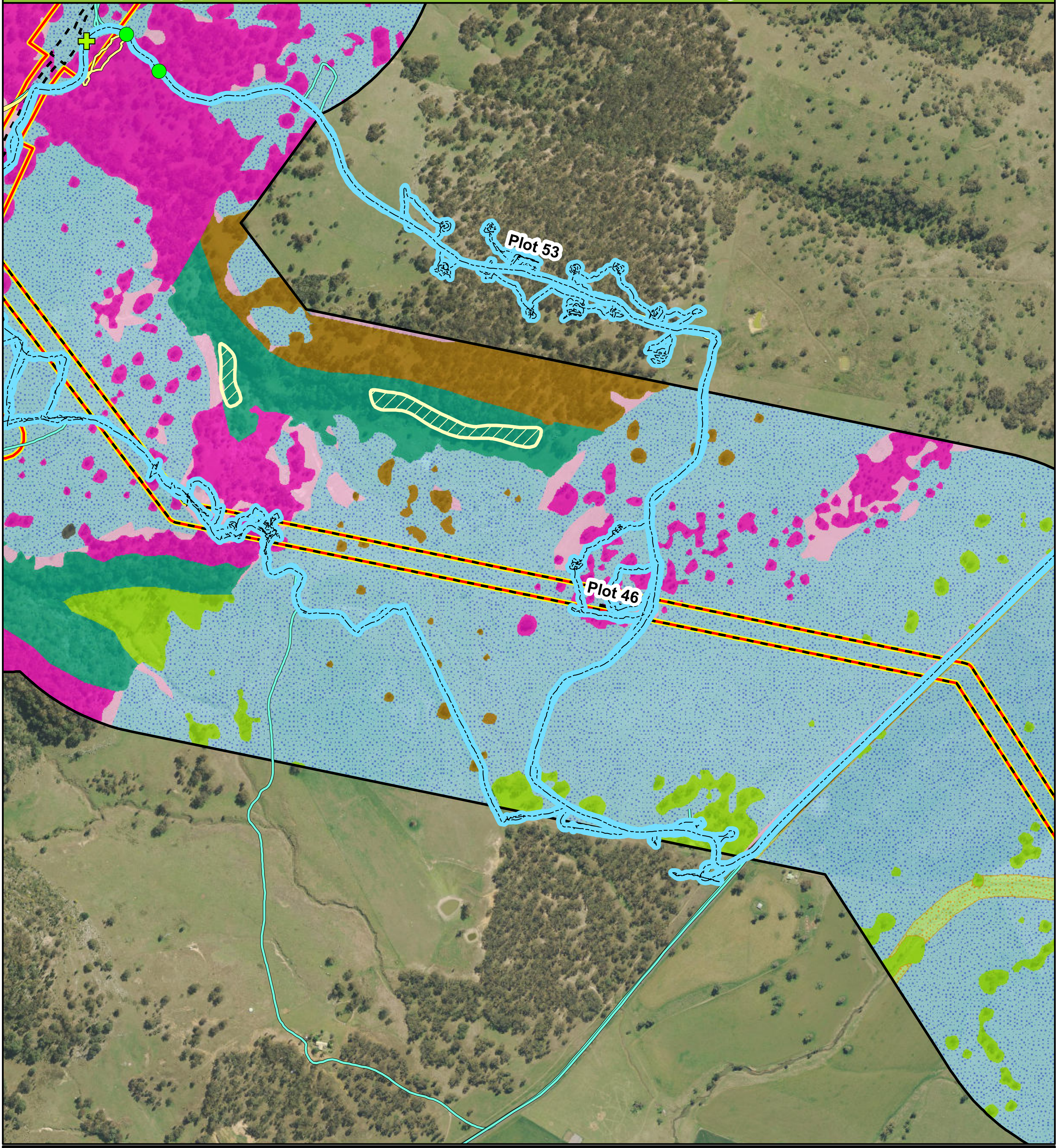


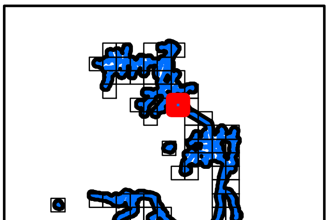
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Call playback (17 locations, twice each)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Clifflines
BAM Plots (64)

Vegetation Zones

05 281 G
06 281 M
11 479 B
12 479 M
15 483 M
16 483 L
17 616 M
C1
X1 Crop
X5 Road

Threatened flora effort

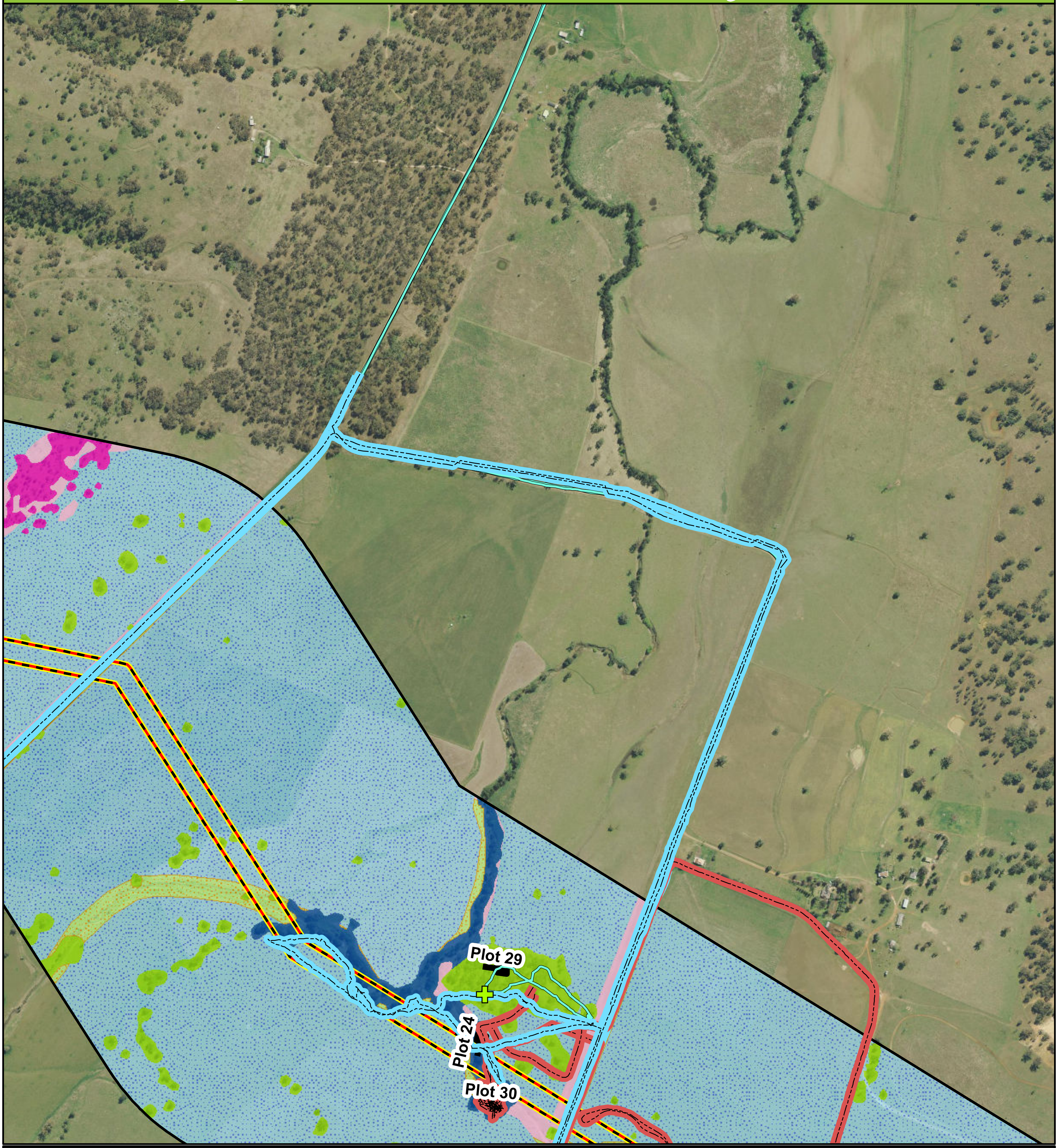
September



0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022



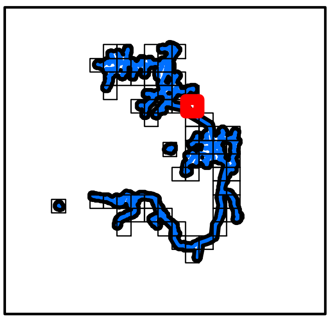
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Avifauna survey (486 surveys)
Diurnal tracks
BAM Plots (64)

Vegetation Zones

02 84 M
06 281 M
15 483 M
16 483 L
C1
X1 Crop
X5 Road

Threatened flora effort

September
May



0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

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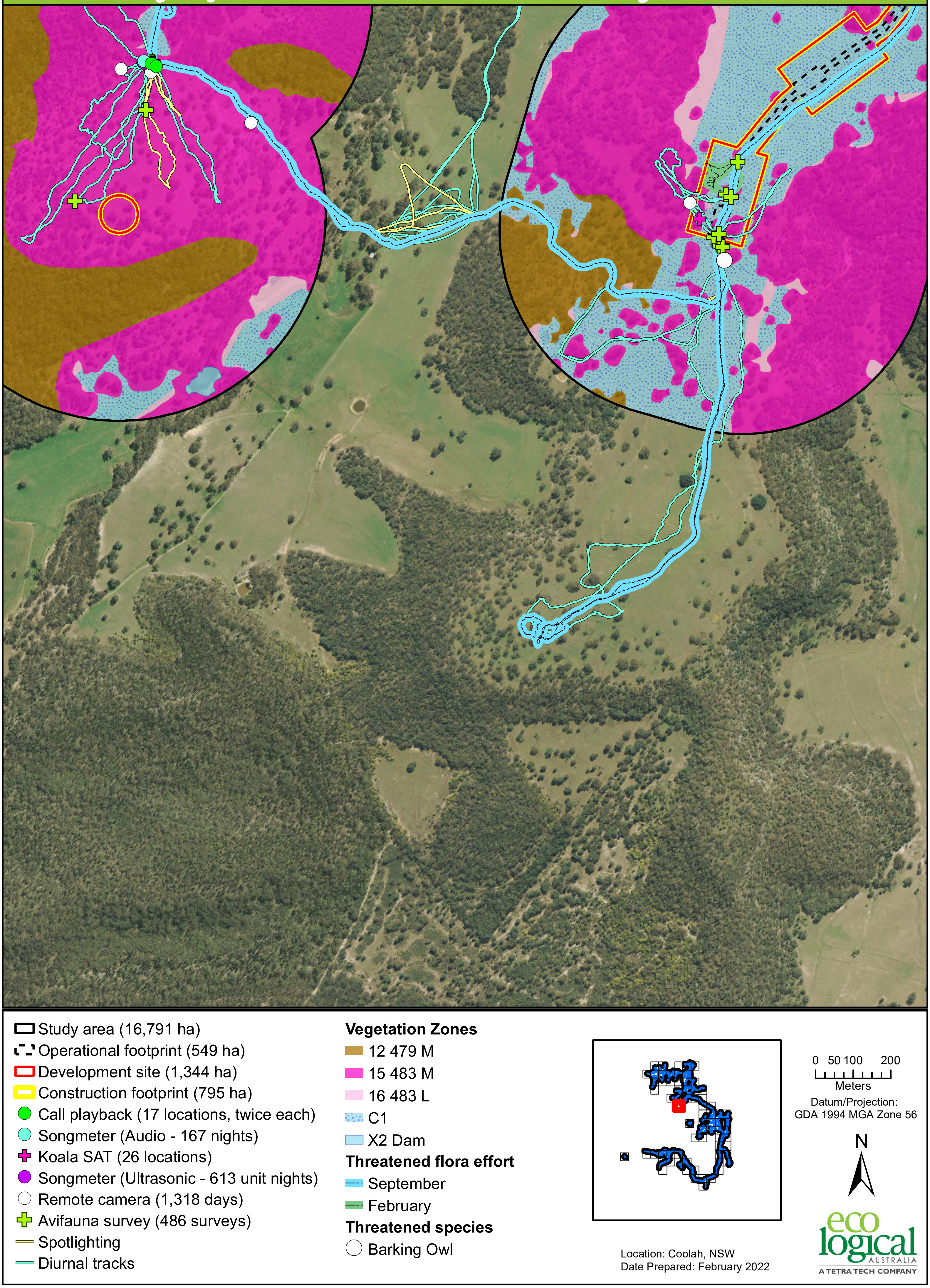
Detailed survey maps

Valley of the Winds Wind Farm



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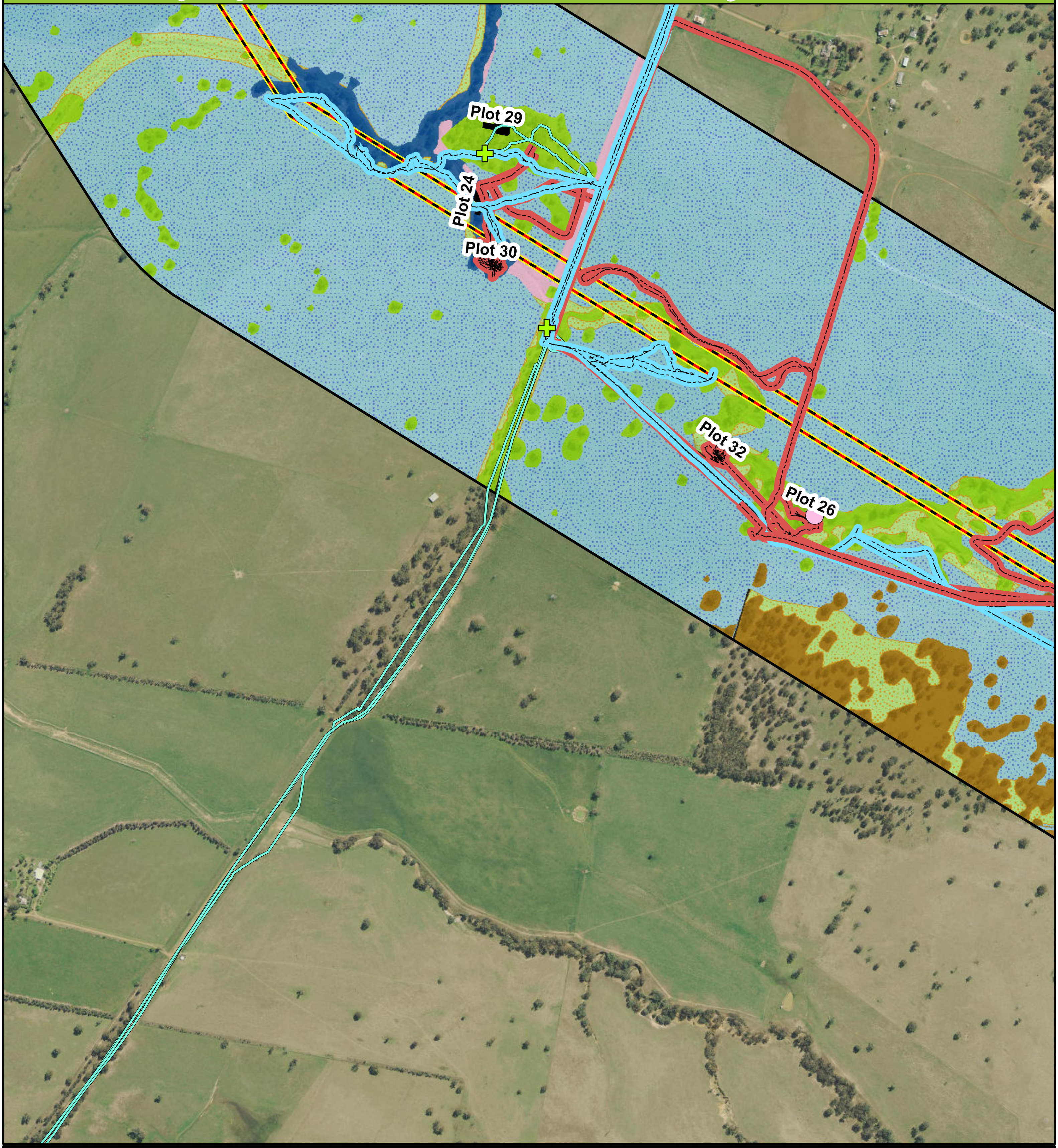
Detailed survey maps **Valley of the Winds Wind Farm**



Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
BAM Plots (64)

Vegetation Zones

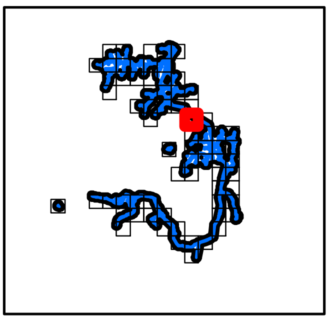
02 84 M
06 281 M
12 479 M
16 483 L
C1
X1 Crop
X5 Road

Threatened flora effort

September
May

Threatened species

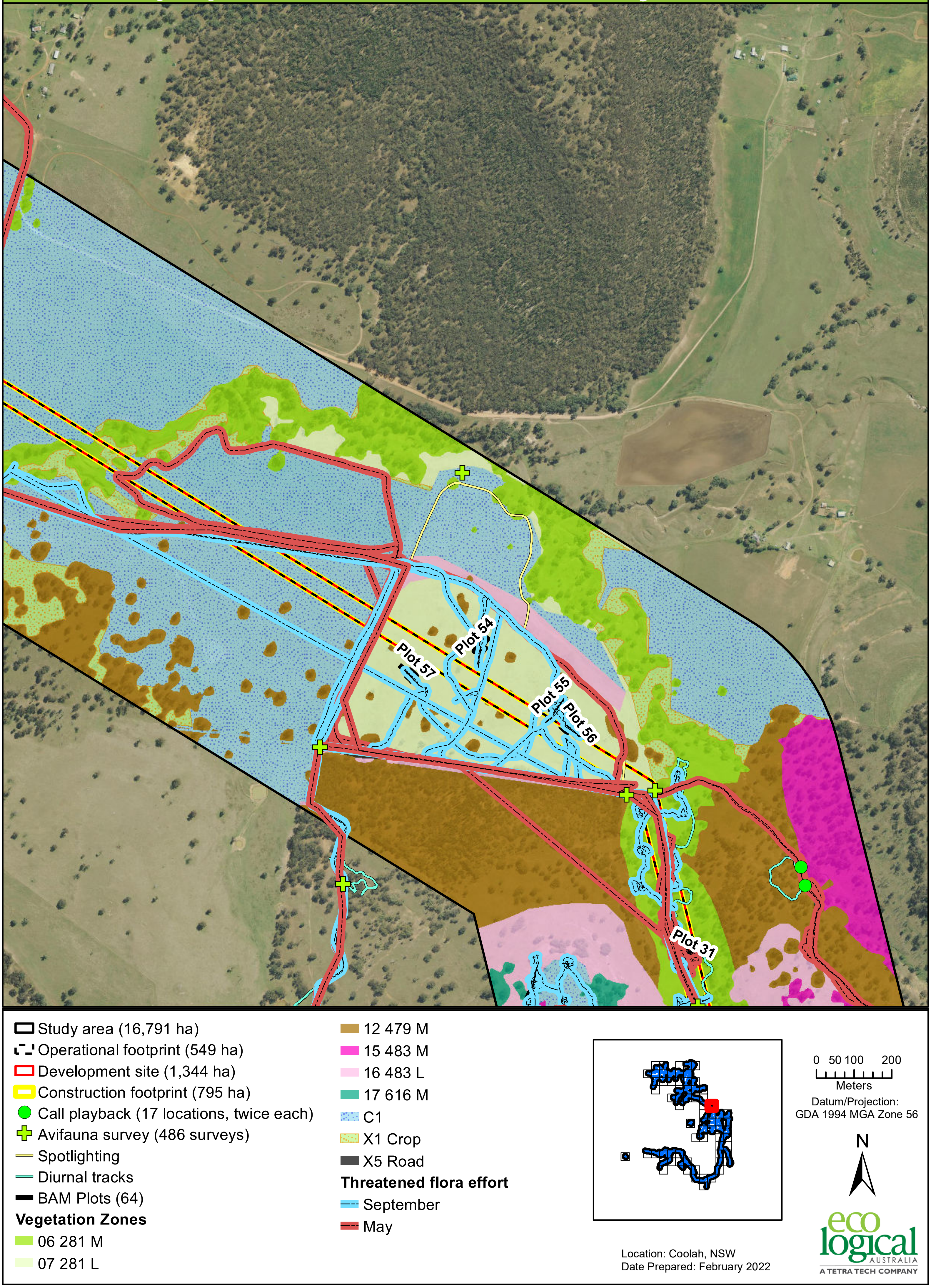
Dichanthium setosum

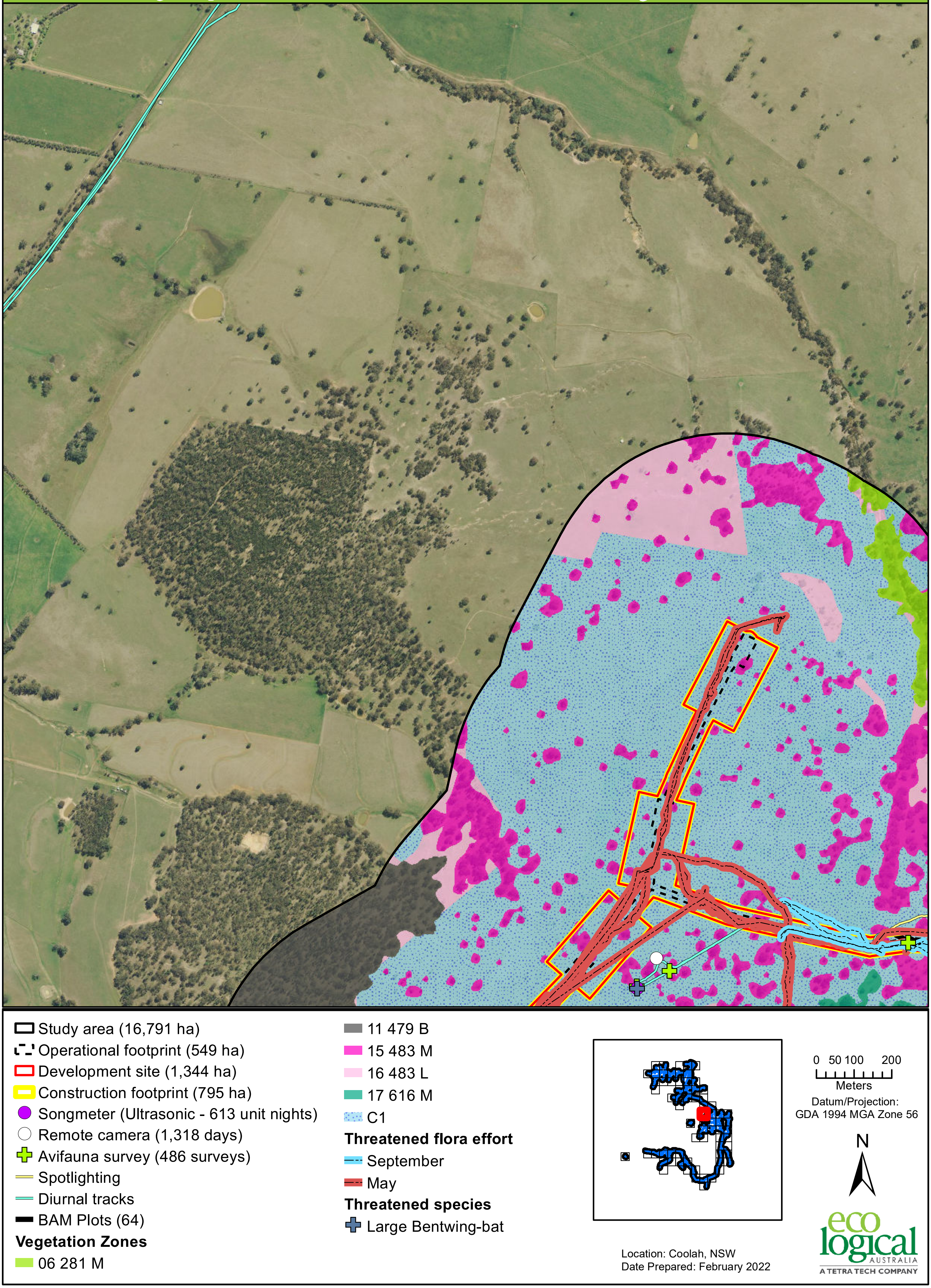


Location: Coolah, NSW
Date Prepared: February 2022

0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N


Plot 54
Plot 57
Plot 55
Plot 56
Plot 31
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Call playback (17 locations, twice each)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
BAM Plots (64)
Vegetation Zones
06 281 M
07 281 L
12 479 M
15 483 M
16 483 L
17 616 M
C1
X1 Crop
X5 Road
Threatened flora effort
September
May
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022
eco logical AUSTRALIA
A TETRA TECH COMPANY


Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Songmeter (Ultrasonic - 613 unit nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
BAM Plots (64)
Vegetation Zones
06 281 M
11 479 B
15 483 M
16 483 L
17 616 M
C1
Threatened flora effort
September
May
Threatened species
Large Bentwing-bat
Location: Coolah, NSW
Date Prepared: February 2022
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
eco logical AUSTRALIA
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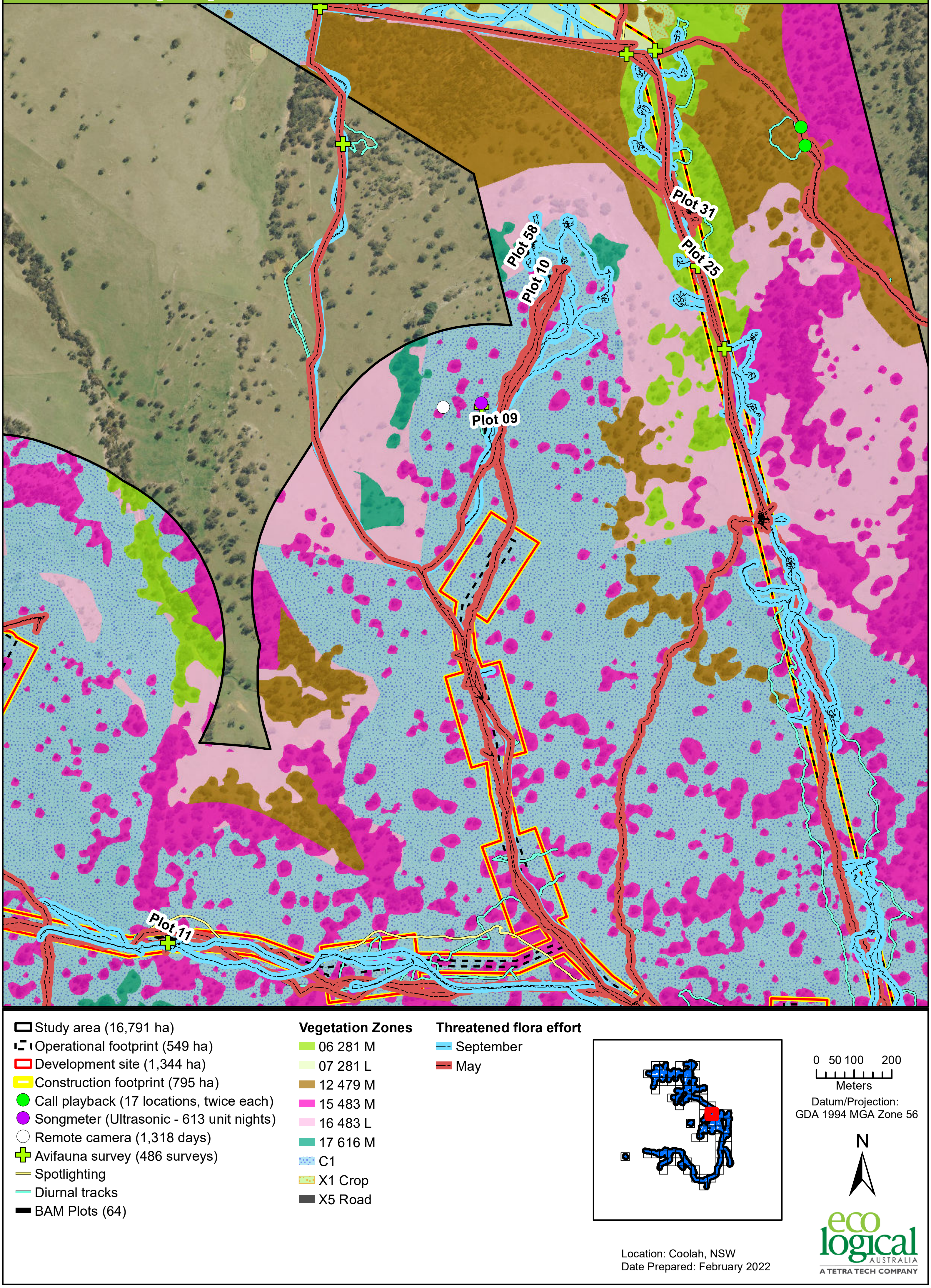

Location: Coolah, NSW
Date Prepared: February 2022

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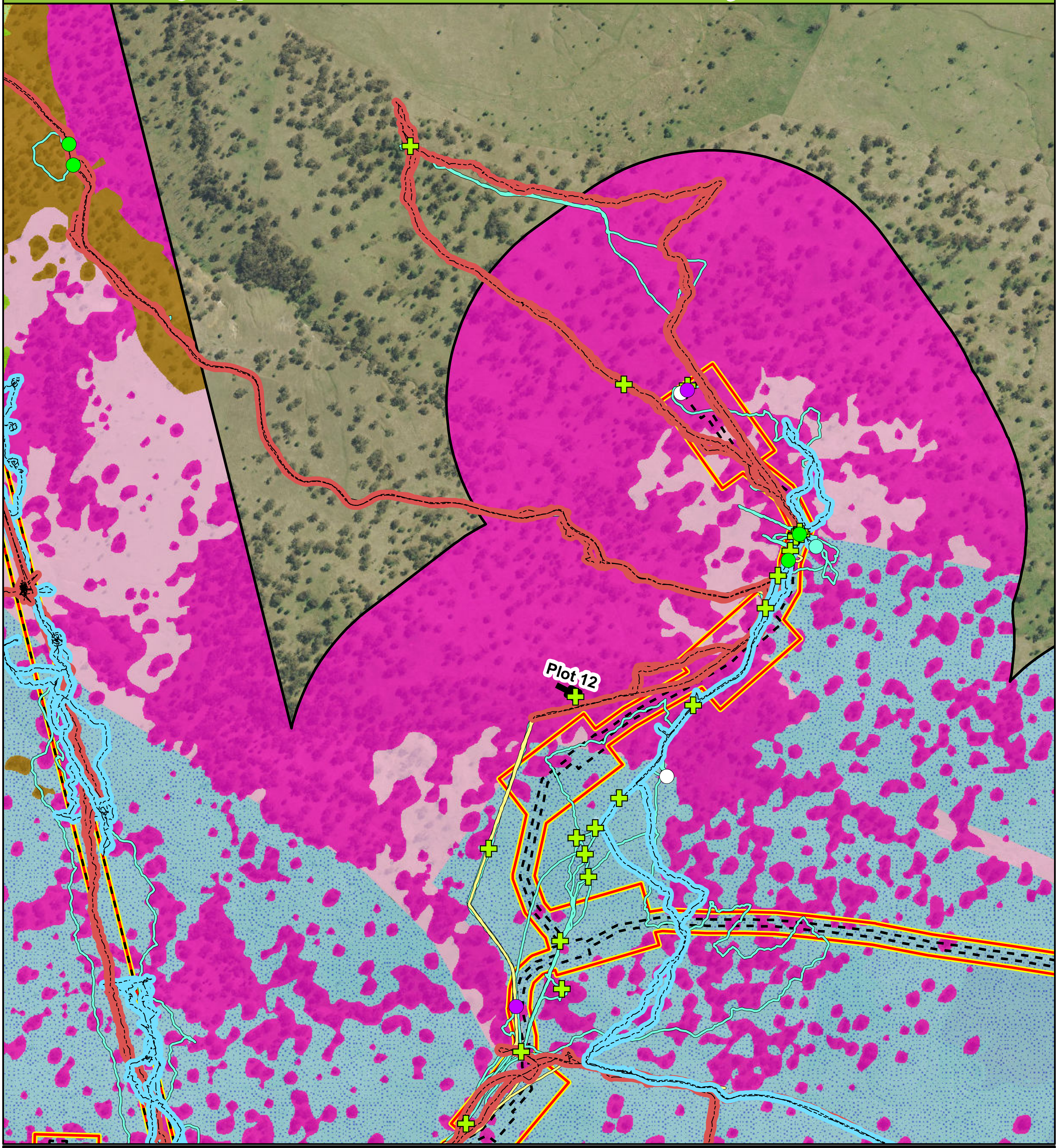
Detailed survey maps

Valley of the Winds Wind Farm



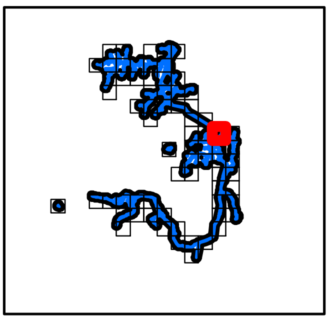
- Study area (16,791 ha)
- Operational footprint (549 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Call playback (17 locations, twice each)
- Songmeter (Audio - 167 nights)
- Songmeter (Ultrasonic - 613 unit nights)
- Remote camera (1,318 days)
- Avifauna survey (486 surveys)
- Spotlighting
- Diurnal tracks
- BAM Plots (64)

Vegetation Zones

- 06 281 M
- 12 479 M
- 15 483 M
- 16 483 L
- C1
- X1 Crop

Threatened flora effort

- September
- May



0 50 100 200
Meters

Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

eco logical AUSTRALIA
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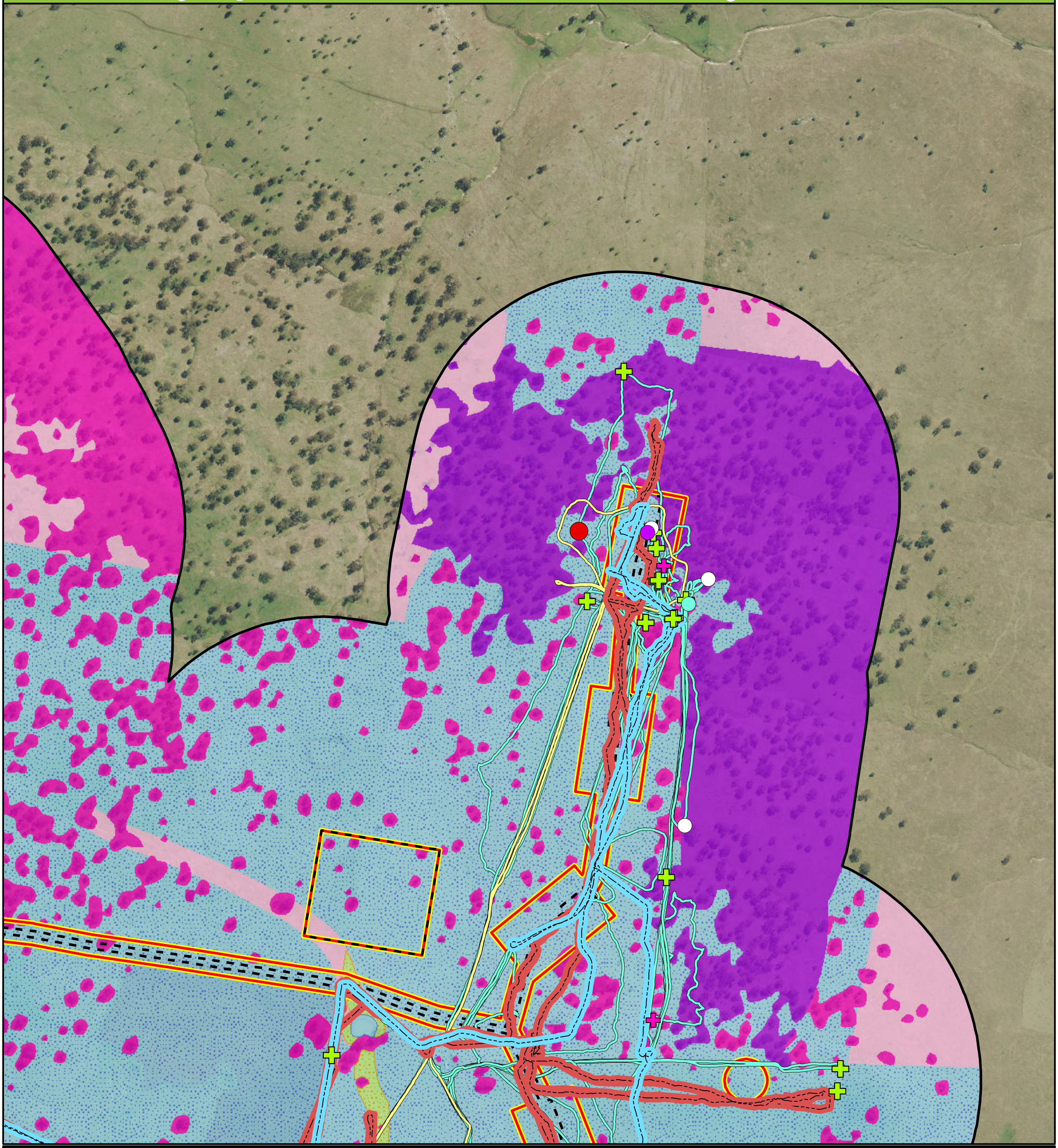


Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Songmeter (Audio - 167 nights)
Koala SAT (26 locations)
Songmeter (Ultrasonic - 613 unit nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks

Vegetation Zones

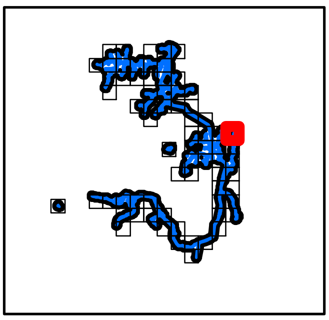
14 483 G
15 483 M
16 483 L
C1
X1 Crop
X2 Dam

Threatened flora effort

September
May

Threatened species

Little Lorikeet



0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

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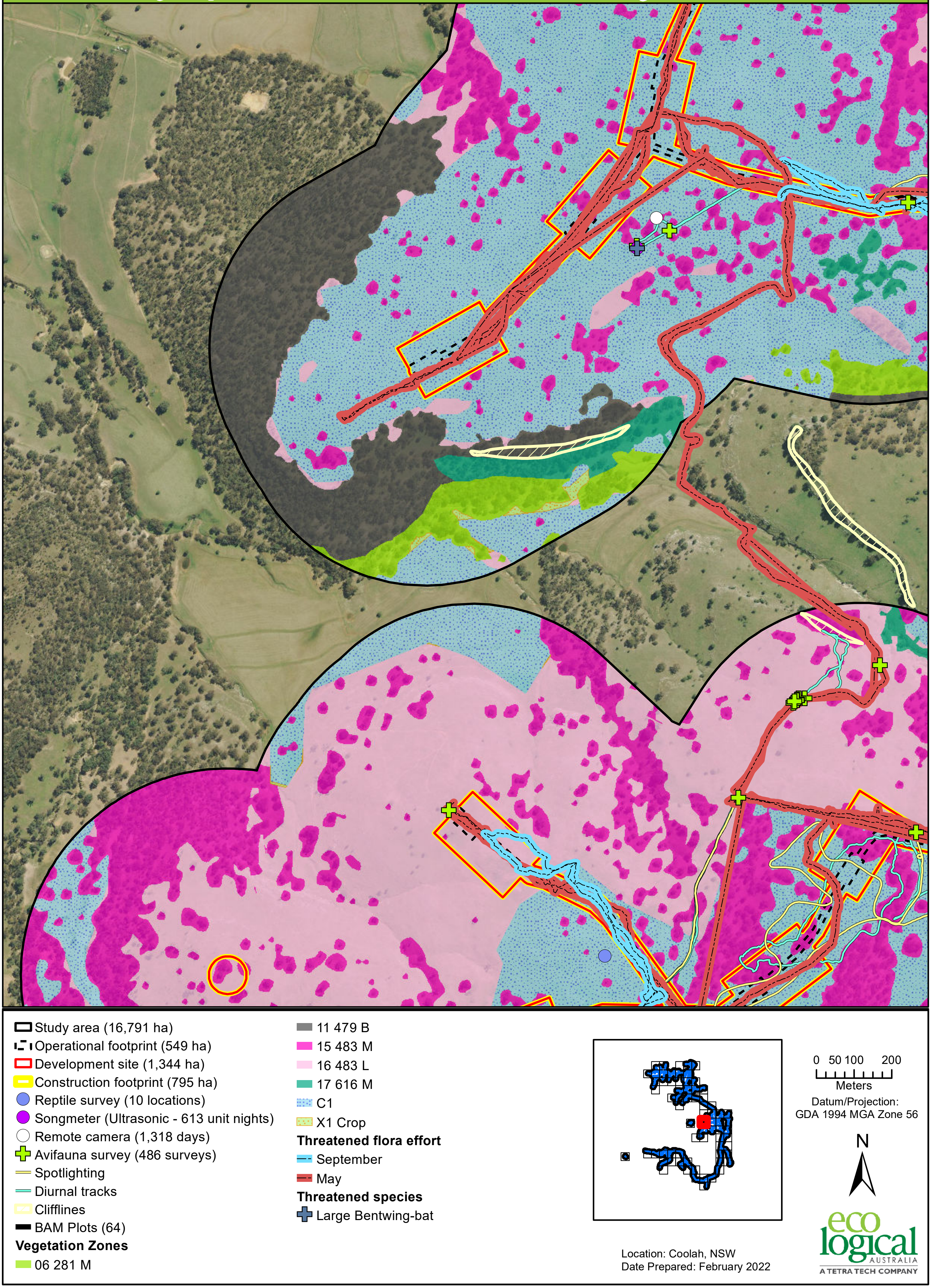
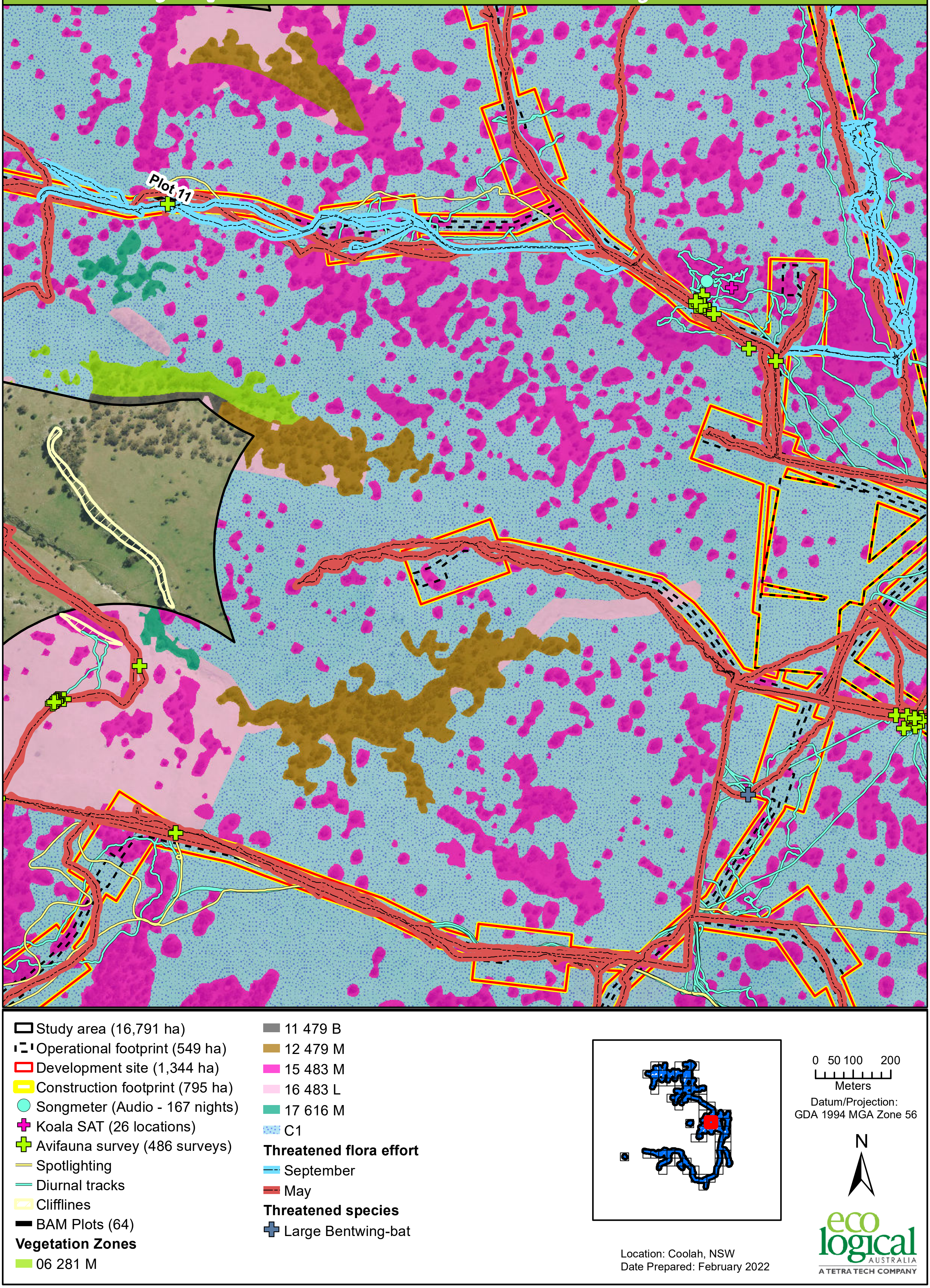
Detailed survey maps

Valley of the Winds Wind Farm




Plot 11
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Songmeter (Audio - 167 nights)
Koala SAT (26 locations)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Clifflines
BAM Plots (64)
Vegetation Zones
06 281 M
11 479 B
12 479 M
15 483 M
16 483 L
17 616 M
C1
Threatened flora effort
September
May
Threatened species
Large Bentwing-bat
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022
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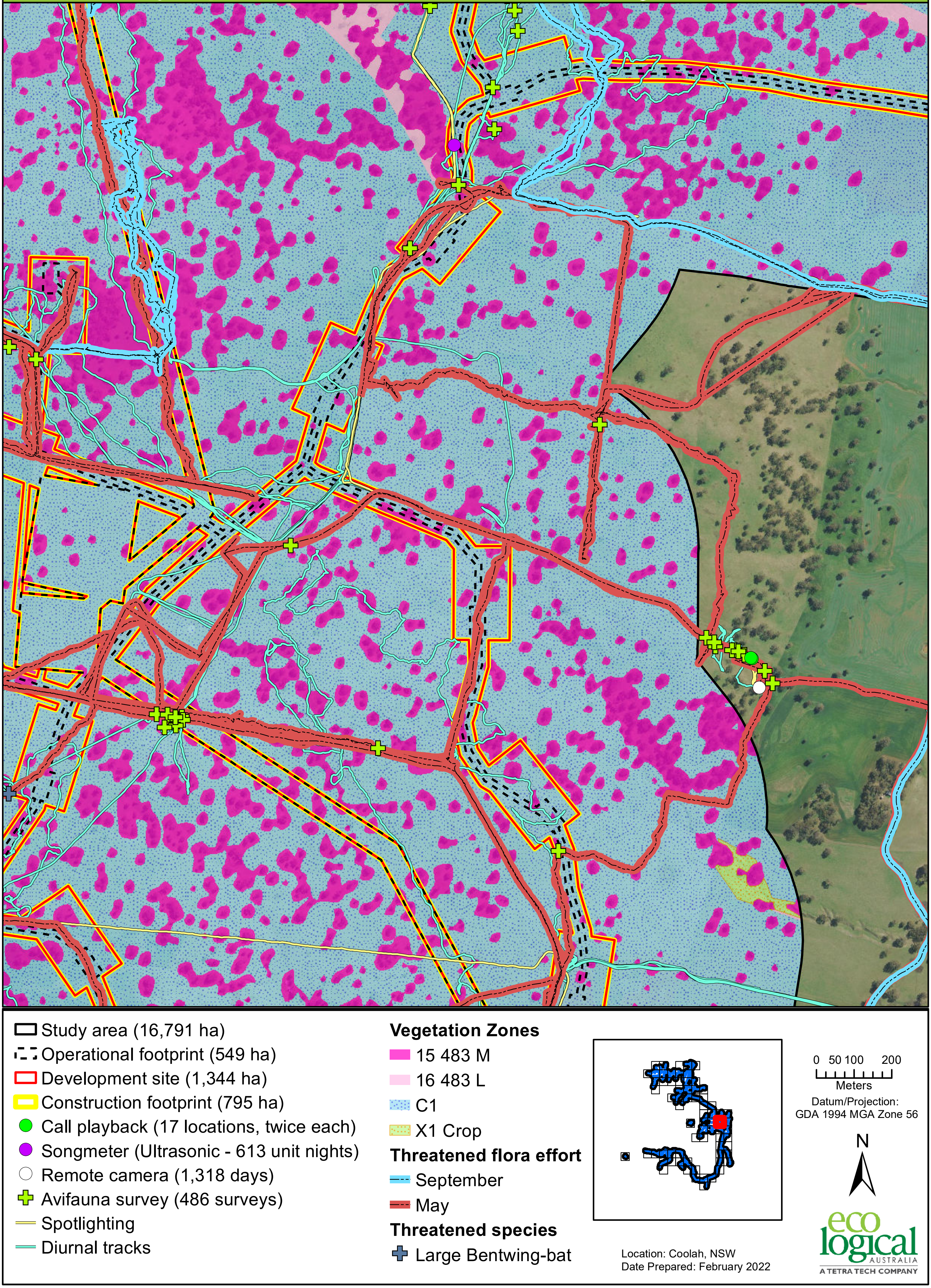
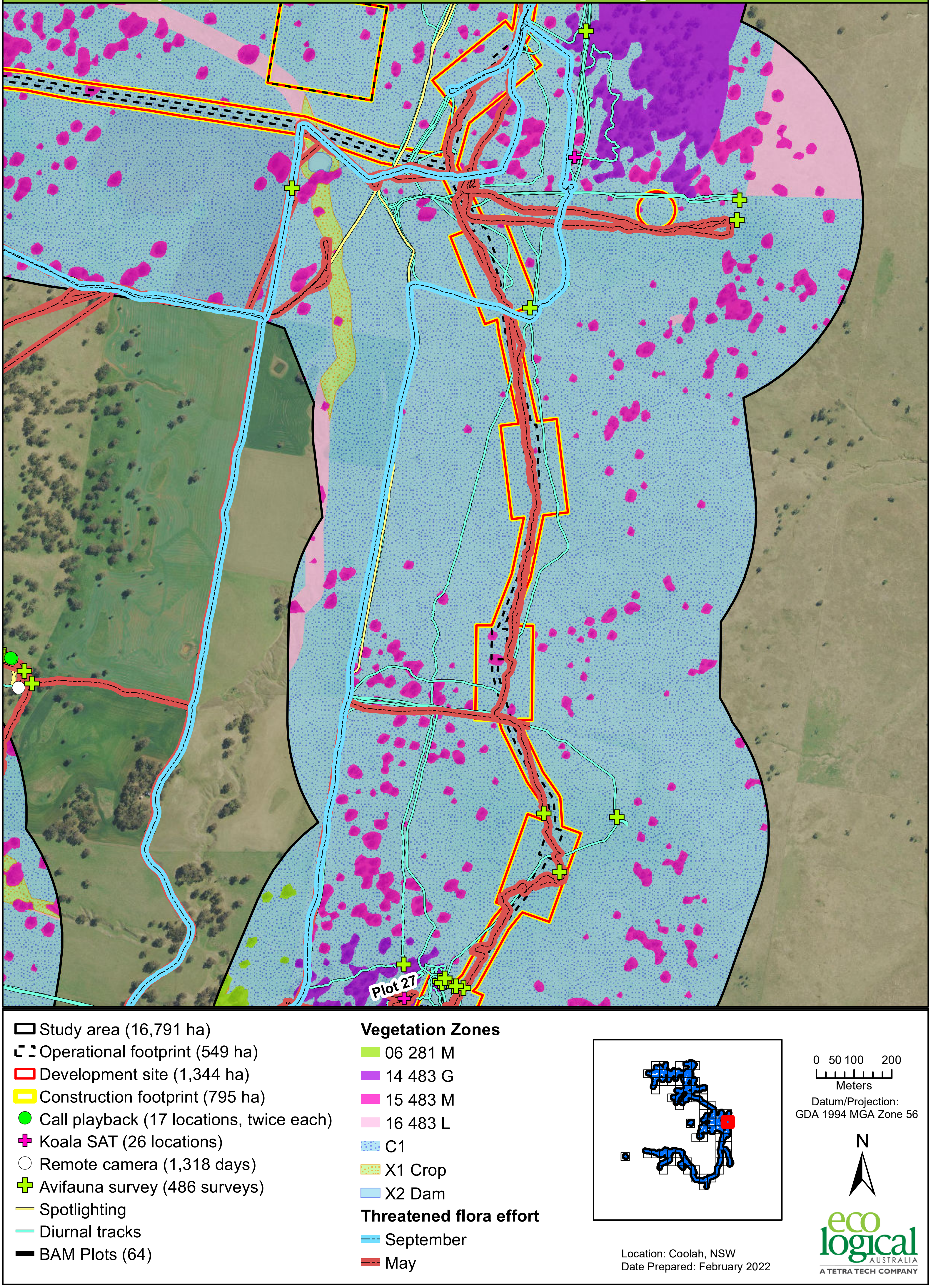


Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Call playback (17 locations, twice each)
Songmeter (Ultrasonic - 613 unit nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Vegetation Zones
15 483 M
16 483 L
C1
X1 Crop
Threatened flora effort
September
May
Threatened species
Large Bentwing-bat
0 50 100 200
Meters
Datum/Projection: GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022


Plot 27
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Call playback (17 locations, twice each)
Koala SAT (26 locations)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
BAM Plots (64)
Vegetation Zones
06 281 M
14 483 G
15 483 M
16 483 L
C1
X1 Crop
X2 Dam
Threatened flora effort
September
May
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022
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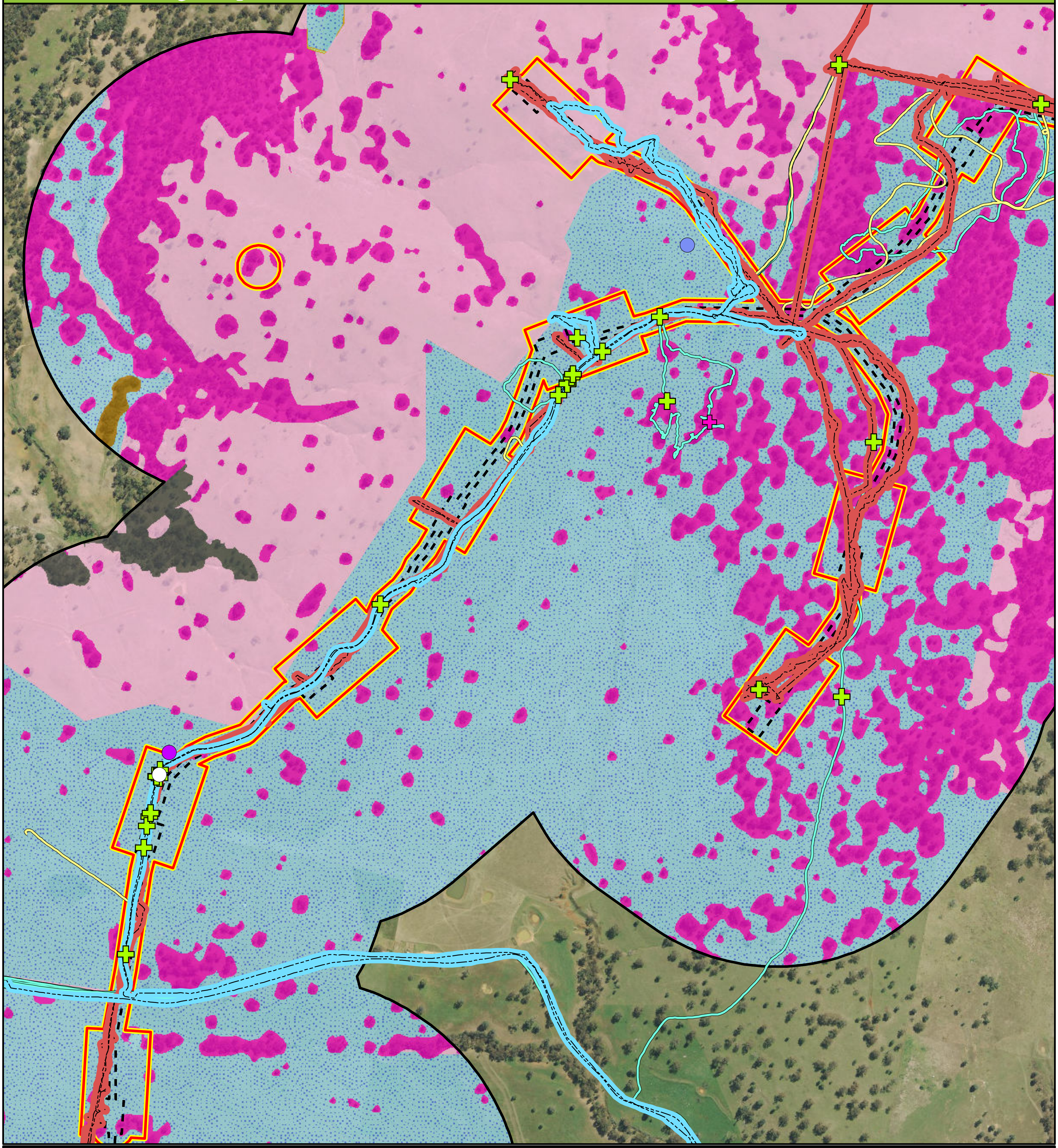
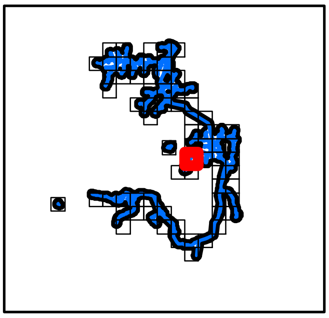
Detailed survey maps **Valley of the Winds Wind Farm**



Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Reptile survey (10 locations)
Koala SAT (26 locations)
Songmeter (Ultrasonic - 613 unit nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks

Vegetation Zones
11 479 B
12 479 M
15 483 M
16 483 L
C1
X1 Crop
X5 Road

Threatened flora effort
September
May



Location: Coolah, NSW
Date Prepared: February 2022

0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

eco logical AUSTRALIA
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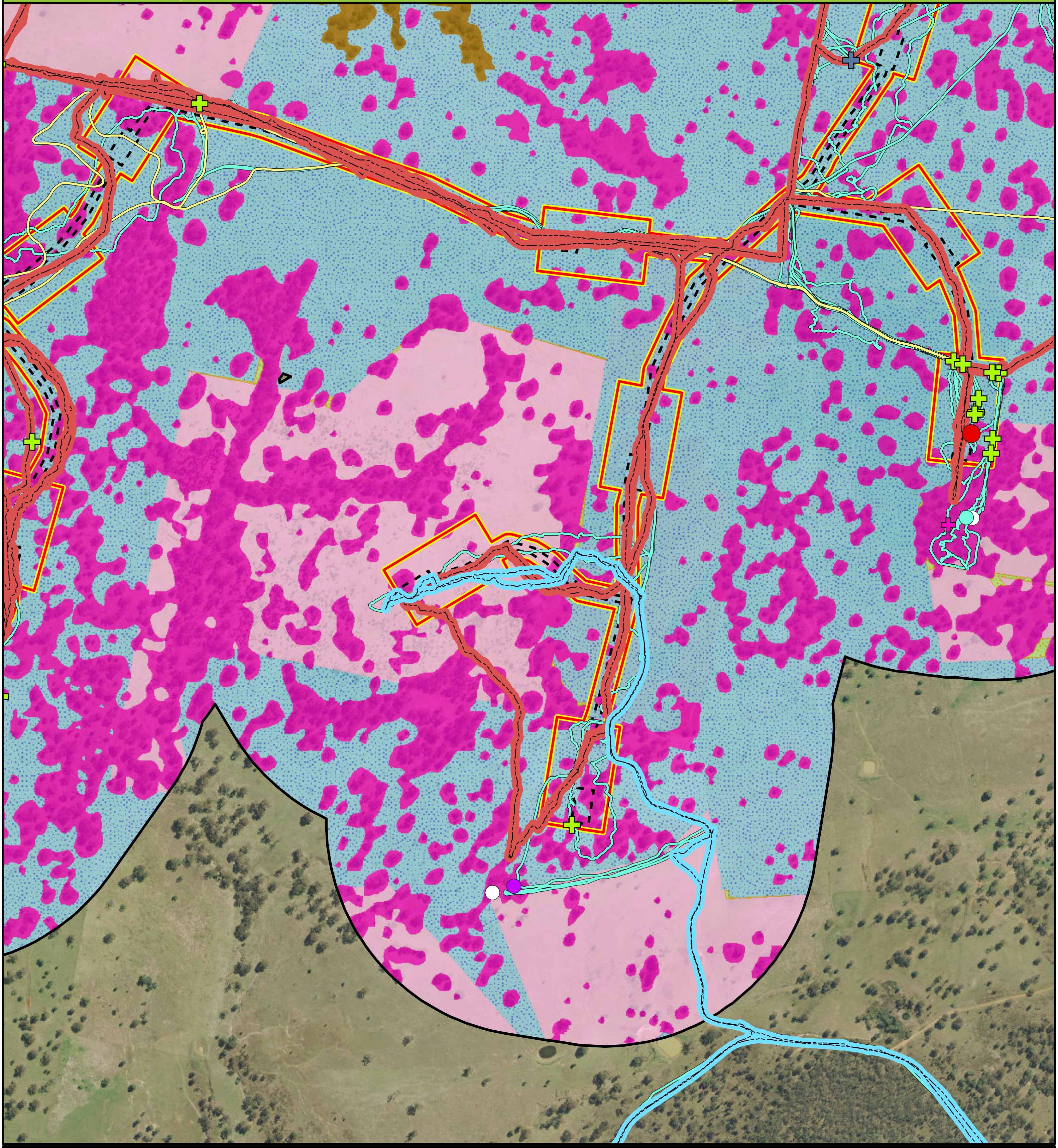
Detailed survey maps **Valley of the Winds Wind Farm**

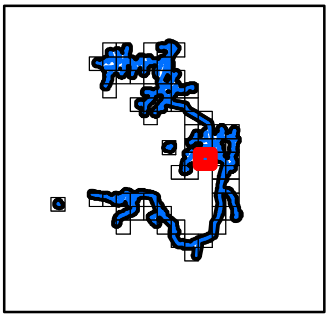


Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Songmeter (Audio - 167 nights)
Koala SAT (26 locations)
Songmeter (Ultrasonic - 613 unit nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks

Vegetation Zones
12 479 M
15 483 M
16 483 L
C1
X1 Crop
X2 Dam

Threatened flora effort
September
May

Threatened species
Little Lorikeet
Large Bentwing-bat



0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

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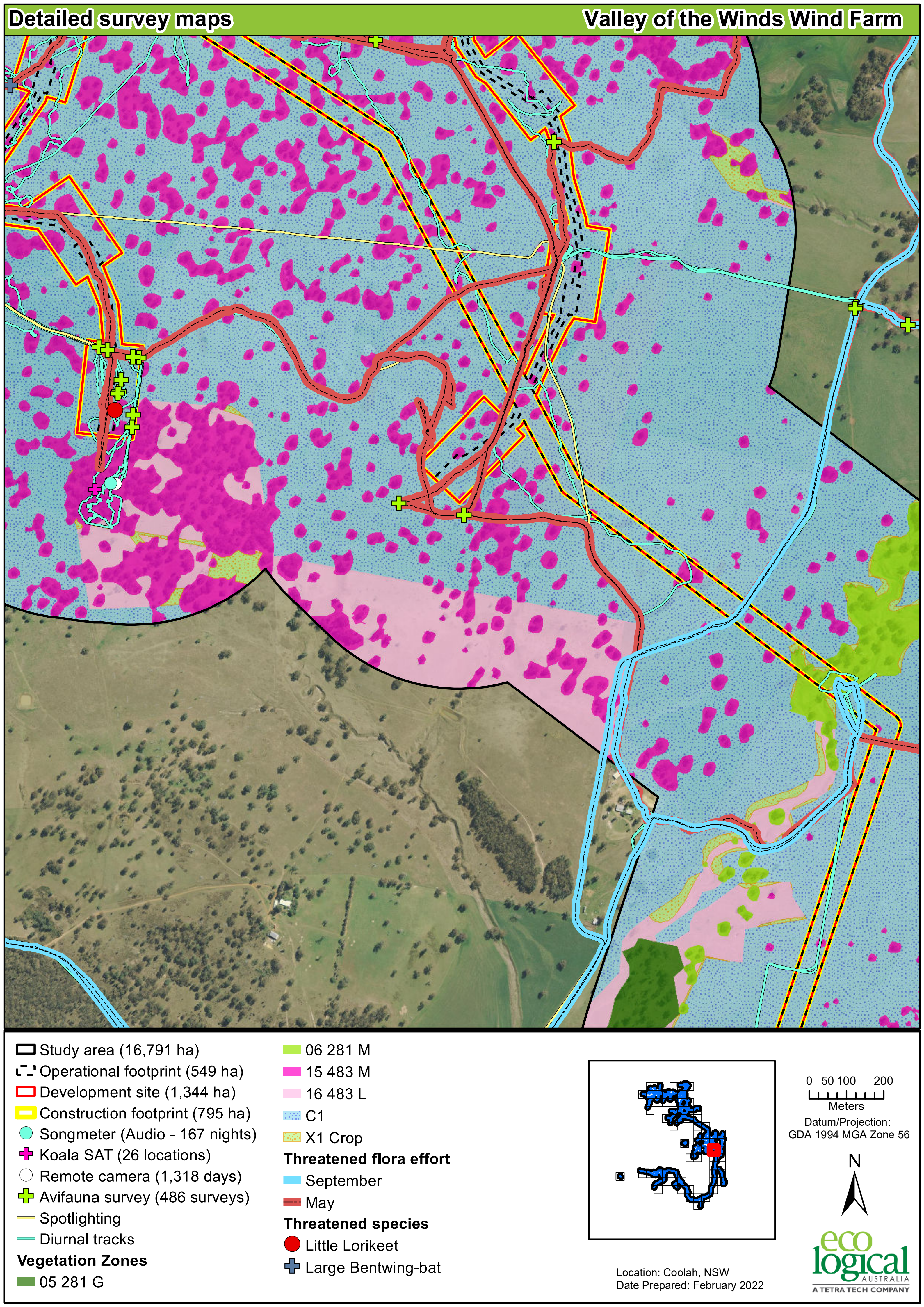

Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Songmeter (Audio - 167 nights)
Koala SAT (26 locations)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Vegetation Zones
05 281 G
06 281 M
15 483 M
16 483 L
C1
X1 Crop
Threatened flora effort
September
May
Threatened species
Little Lorikeet
Large Bentwing-bat
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022
eco logical AUSTRALIA
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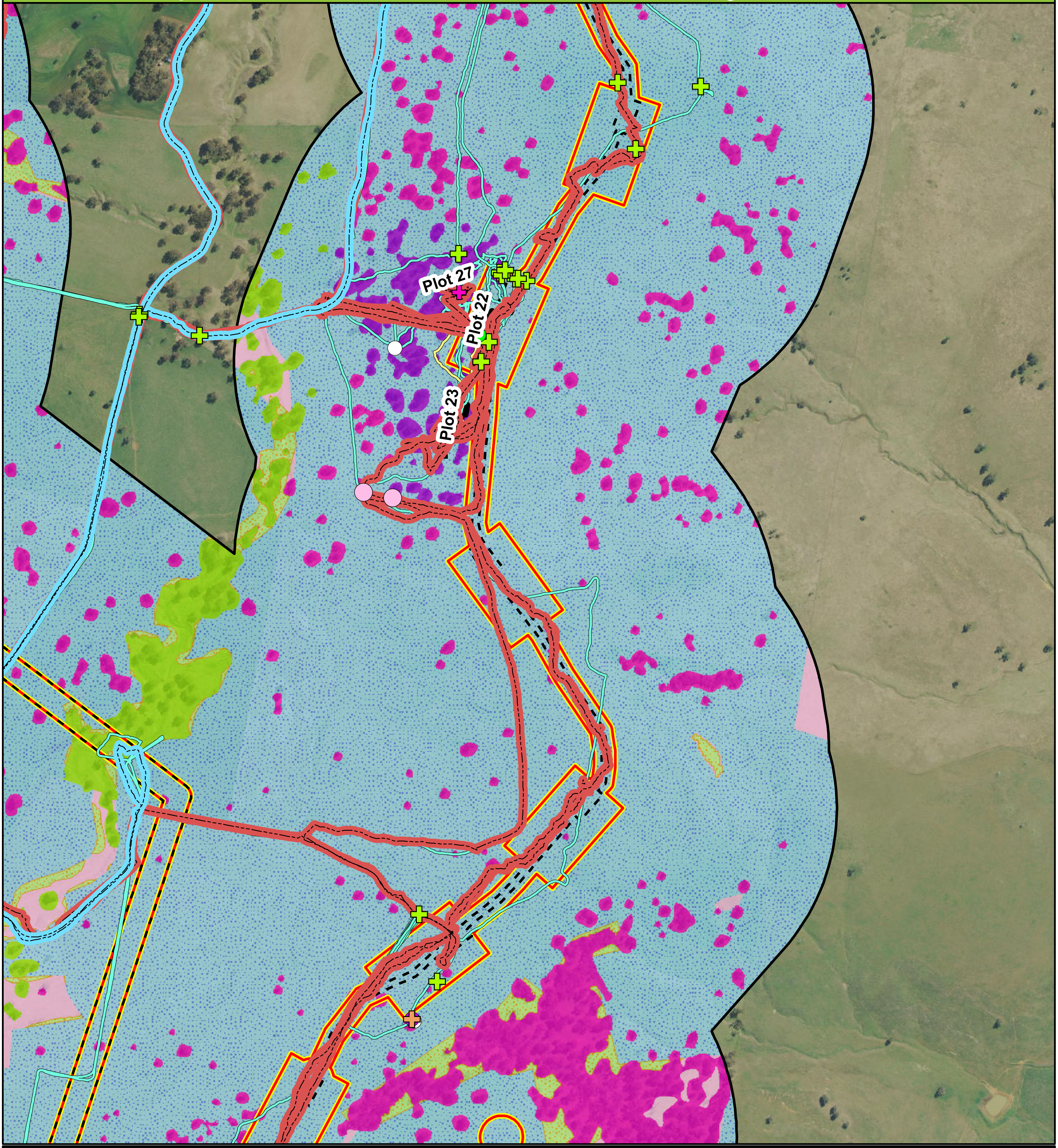
Detailed survey maps

Valley of the Winds Wind Farm



- Study area (16,791 ha)
- Operational footprint (549 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Call playback (17 locations, twice each)
- Koala SAT (26 locations)
- Songmeter (Ultrasonic - 613 unit nights)
- Remote camera (1,318 days)
- Avifauna survey (486 surveys)
- Spotlighting
- Diurnal tracks
- BAM Plots (64)

Vegetation Zones

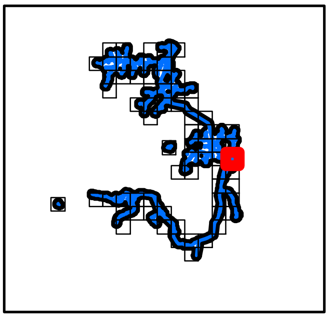
- 06 281 M
- 14 483 G
- 15 483 M
- 16 483 L
- C1
- X1 Crop

Threatened flora effort

- September
- May

Threatened species

- Dichanthium setosum
- Yellow-bellied Sheathtail Bat



0 50 100 200
Meters

Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

eco logical AUSTRALIA
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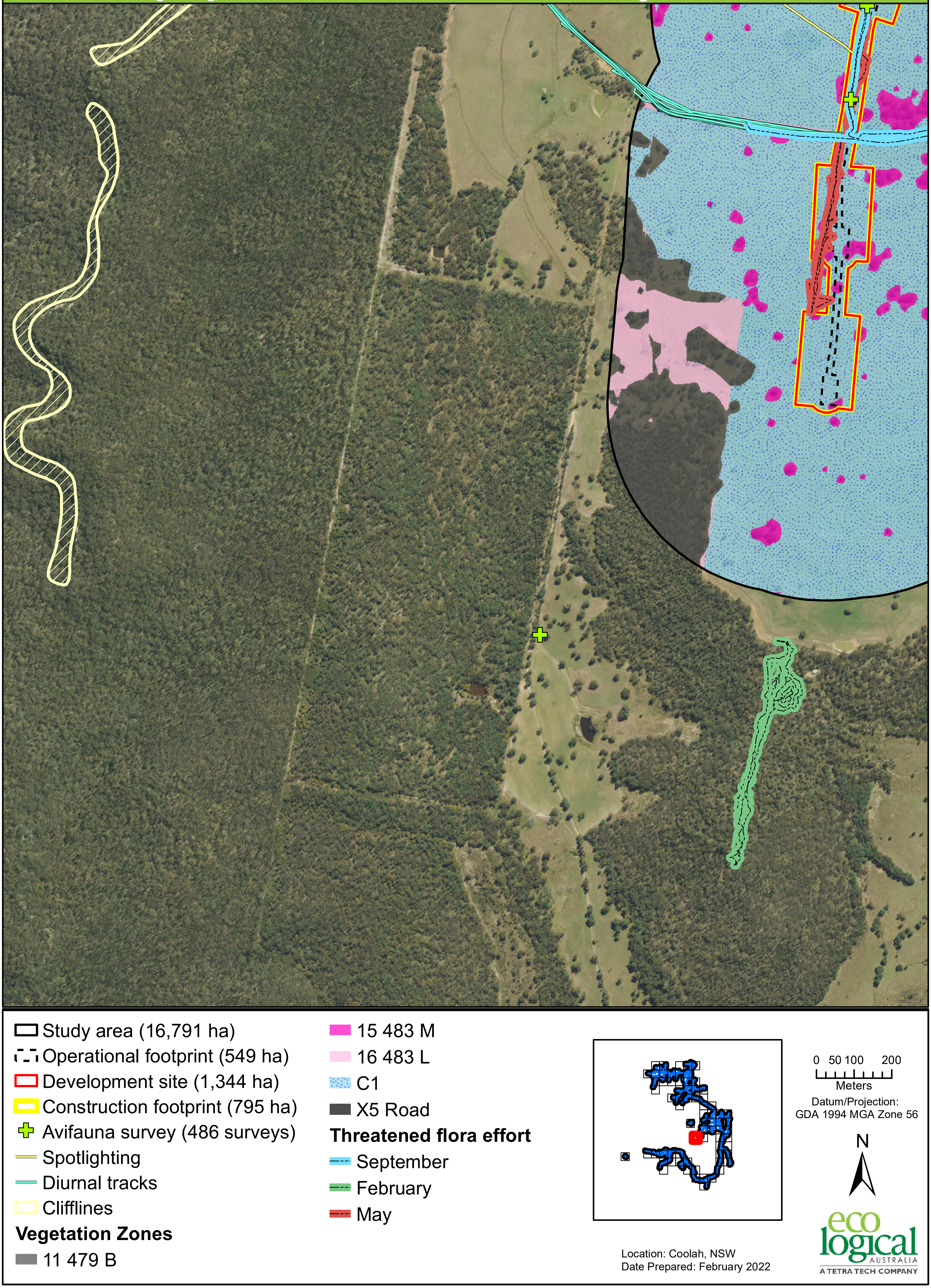
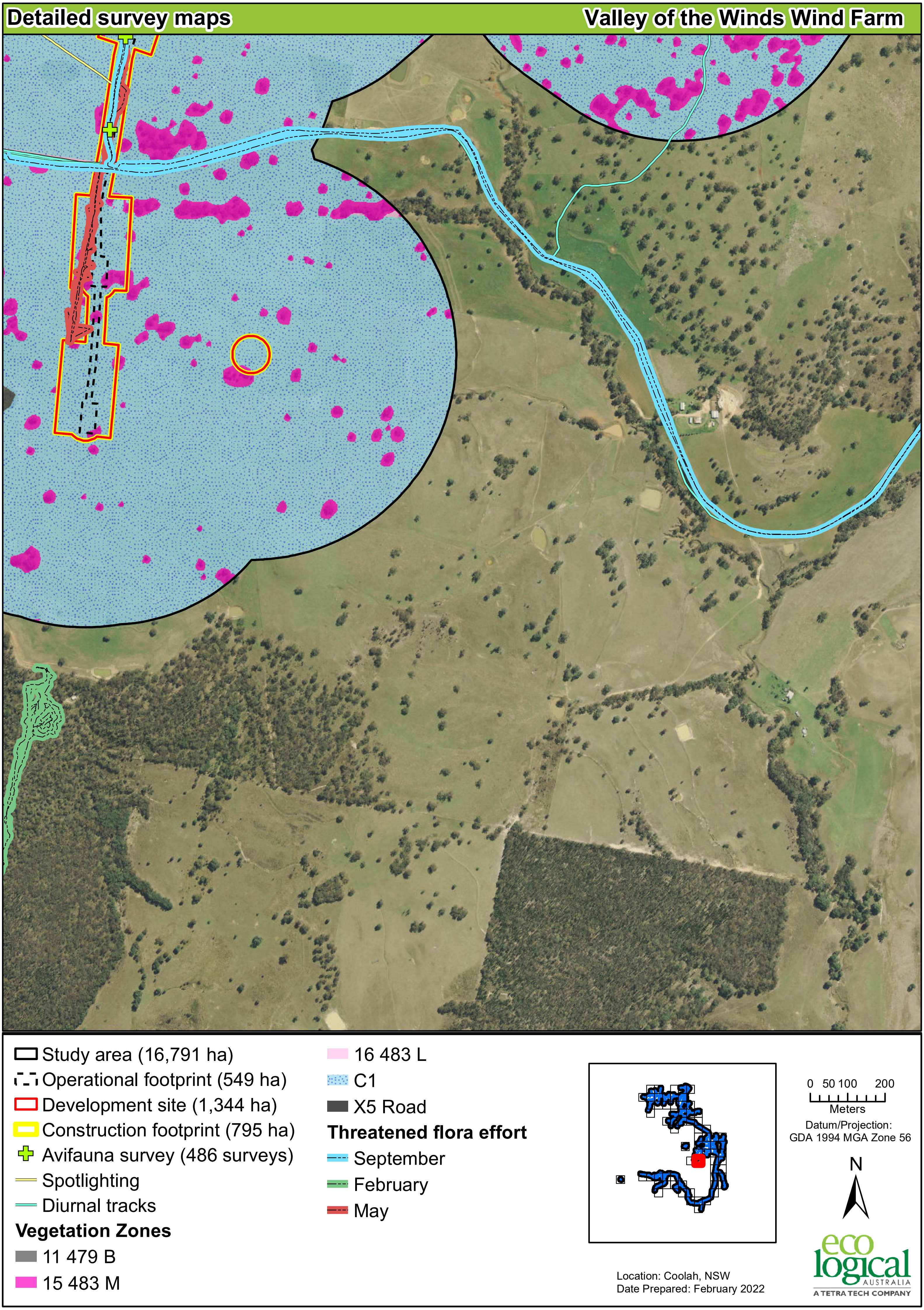
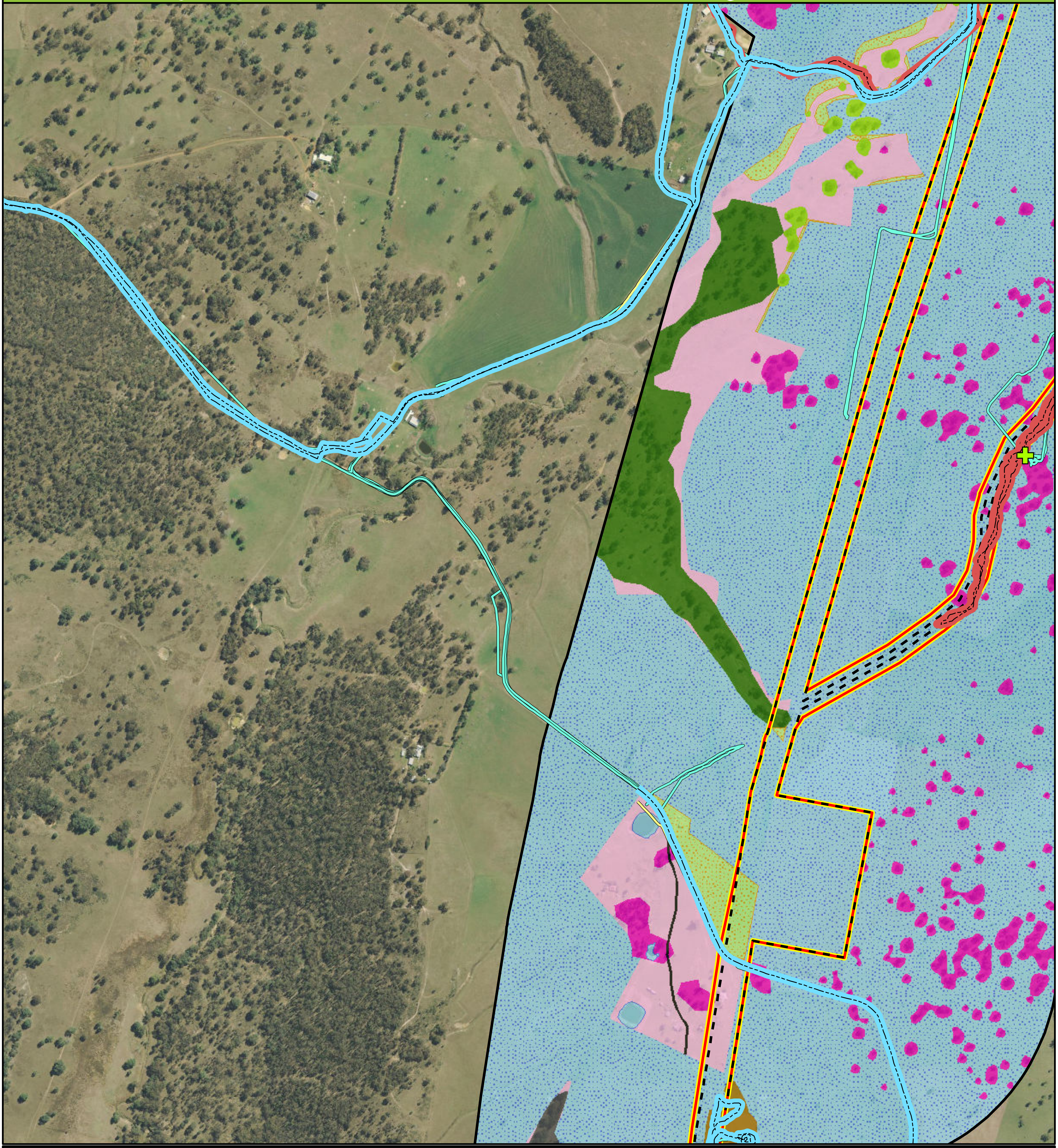
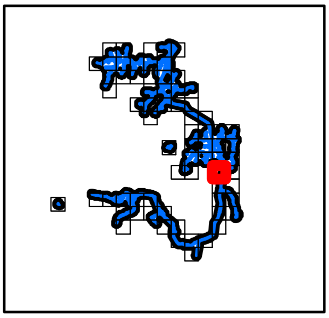

Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Clifflines
Vegetation Zones
11 479 B
15 483 M
16 483 L
C1
X5 Road
Threatened flora effort
September
February
May
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022


Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Vegetation Zones
11 479 B
15 483 M
16 483 L
C1
X5 Road
Threatened flora effort
September
February
May
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022
eco logical AUSTRALIA
A TETRA TECH COMPANY





Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks

Vegetation Zones

05 281 G
06 281 M
11 479 B
12 479 M
15 483 M
16 483 L
C1
X1 Crop
X2 Dam
X5 Road

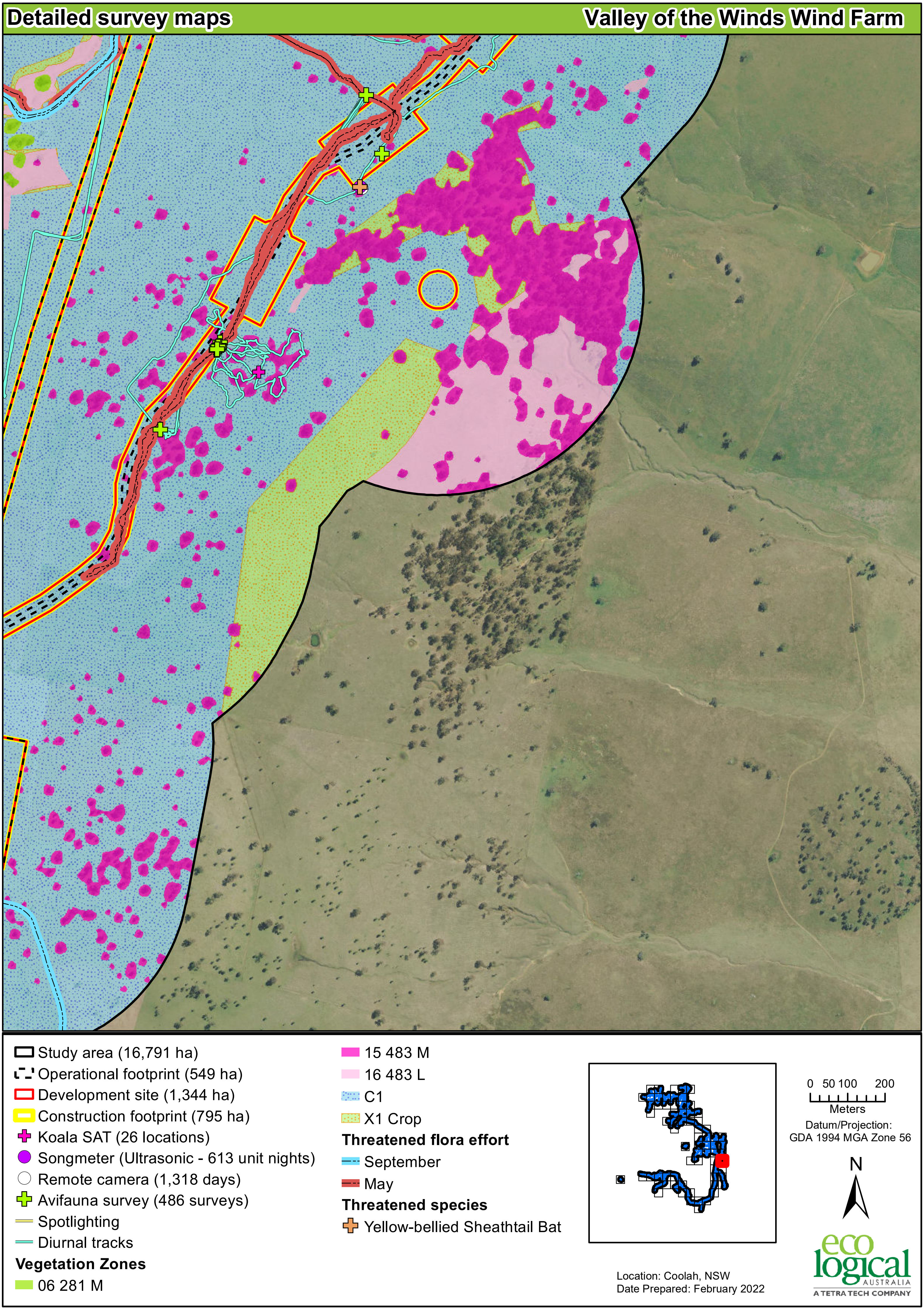
Threatened flora effort

September
May

0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

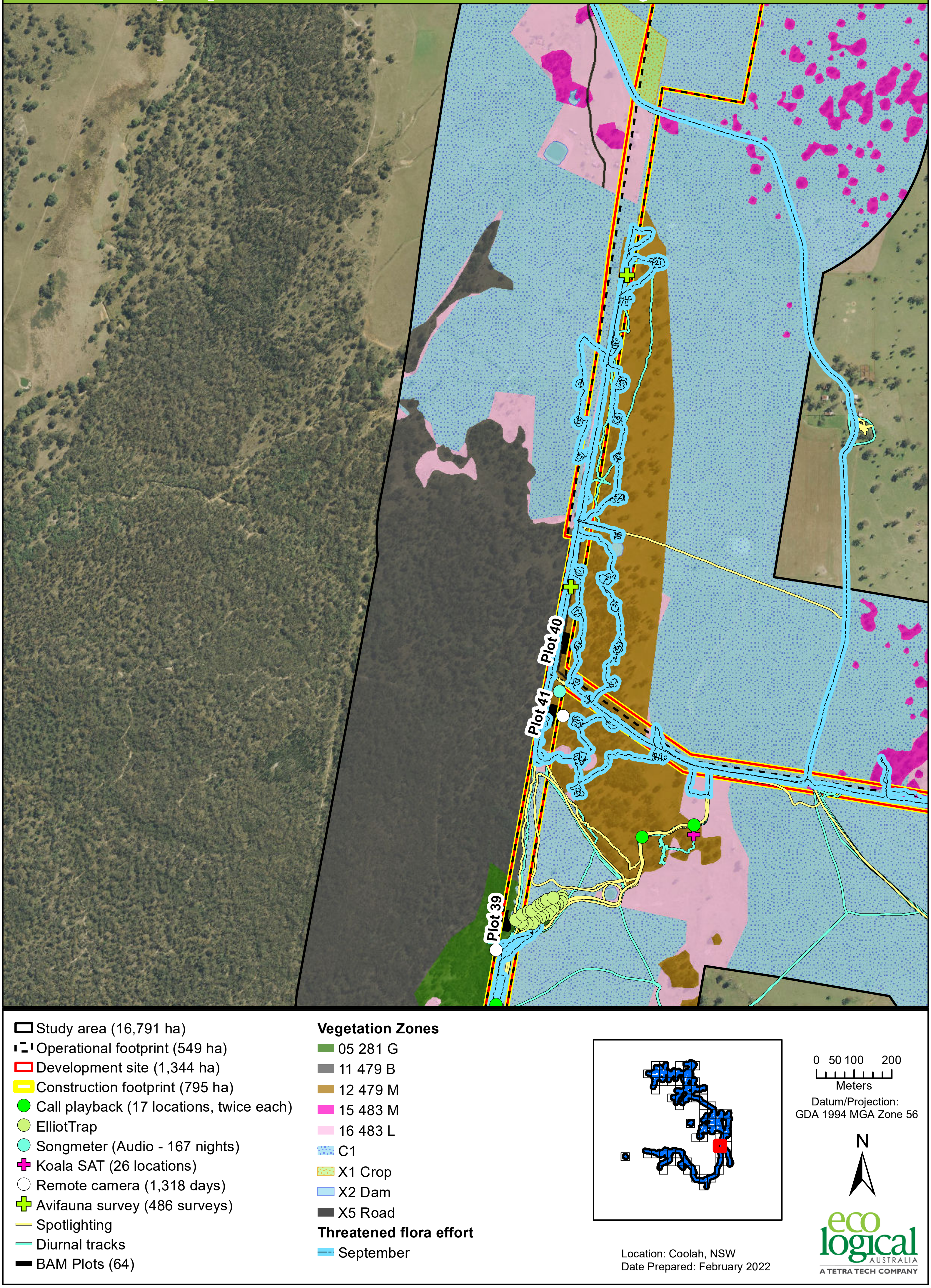
Location: Coolah, NSW
Date Prepared: February 2022

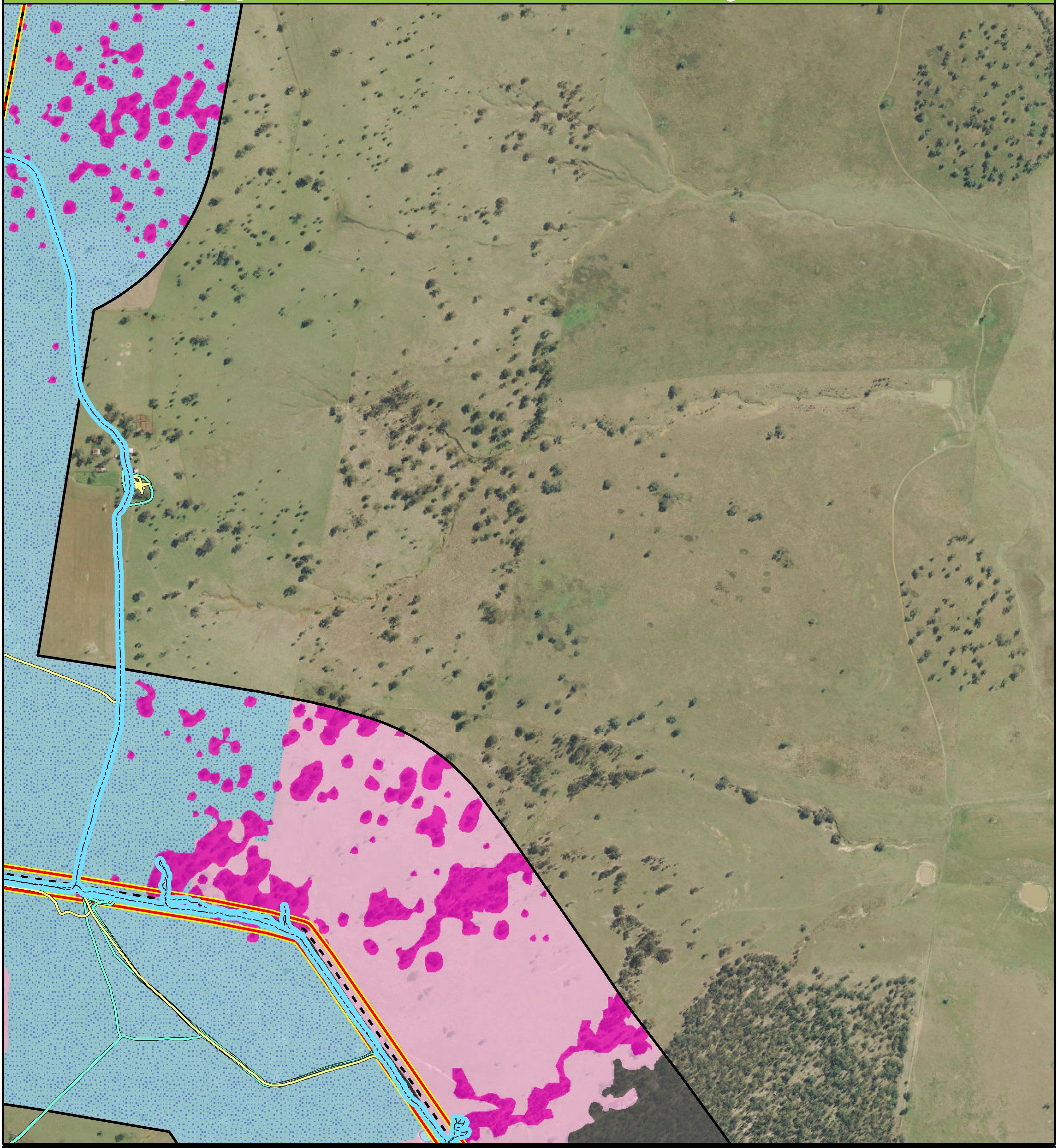


Detailed survey maps
Valley of the Winds Wind Farm
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Koala SAT (26 locations)
Songmeter (Ultrasonic - 613 unit nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Vegetation Zones
06 281 M
15 483 M
16 483 L
C1
X1 Crop
Threatened flora effort
September
May
Threatened species
Yellow-bellied Sheathtail Bat
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022
eco logical AUSTRALIA
A TETRA TECH COMPANY

Detailed survey maps

Valley of the Winds Wind Farm





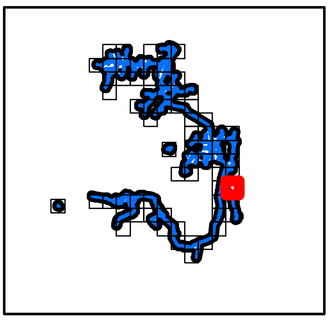
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Spotlighting
Diurnal tracks

Vegetation Zones

11 479 B
15 483 M
16 483 L
C1
X2 Dam
X5 Road

Threatened flora effort

September



0 50 100 200
Meters

Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

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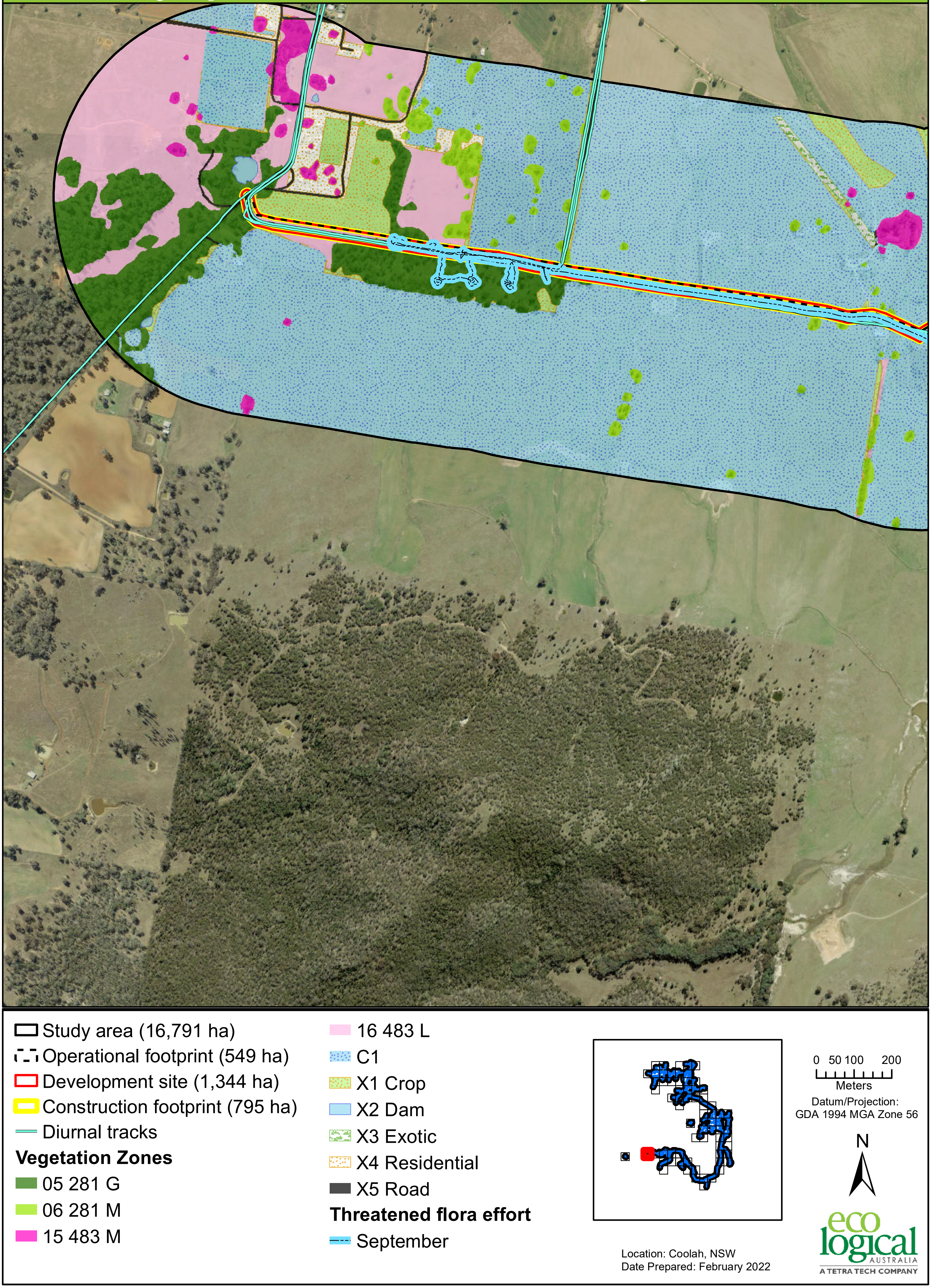
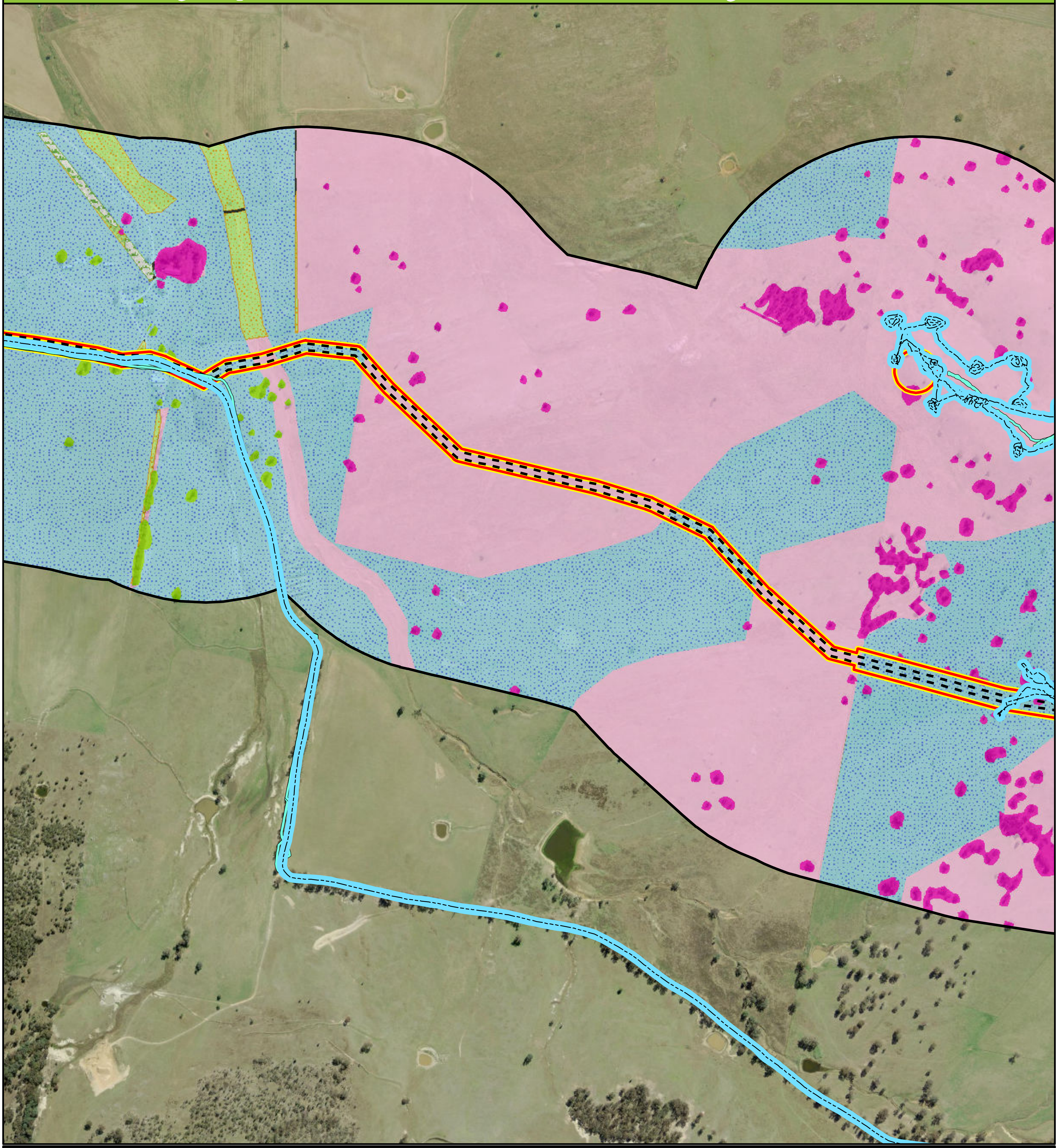

Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Diurnal tracks
Vegetation Zones
05 281 G
06 281 M
15 483 M
16 483 L
C1
X1 Crop
X2 Dam
X3 Exotic
X4 Residential
X5 Road
Threatened flora effort
September
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022

Detailed survey maps

Valley of the Winds Wind Farm



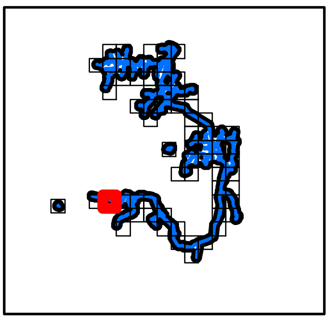
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Spotlighting
Diurnal tracks

Vegetation Zones

06 281 M
11 479 B
15 483 M
16 483 L
C1
X1 Crop
X3 Exotic
X5 Road

Threatened flora effort

September



0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

eco logical AUSTRALIA
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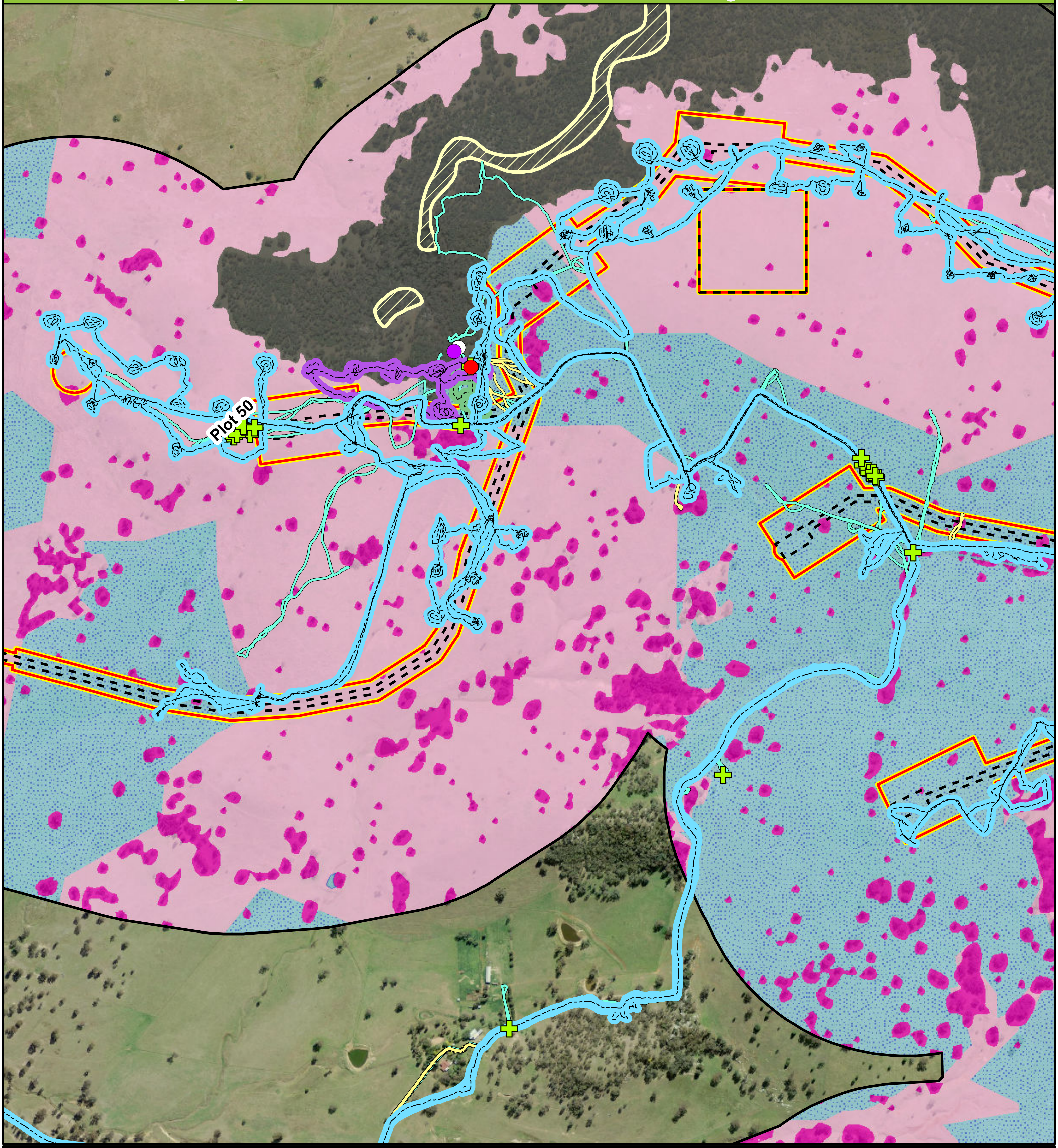


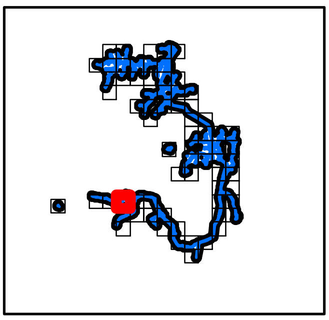
- Study area (16,791 ha)
- Operational footprint (549 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Harp trap (64 trap nights)
- Songmeter (Ultrasonic - 613 unit nights)
- Remote camera (1,318 days)
- Avifauna survey (486 surveys)
- Spotlighting
- Diurnal tracks
- Clifflines
- BAM Plots (64)

Vegetation Zones

- 11 479 B
- 15 483 M
- 16 483 L
- C1
- X2 Dam
- X5 Road

Threatened flora effort

- September
- February
- April



0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

eco logical AUSTRALIA
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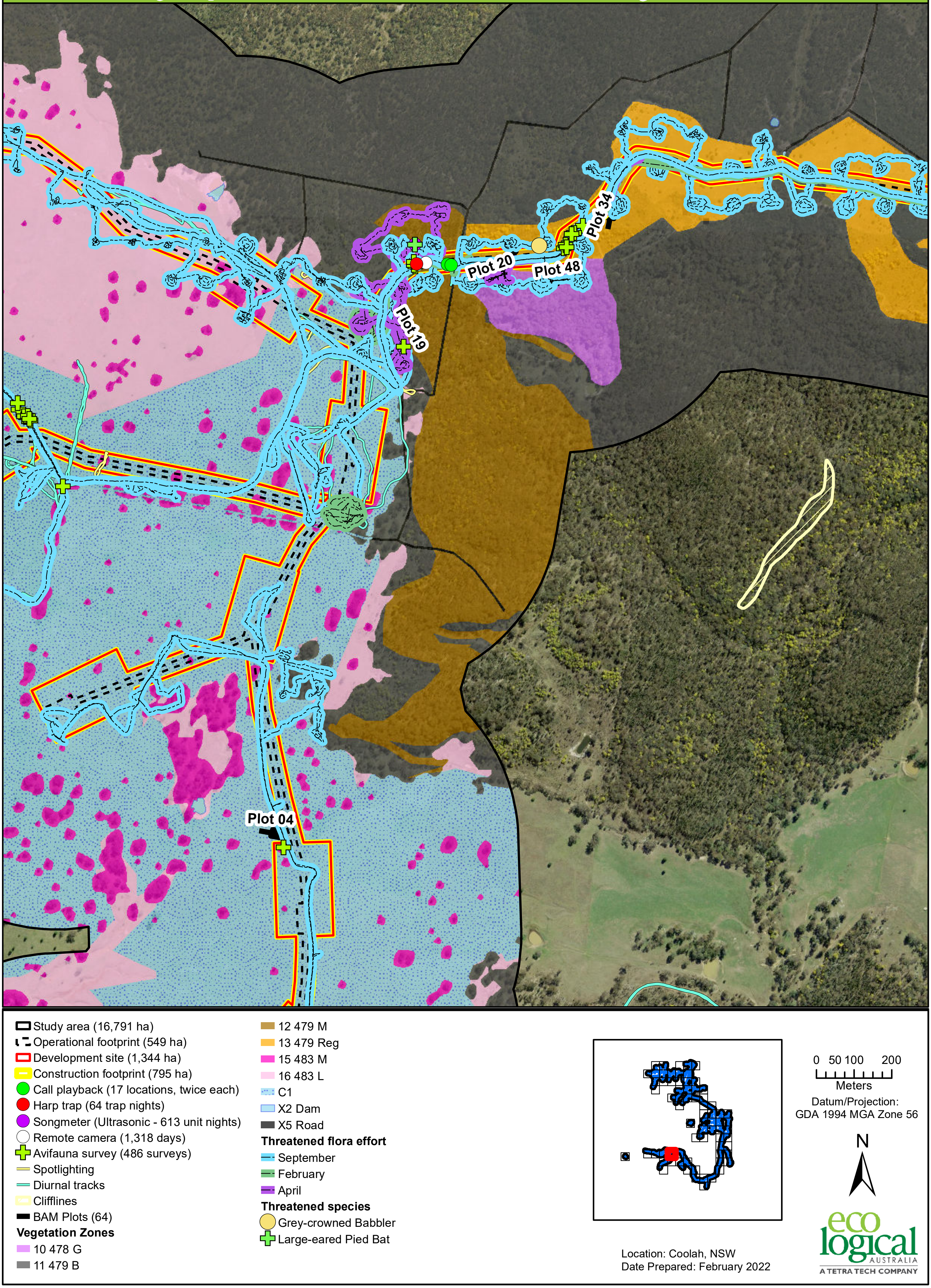
Detailed survey maps

Valley of the Winds Wind Farm



Location: Coolah, NSW
Date Prepared: February 2022

eco logical AUSTRALIA
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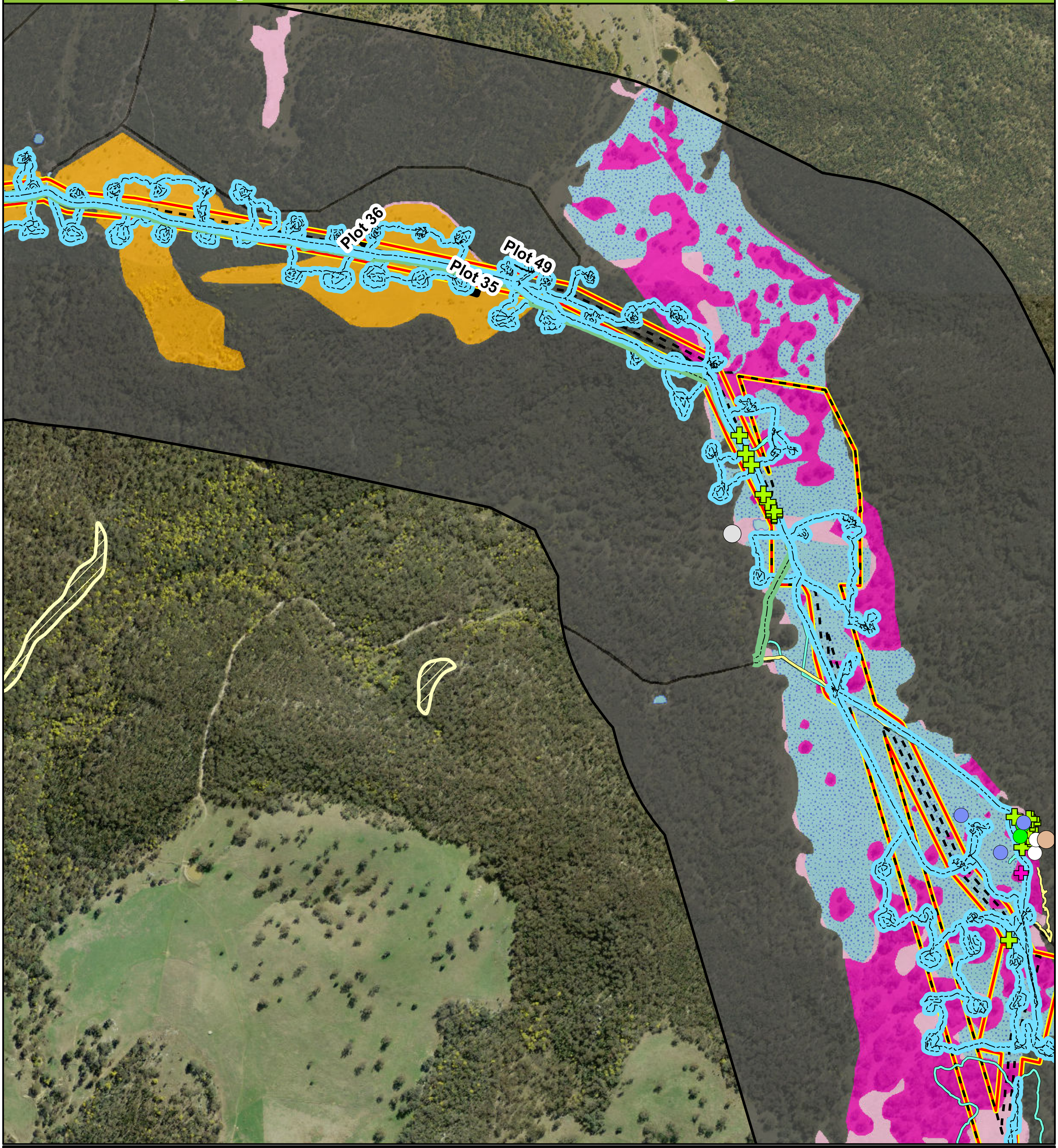
Detailed survey maps

Valley of the Winds Wind Farm



- Study area (16,791 ha)
- Operational footprint (549 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Reptile survey (10 locations)
- Call playback (17 locations, twice each)
- Koala SAT (26 locations)
- Remote camera (1,318 days)
- Avifauna survey (486 surveys)
- Spotlighting
- Diurnal tracks
- Clifflines
- BAM Plots (64)

Vegetation Zones

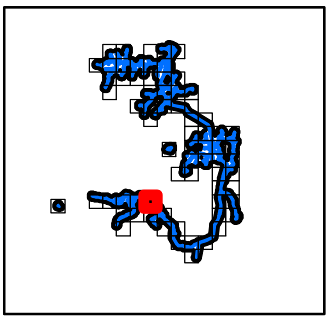
- 11 479 B
- 13 479 Reg
- 15 483 M
- 16 483 L
- C1
- X2 Dam
- X5 Road

Threatened flora effort

- September
- February

Threatened species

- Speckled Warbler
- Varied Sittella



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Meters

Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

eco logical AUSTRALIA
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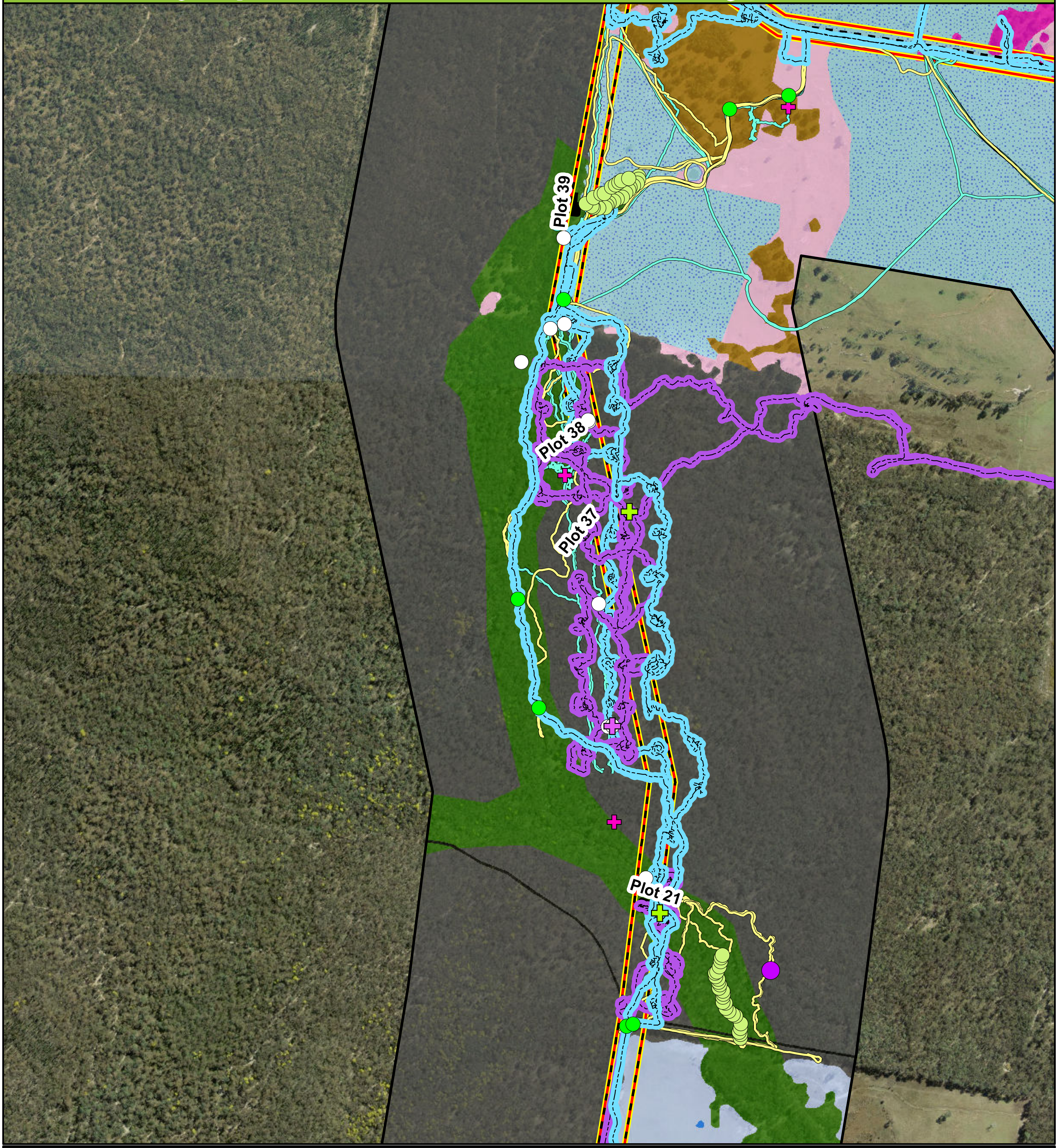
Detailed survey maps

Valley of the Winds Wind Farm



- Study area (16,791 ha)
- Operational footprint (549 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Call playback (17 locations, twice each)
- ElliotTrap
- Songmeter (Audio - 167 nights)
- Koala SAT (26 locations)
- Remote camera (1,318 days)
- Avifauna survey (486 surveys)
- Spotlighting
- Diurnal tracks
- BAM Plots (64)

Vegetation Zones

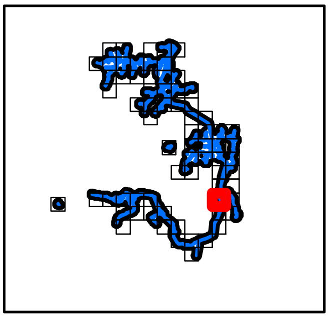
- 03 272 M
- 04 272 L
- 05 281 G
- 11 479 B
- 12 479 M
- 15 483 M
- 16 483 L
- C1
- X2 Dam
- X5 Road

Threatened flora effort

- September
- April

Threatened species

- Masked Owl
- Squirrel Glider



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Datum/Projection:
GDA 1994 MGA Zone 56

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Location: Coolah, NSW
Date Prepared: February 2022

eco logical AUSTRALIA
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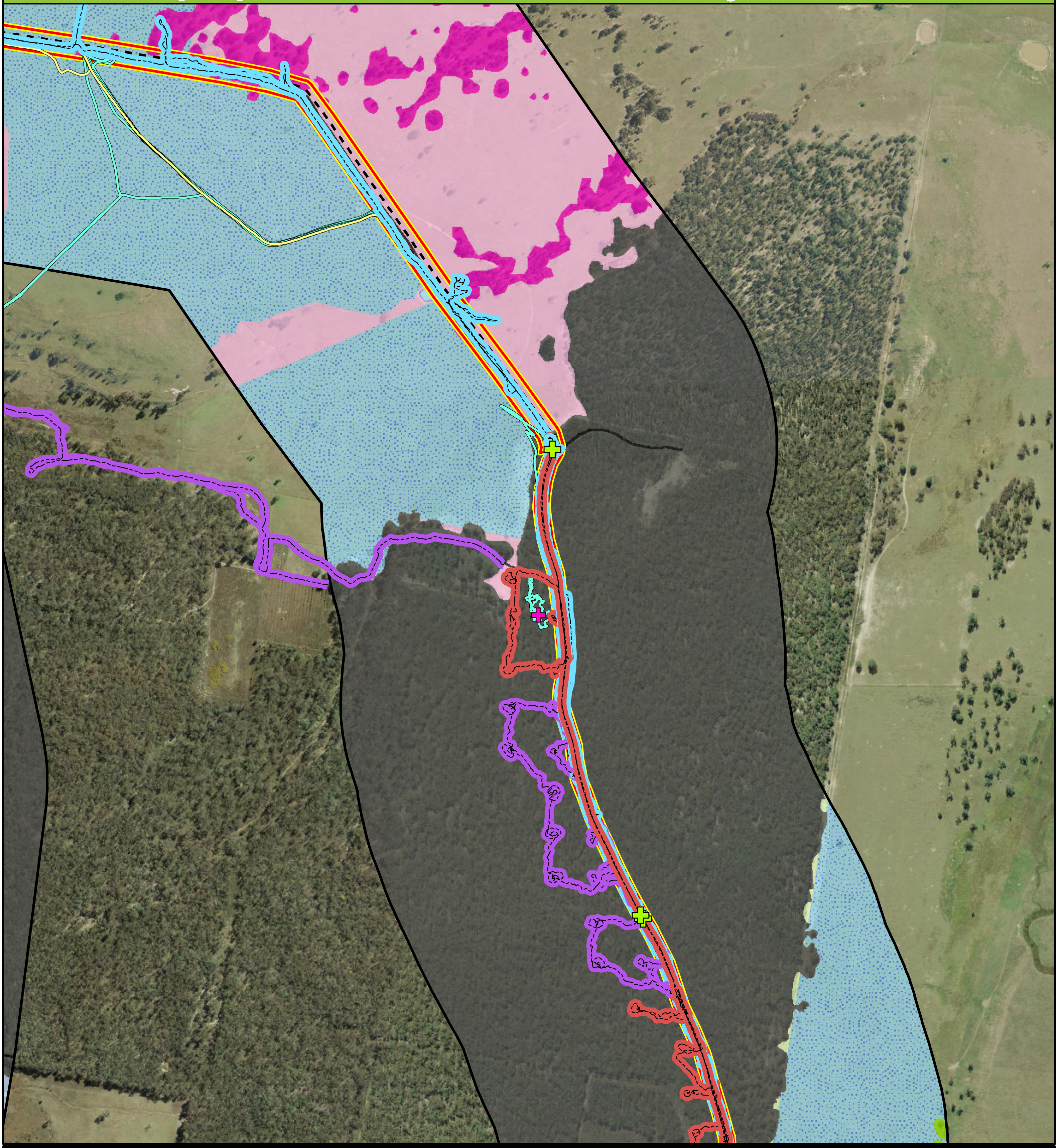


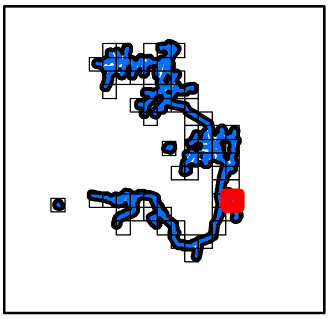
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Koala SAT (26 locations)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks

Vegetation Zones

04 272 L
06 281 M
07 281 L
11 479 B
15 483 M
16 483 L
C1
X2 Dam
X5 Road

Threatened flora effort

September
April
May



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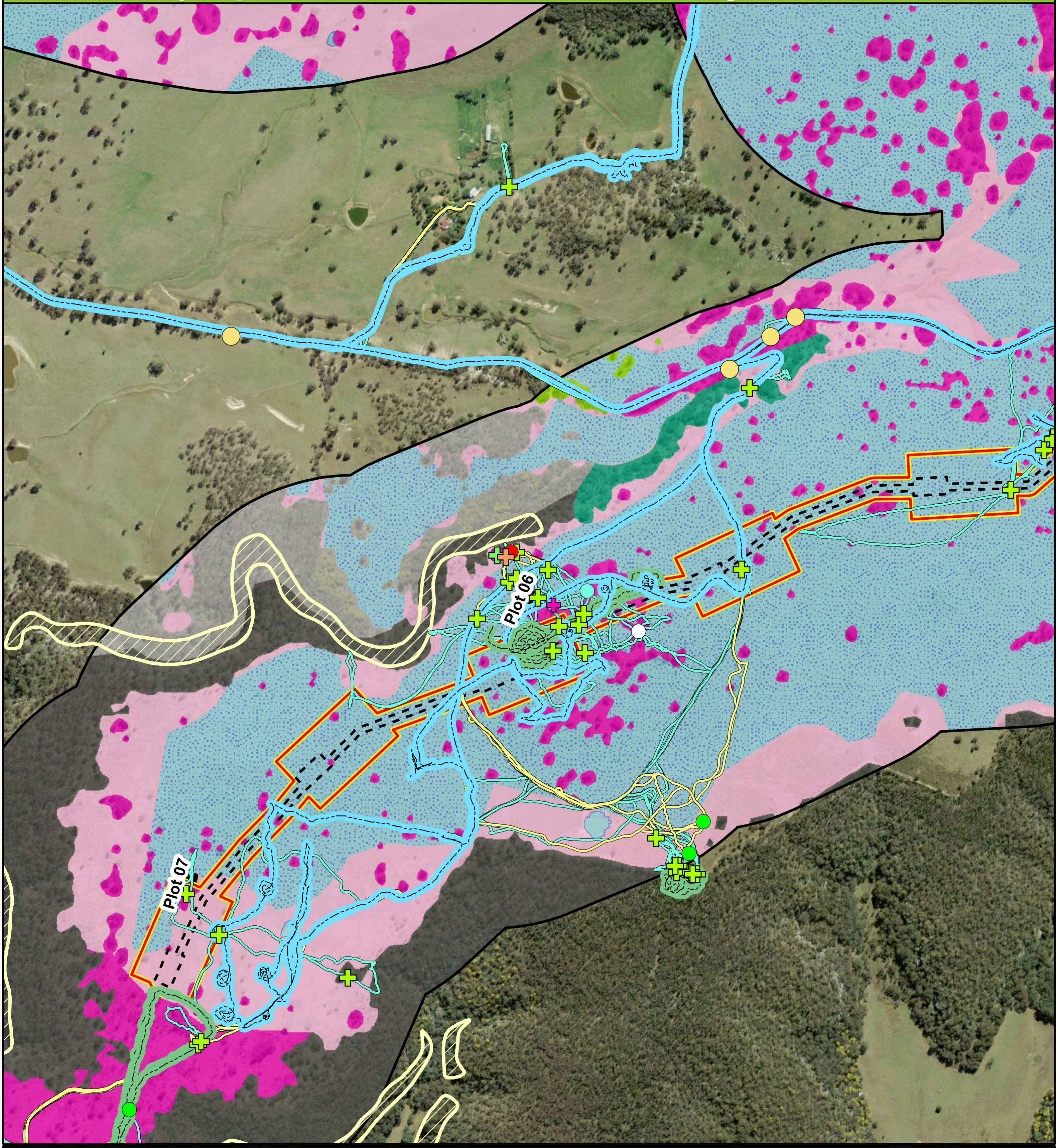
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

Detailed survey maps

Valley of the Winds Wind Farm

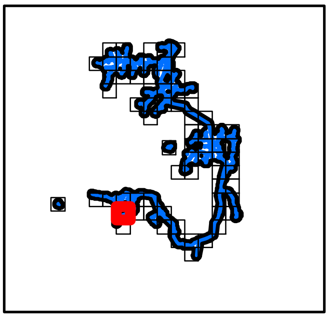


Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Call playback (17 locations, twice each)
Songmeter (Audio - 167 nights)
Koala SAT (26 locations)
Harp trap (64 trap nights)
Songmeter (Ultrasonic - 613 unit nights)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks

Cliffines
BAM Plots (64)

Vegetation Zones

06 281 M
08 461 B
11 479 B
15 483 M
16 483 L
17 616 M
C1
X2 Dam
X5 Road



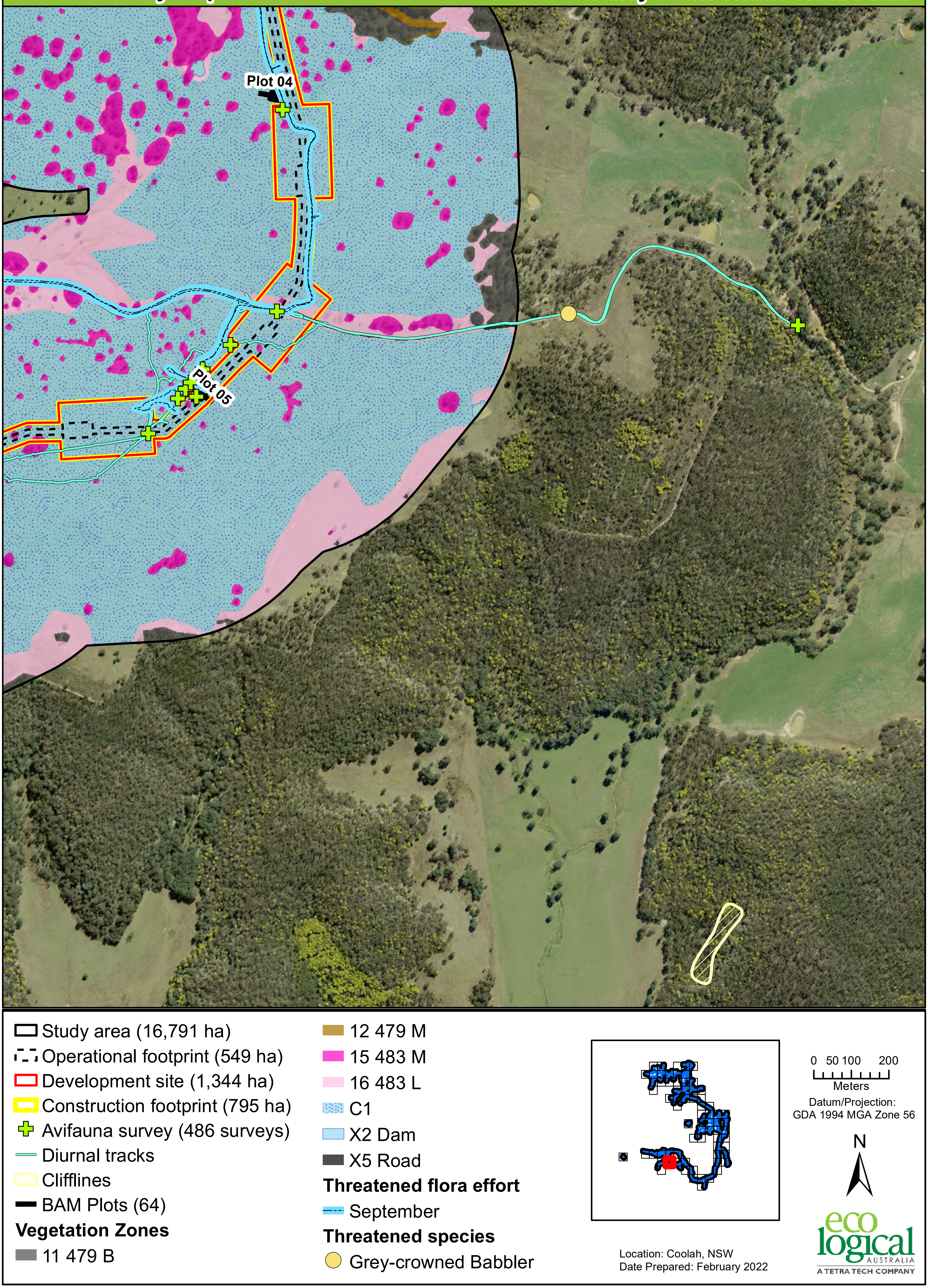
0 50 100 200
Meters

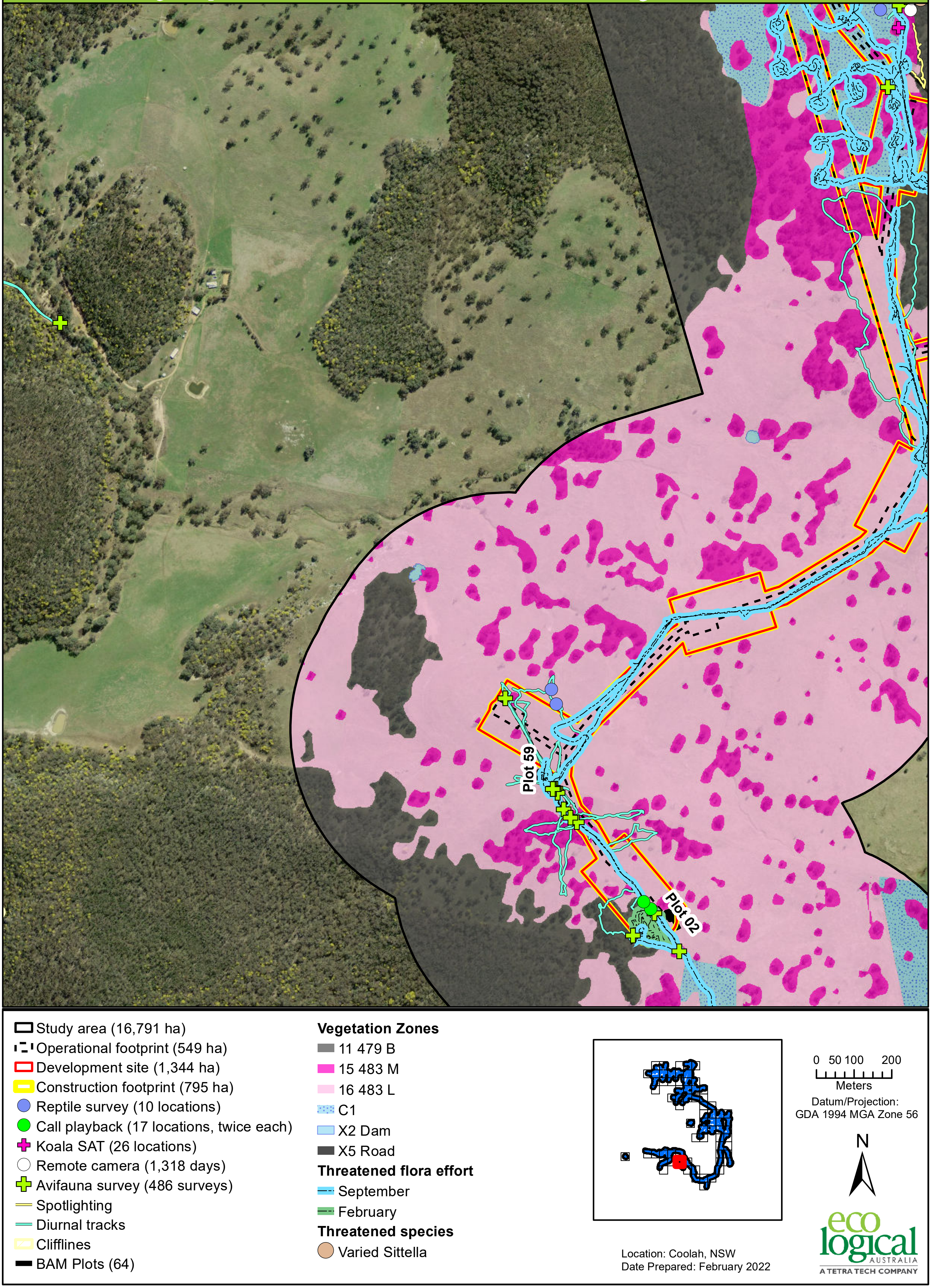
Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

eco logical AUSTRALIA
A TETRA TECH COMPANY


Plot 04
Plot 05
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Avifauna survey (486 surveys)
Diurnal tracks
Cliffines
BAM Plots (64)
Vegetation Zones
11 479 B
12 479 M
15 483 M
16 483 L
C1
X2 Dam
X5 Road
Threatened flora effort
September
Threatened species
Grey-crowned Babbler
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022


Plot 59
Plot 02
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Reptile survey (10 locations)
Call playback (17 locations, twice each)
Koala SAT (26 locations)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Clifflines
BAM Plots (64)
Vegetation Zones
11 479 B
15 483 M
16 483 L
C1
X2 Dam
X5 Road
Threatened flora effort
September
February
Threatened species
Varied Sittella
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022
eco logical AUSTRALIA
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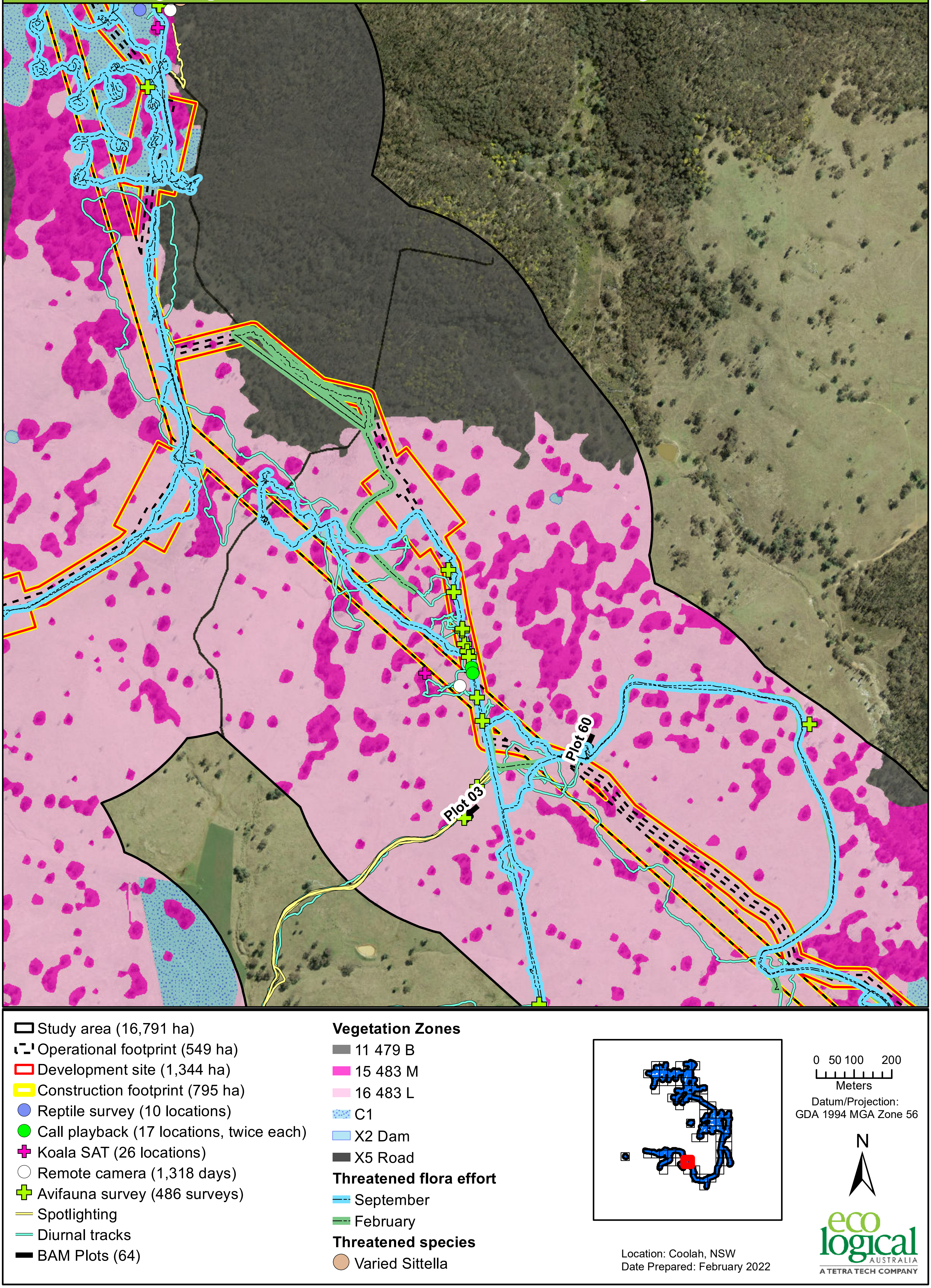
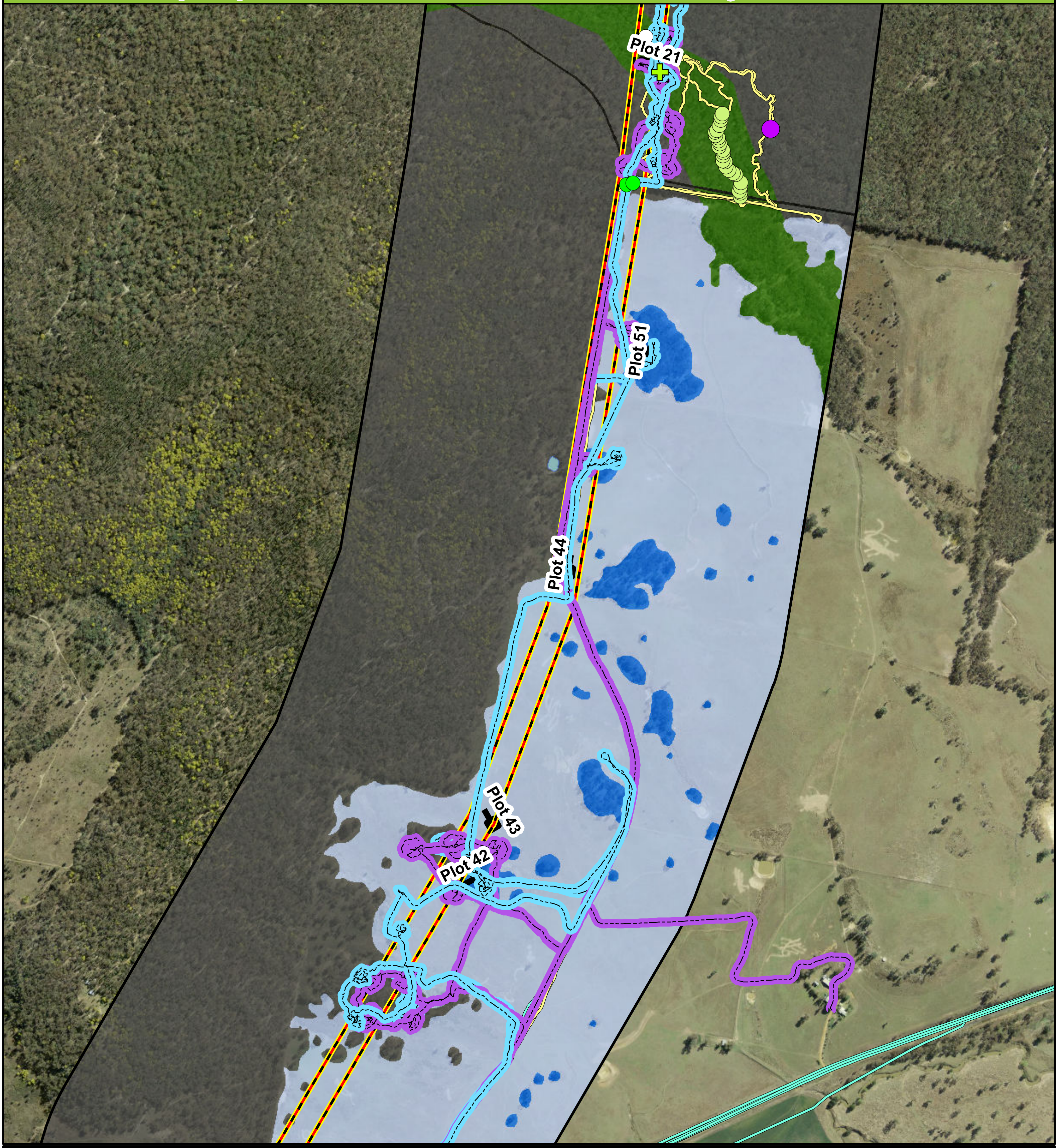

Plot 60
Plot 03
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Reptile survey (10 locations)
Call playback (17 locations, twice each)
Koala SAT (26 locations)
Remote camera (1,318 days)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
BAM Plots (64)
Vegetation Zones
11 479 B
15 483 M
16 483 L
C1
X2 Dam
X5 Road
Threatened flora effort
September
February
Threatened species
Varied Sittella
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022
eco logical AUSTRALIA
A TETRA TECH COMPANY



- Study area (16,791 ha)
- Operational footprint (549 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Call playback (17 locations, twice each)
- ElliotTrap
- Remote camera (1,318 days)
- Avifauna survey (486 surveys)
- Spotlighting
- Diurnal tracks
- BAM Plots (64)

Vegetation Zones

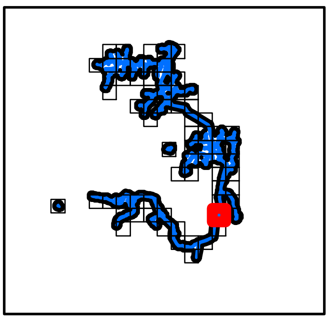
- 03 272 M
- 04 272 L
- 05 281 G
- 11 479 B
- X2 Dam
- X5 Road

Threatened flora effort

- September
- April

Threatened species

- Masked Owl

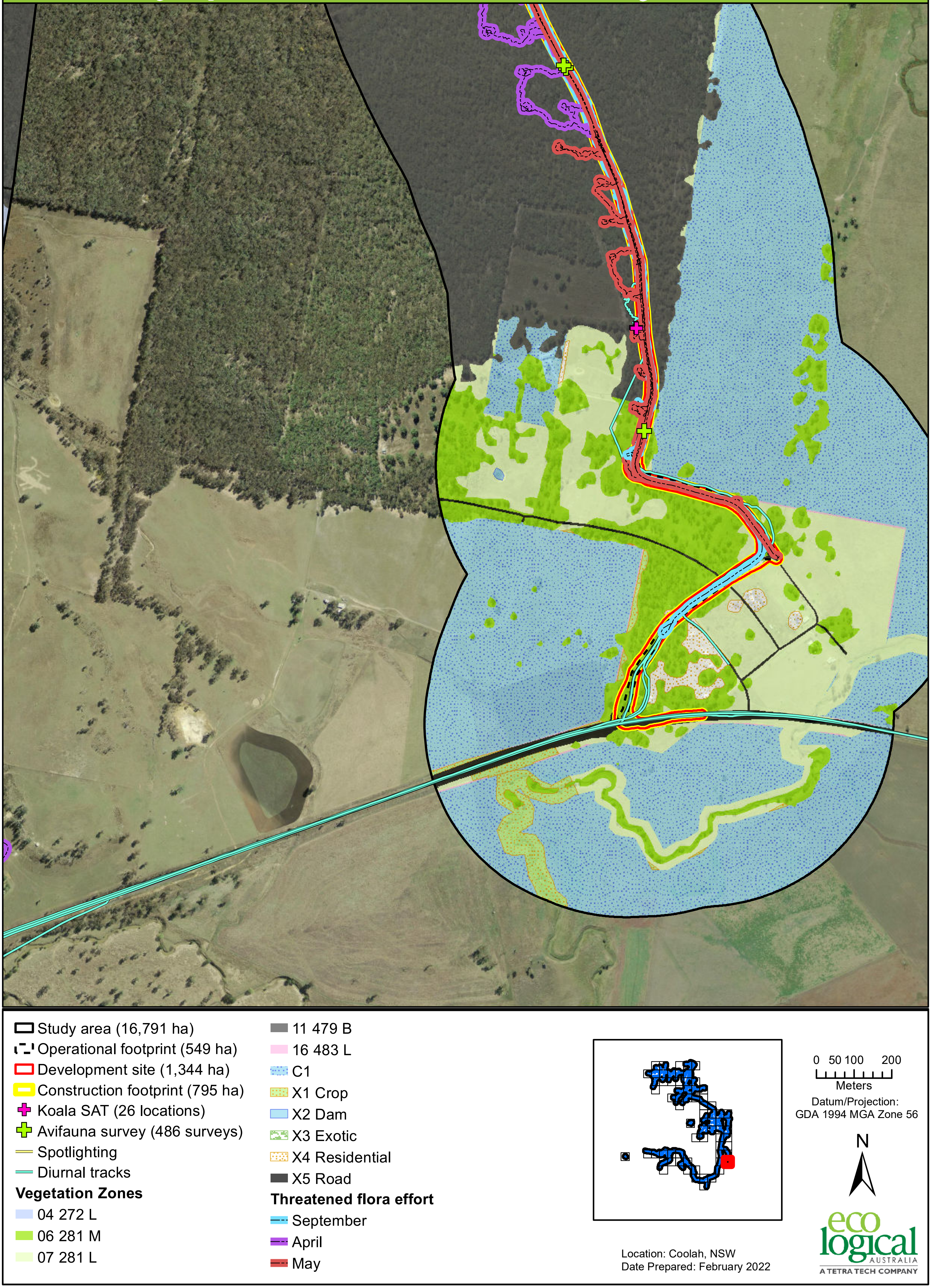


0 50 100 200
Meters

Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022



Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Koala SAT (26 locations)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Vegetation Zones
04 272 L
06 281 M
07 281 L
11 479 B
16 483 L
C1
X1 Crop
X2 Dam
X3 Exotic
X4 Residential
X5 Road
Threatened flora effort
September
April
May
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022
eco logical AUSTRALIA
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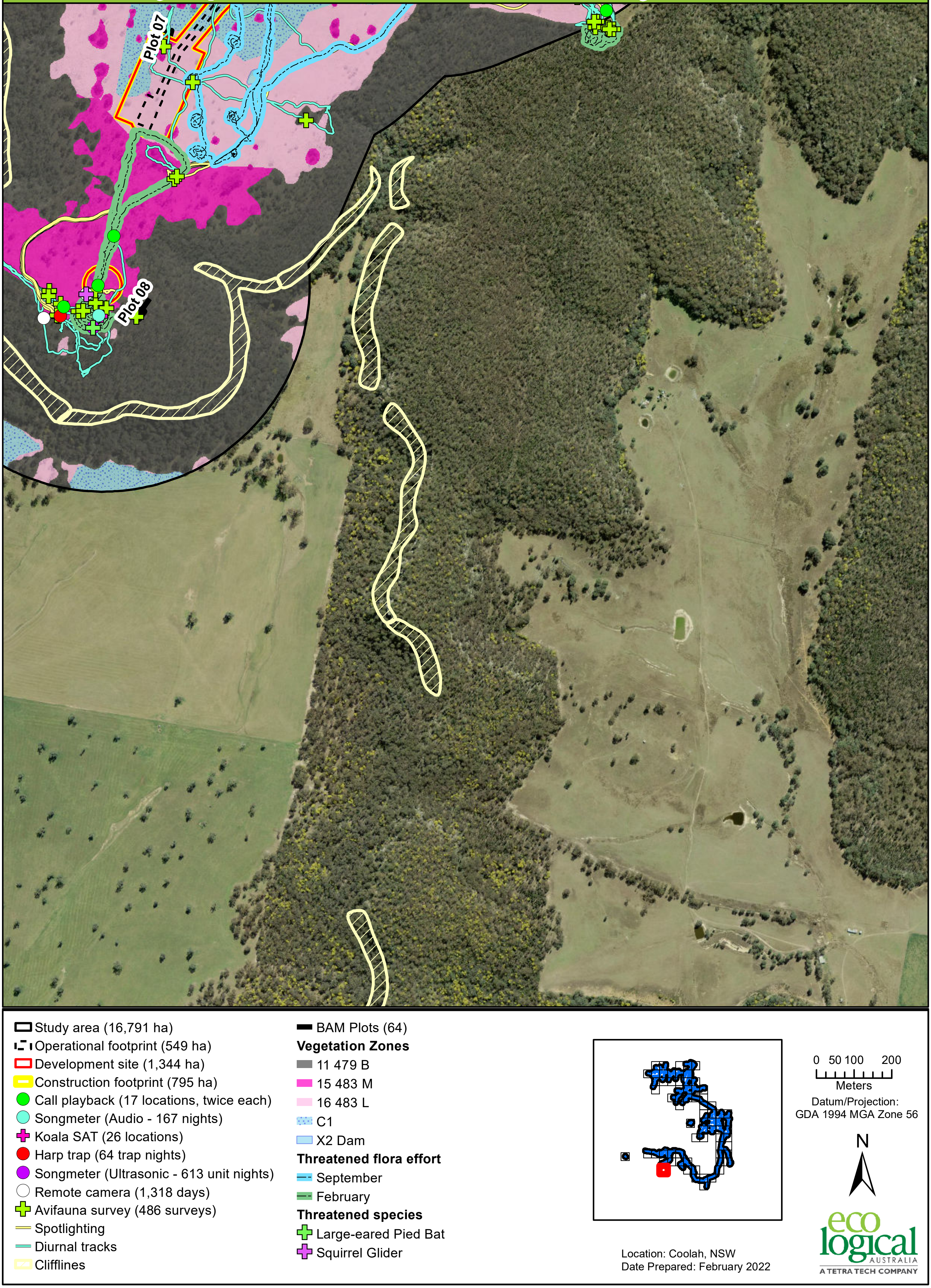
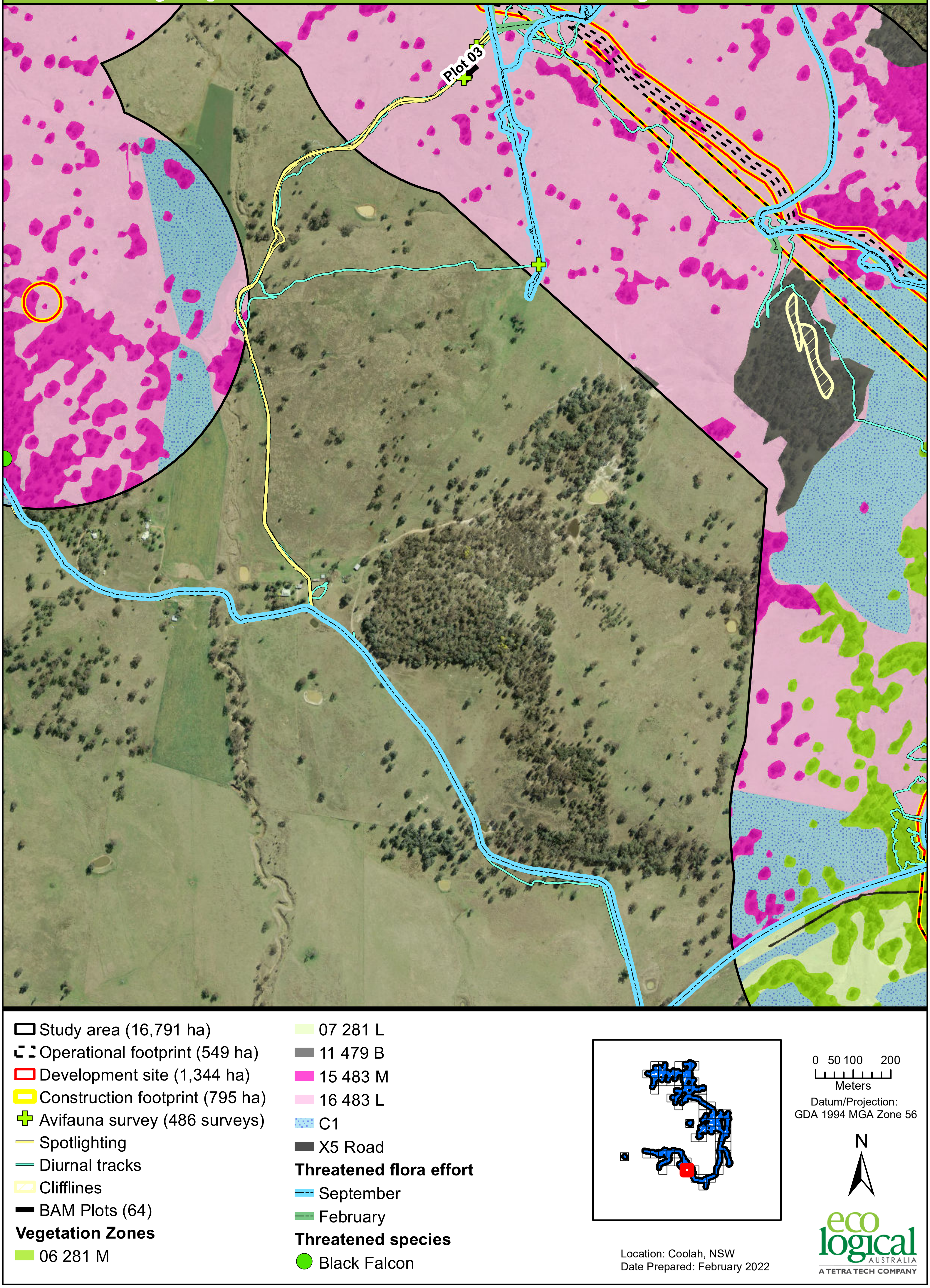
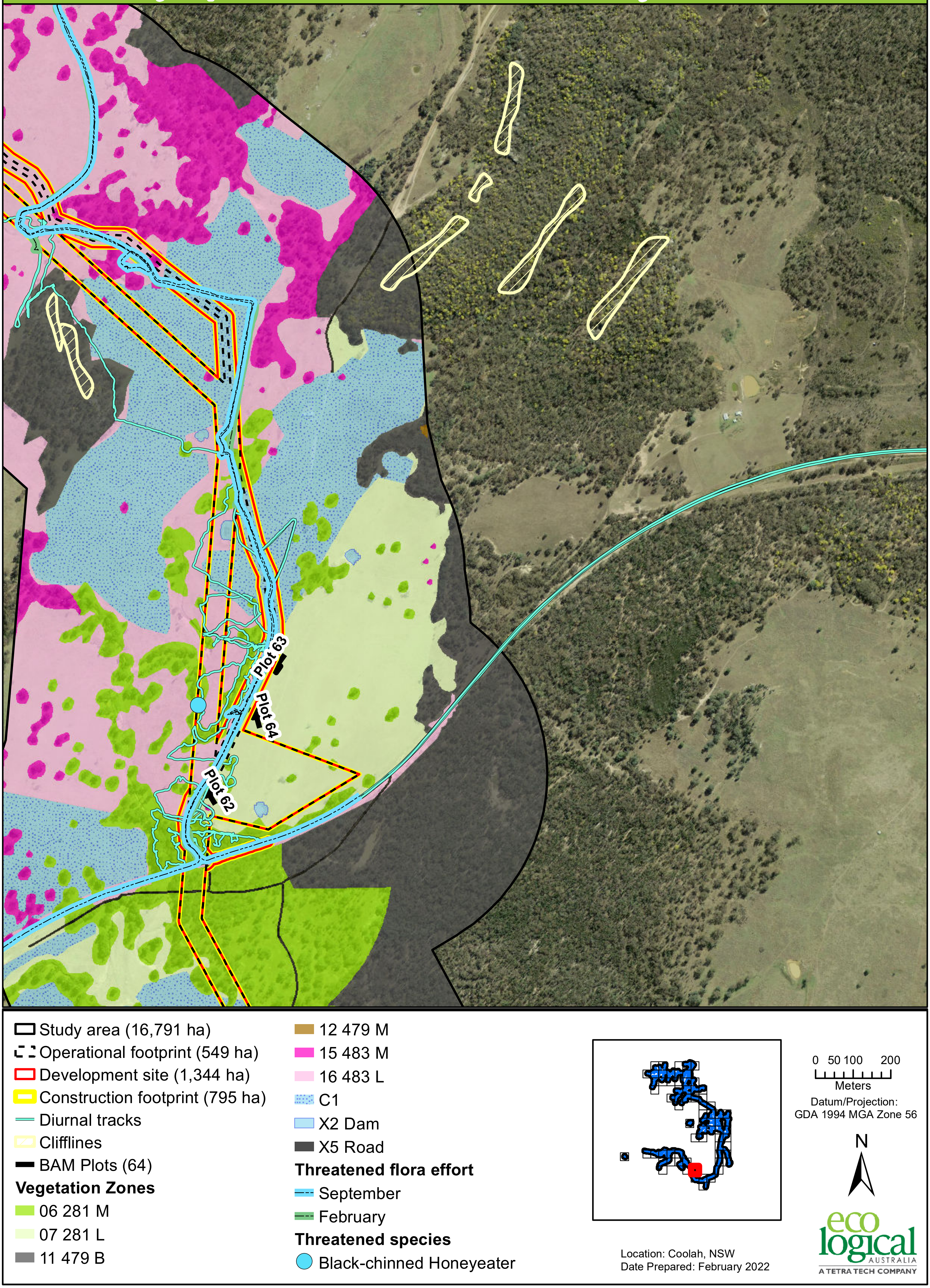
Detailed survey maps

Valley of the Winds Wind Farm




Plot 03
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Avifauna survey (486 surveys)
Spotlighting
Diurnal tracks
Clifflines
BAM Plots (64)
Vegetation Zones
06 281 M
07 281 L
11 479 B
15 483 M
16 483 L
C1
X5 Road
Threatened flora effort
September
February
Threatened species
Black Falcon
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022


Plot 63
Plot 64
Plot 62
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Diurnal tracks
Clifflines
BAM Plots (64)
Vegetation Zones
06 281 M
07 281 L
11 479 B
12 479 M
15 483 M
16 483 L
C1
X2 Dam
X5 Road
Threatened flora effort
September
February
Threatened species
Black-chinned Honeyeater
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022
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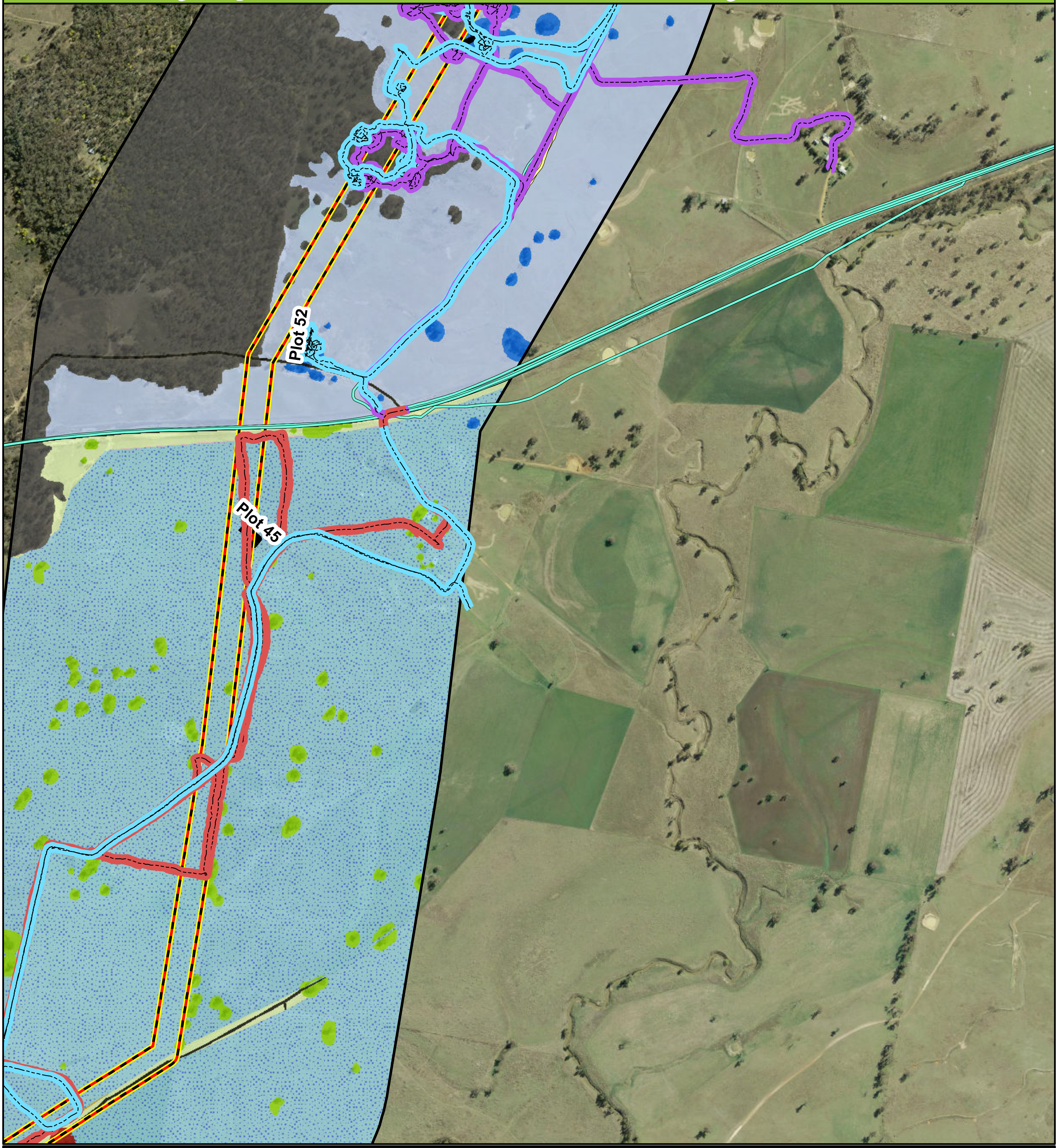


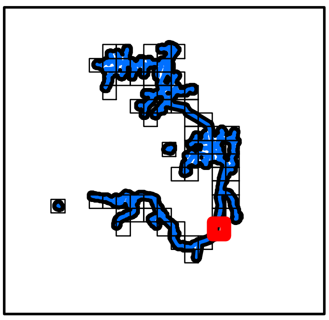
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Spotlighting
Diurnal tracks
BAM Plots (64)

Vegetation Zones

01 42 M
03 272 M
04 272 L
06 281 M
07 281 L
11 479 B
16 483 L
C1
X1 Crop
X5 Road

Threatened flora effort

September
April
May



0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

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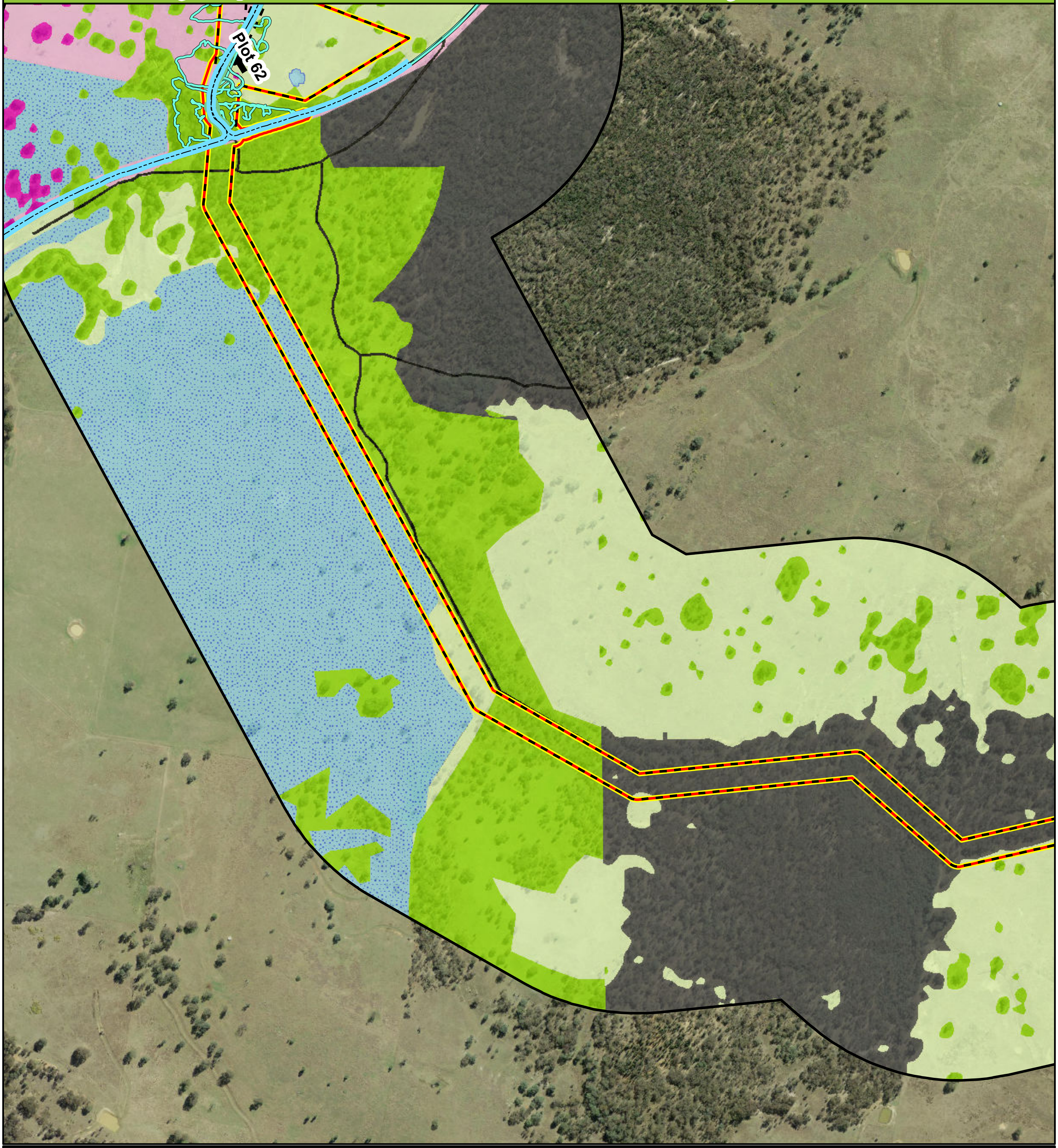
Detailed survey maps

Valley of the Winds Wind Farm



Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Diurnal tracks
BAM Plots (64)

Vegetation Zones

06 281 M
07 281 L
11 479 B
15 483 M
16 483 L
C1
X2 Dam
X5 Road

Threatened flora effort

September
February

0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022

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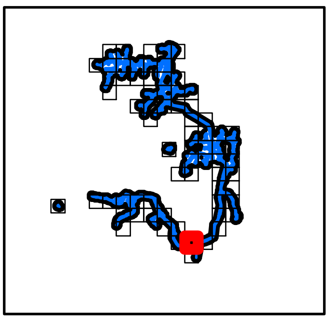
Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)

Vegetation Zones

01 42 M
06 281 M
07 281 L
11 479 B
C1
X1 Crop
X5 Road



0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

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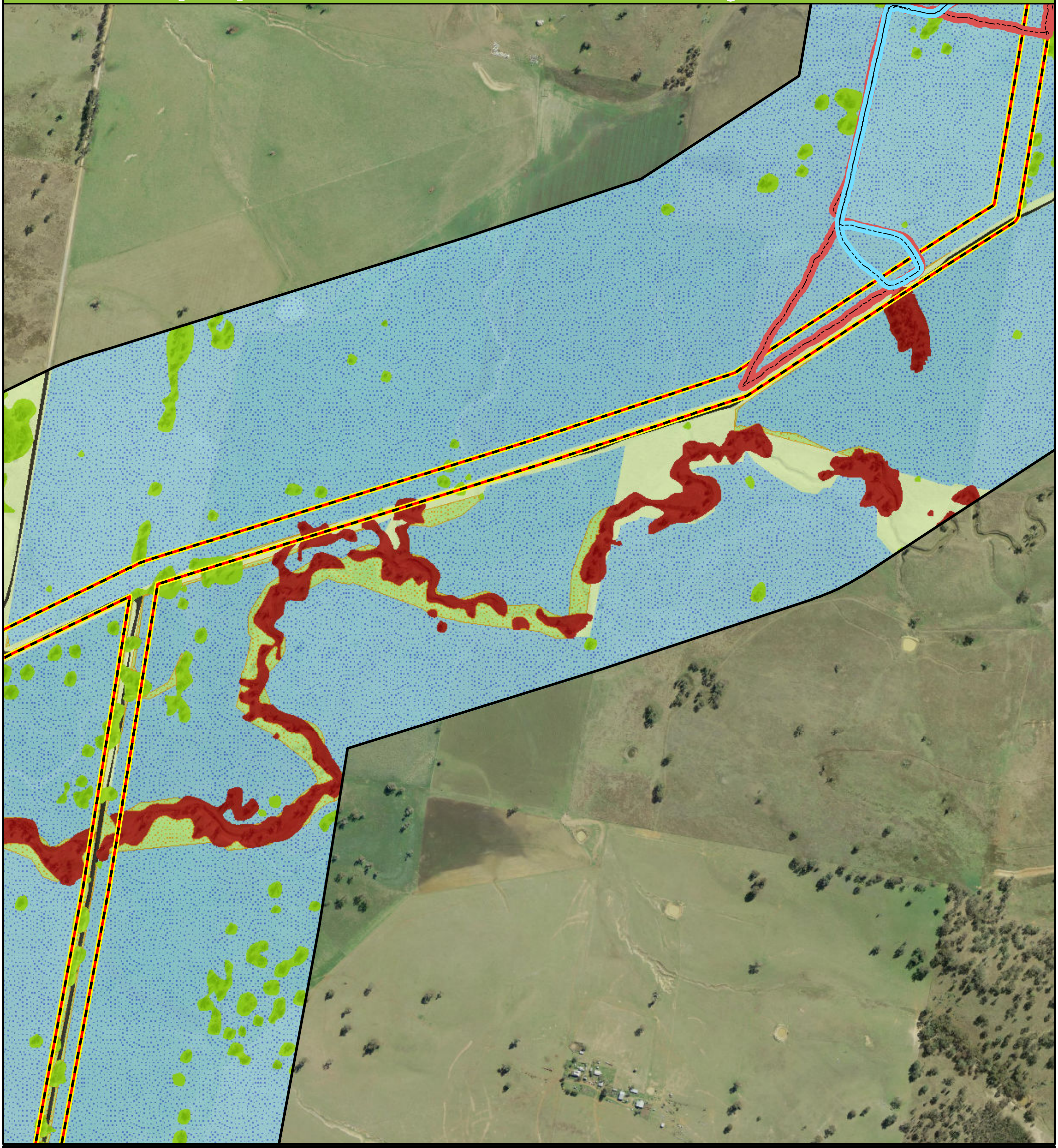
Location: Coolah, NSW
Date Prepared: February 2022



Study area (16,791 ha)
Operational footprint (549 ha)
Development site (1,344 ha)
Construction footprint (795 ha)

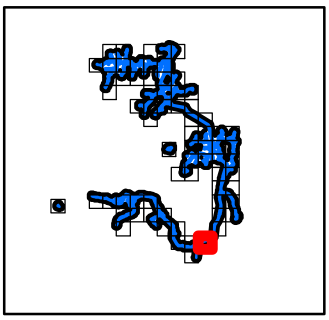
Vegetation Zones

01 42 M
06 281 M
07 281 L
16 483 L

C1
X1 Crop
X5 Road

Threatened flora effort

September
May



0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56

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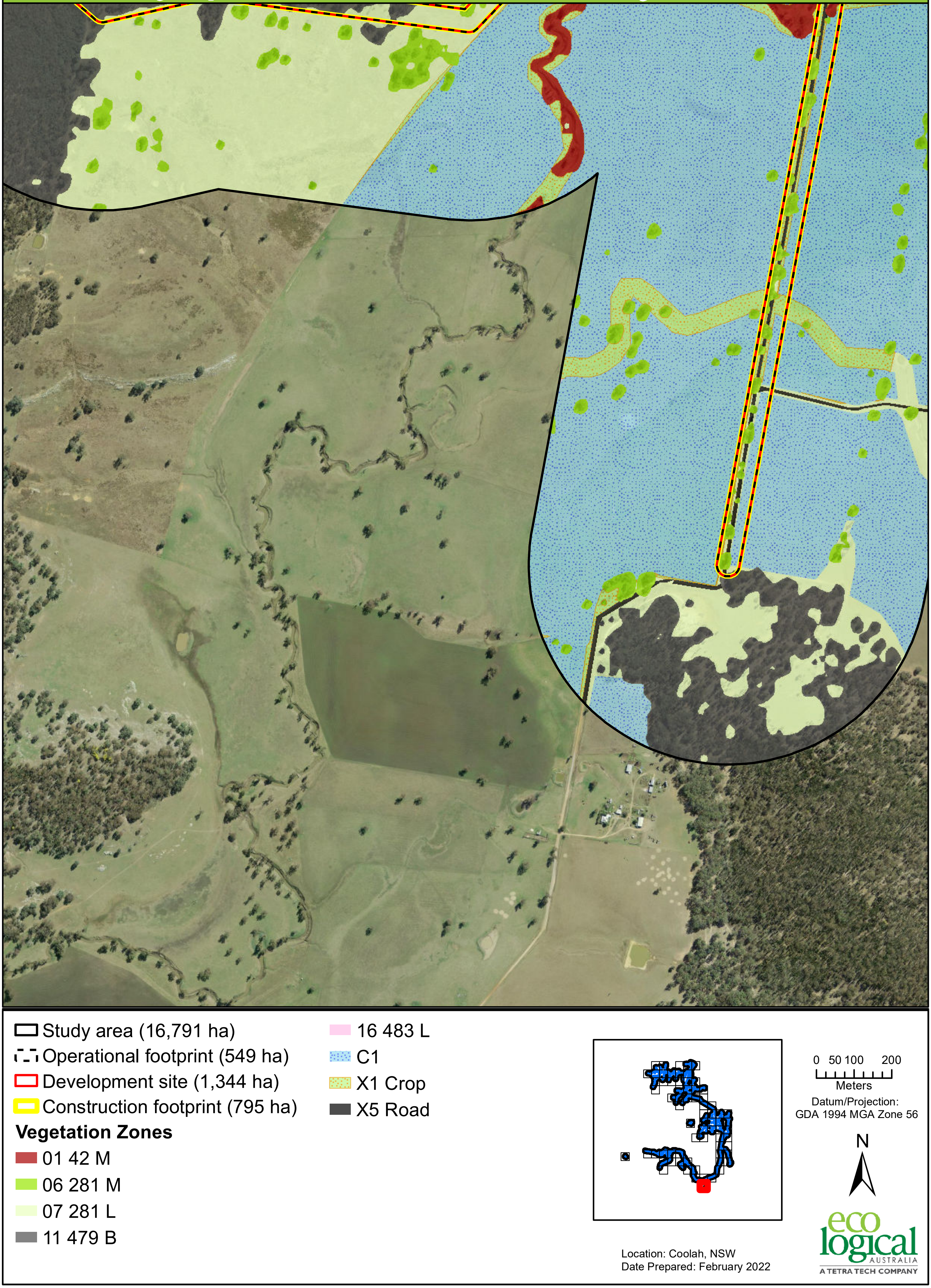
Location: Coolah, NSW
Date Prepared: February 2022

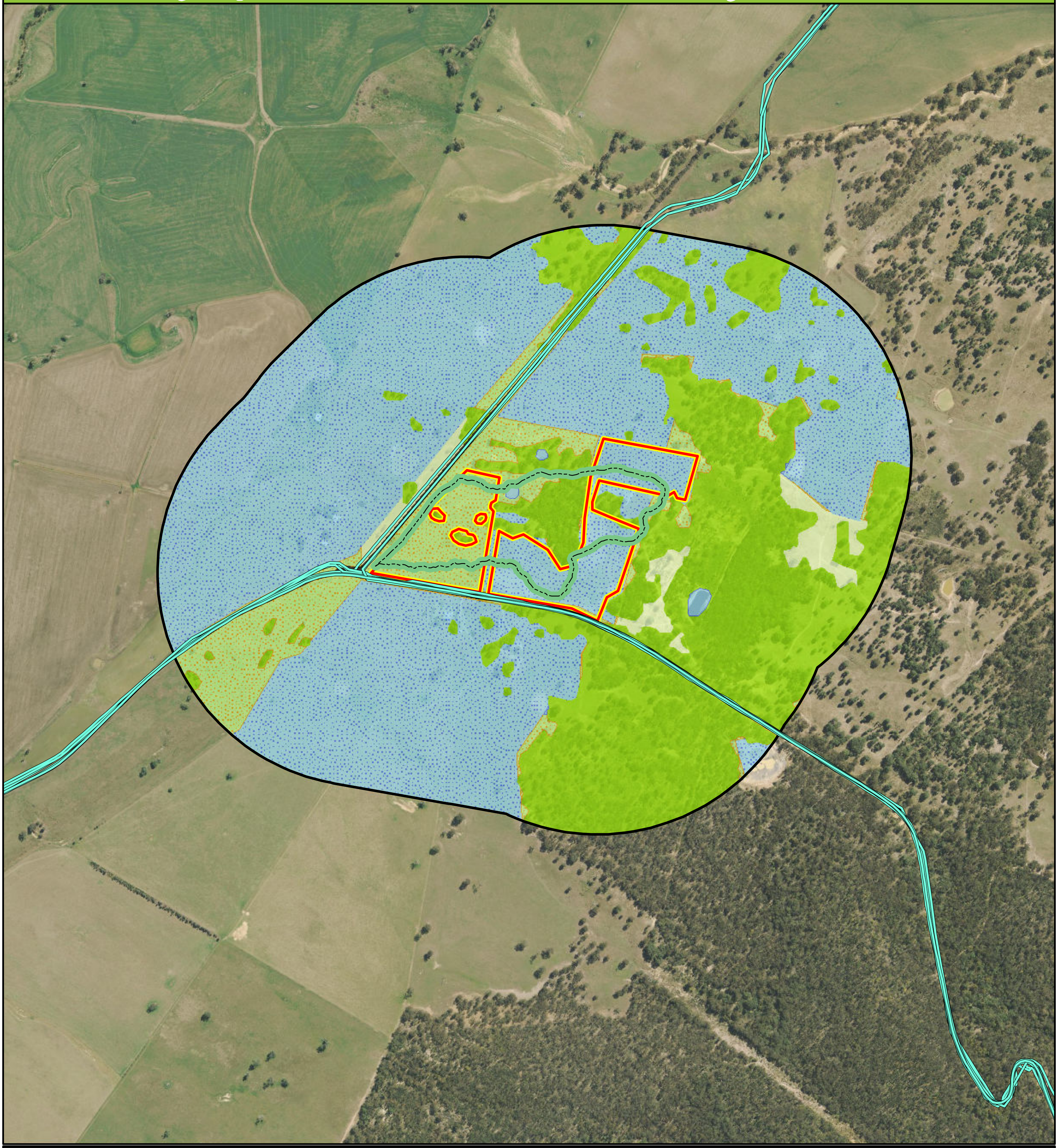
eco logical AUSTRALIA
A TETRA TECH COMPANY

Detailed survey maps

Valley of the Winds Wind Farm



Detailed survey maps **Valley of the Winds Wind Farm**



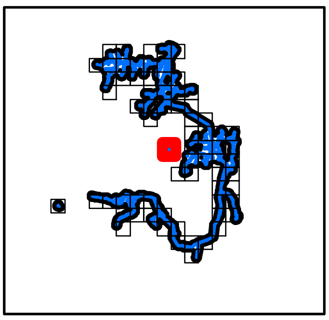
- Study area (16,791 ha)
- Development site (1,344 ha)
- Construction footprint (795 ha)
- Diurnal tracks

Vegetation Zones

- 06 281 M
- 07 281 L
- C1
- X1 Crop
- X2 Dam
- X5 Road

Threatened flora effort

- February



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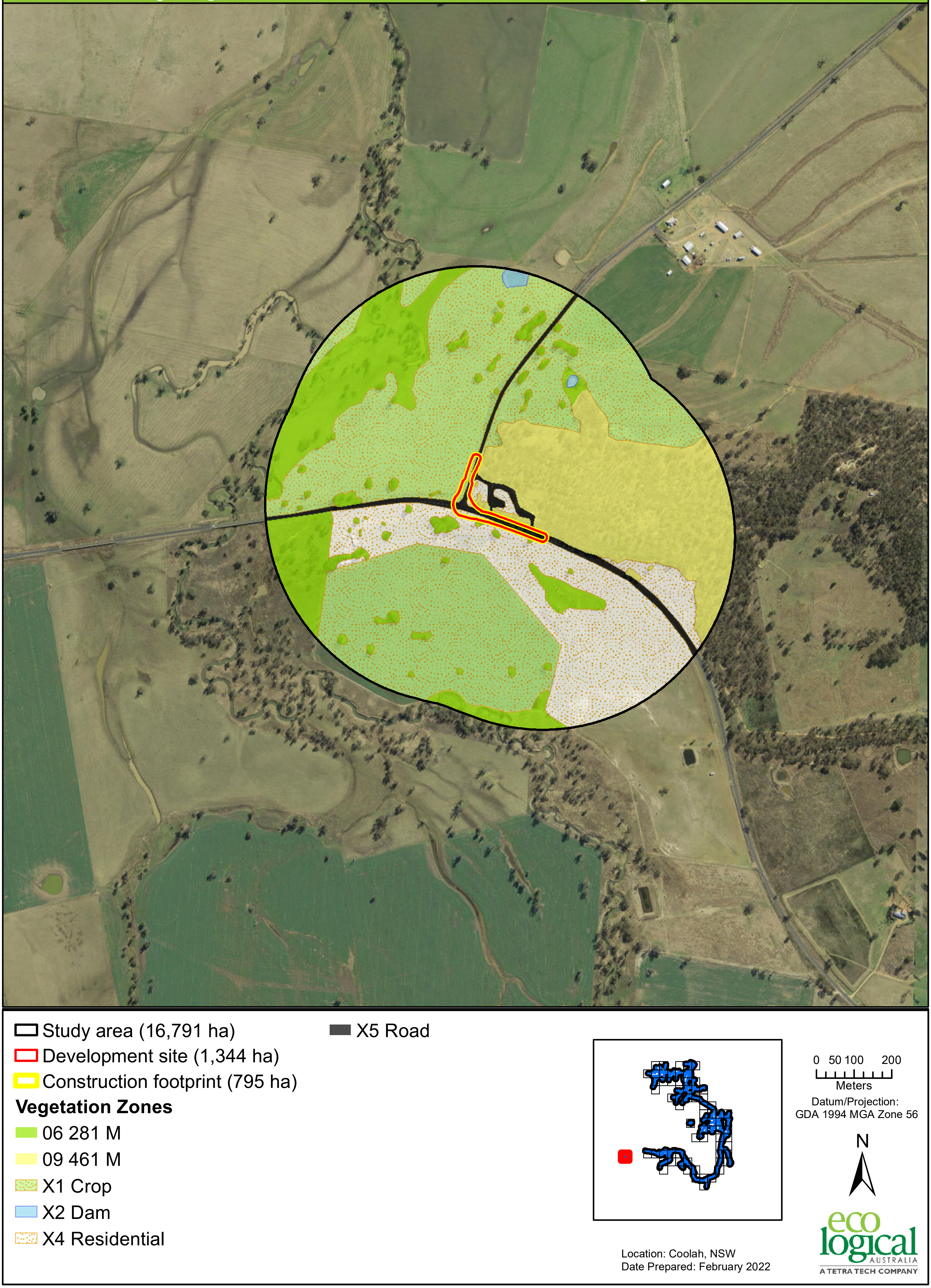
Meters

Datum/Projection:
GDA 1994 MGA Zone 56

N

Location: Coolah, NSW
Date Prepared: February 2022



Study area (16,791 ha)
Development site (1,344 ha)
Construction footprint (795 ha)
Vegetation Zones
06 281 M
09 461 M
X1 Crop
X2 Dam
X4 Residential
X5 Road
0 50 100 200
Meters
Datum/Projection:
GDA 1994 MGA Zone 56
N
Location: Coolah, NSW
Date Prepared: February 2022

Appendix J Bat data analysis

Microbat Call Identification Report

Prepared for ("Client"):	Eco Logical Australia
Cape Bedford	Coolah area, central-western NSW
Survey dates:	30th Nov. 2020 – 10th Feb. 2021
Client project reference:	
Job no.:	ELA-2102
Report date:	9 June 2021

Methods

Data received

Balance! Environmental received >219,000 WAV files recorded on Song Meter detectors at three localities (Girragulang Road, Leadville & Mount Hope) in the Coolah region between 30th November 2020 and 10th February 2021. Data were sorted by detector/site name for each locality.

The data had been processed by the client with Wildlife Acoustics' *Kaleidoscope* software to separate noise files from those containing bat calls. Consequently, the dataset analysed by *Balance! Environmental* included only ~106,000 of the submitted WAV files.

Call identification

Call analyses were performed in *Anabat Insight* Version 1.9.7 (Titley Scientific, Brisbane), as follows:.

- The ~106,000 WAV files recognised by the *Kaleidoscope* process as containing bat calls were filtered again to mark and exclude files that had only poor-quality (brief, highly-fragmented, noisy) bat calls or falsely-identified "calls" (usually insect song or anthropogenic sounds).

- Files that passed the filtration process were then passed through a Decision Tree analysis to group and label detected bat-calls based on a combination of call metrics derived from zero-crossing analysis, such as characteristic frequency (Fc), time between calls (TBC), slope (S1 and Sc) and pulse curvature.

- The preliminary call identities applied by the Decision Tree process were then confirmed or adjusted manually by comparing the call spectrograms and derived metrics with those of regionally relevant reference calls and published call descriptions (e.g. Reinhold *et al.* 2001; Pennay *et al.* 2004).

- The likelihood of species' occurrence in the study area was confirmed by referring to the Australasian Bat Society's *BatMaps* application (https://www.ausbats.org.au/batmap.html), other published distribution information (e.g., Churchill 2008; van Dyck et al. 2013) and on-line database records (e.g., http://www.ala.org.au).

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).

Species nomenclature follows Armstrong *et al.* (2020).

Results & Discussion

The *Anabat Insight* noise filtration process further reduced the analysis dataset to just 12,461 WAV files, within which a total of 12,612 bat calls were identified. Fifty-nine percent (7424) of those calls were positively identified, while the remaining "unresolved" calls had characteristics potentially attributable to two or more species. These were allocated to multi-species groups.

Visual review of a random subset of files excluded by the *Insight* noise filter showed that many contained bat calls of low amplitude (i.e., quiet/weak) that did not meet the filter's zero-crossing analysis threshold. All calls thus observed in the excluded files were from species that were identified in the set that passed the noise filter.

At least 16 and up to 19 species were recorded across the three survey localities (see **Tables 1-3**). Positive identification was achieved for 15 distinct species plus the *Nyctophilus* genus, within which species' calls cannot be reliably differentiated. Up to three *Nyctophilus* species potentially occur in the study area, including *N. geoffroyi*, *N. gouldi*, and the threatened *N. corbeni*.

Most of the unresolved calls represented species that were positively identified from more definitive calls; however, one call type potentially represented a species that was not otherwise identified (*Falsistrellus tasmaniensis*). All unresolved species group members are listed as "possible" in **Tables 1-3** unless they were also positively identified from other calls recorded at the same site.

Sample spectrograms of all identified call types are provided at **Appendix 1**. The accompanying Microsoft Excel file < ELA-2102_Coolah_summer 2020-21_ID-output.xlsx> includes data-sheets for each locality that give a breakdown of the number of calls allocated per species or unresolved species group for each site.

Threatened species

At least four and perhaps six threatened species were recorded, including:

- *Chalinolobus dwyeri* – Large-eared Pied Bat
    - Detected at three sites each in the Mt Hope and Leadville areas.
- *Falsistrellus tasmaniensis* – Eastern Falsistrelle
    - <u>Not confirmed</u> but possible calls from all three localities.
- *Nyctophilus corbeni* – Corben's Long-eared Bat
    - <u>Not confirmed</u> but could be responsible for some of the *Nyctophilus* calls.
- *Scoteanax rueppellii* – Greater Broad-nosed Bat
    - Detected across all three localities.
- *Miniopterus orianae oceanensis* – Large Bent-winged Bat (Eastern sub-species)
    - Detected at Girragulang Rd (just 1 call) and Mt Hope (6 sites)
- *Saccolaimus flaviventris* – Bare-rumped Sheath-tailed Bat
    - detected at four sites across all three localities

Table 1 Bats recorded in the Girragulang Road area.

♦ = 'definite' - at least one call was attributed unequivocally to the species at the site

□ = 'possible' - calls like those of the species were recorded, but were not reliably identified

Site/detector name:	GR_Bustard	GR_Flannyflower	GR_Helioporus	GR_Hibbertia	GR_Lionfish	GR_Spicebush	GR_Toadfish
Chalinolobus gouldii	♦	♦	♦	♦	♦	♦	♦
Chalinolobus morio	□	♦	♦	□	♦	♦	♦
Falsistrellus tasmaniensis			□	□		□	
Nyctophilus sp.		♦	♦	♦		♦	♦
Scoteanax rueppellii	□	□		♦	□	♦	
Scotorepens balstoni	♦	♦	♦	♦	♦	♦	♦
Scotorepens orion	□	□	□	□	□	□	□
Vespadelus darlingtoni	□	♦		□	□		
Vespadelus regulus	♦	♦	♦	♦	♦	♦	♦
Vespadelus vulturnus	♦	♦	♦	♦	♦	♦	♦
Miniopterus orianae	□	□	□		♦	□	
Austronomus australis	♦	♦	♦	♦	♦	♦	♦
Ozimops petersi	♦	♦	♦	♦	♦	♦	♦
Ozimops planiceps	□	♦	♦	♦	♦	♦	♦
Ozimops ridei	□	♦	□	□	♦	□	□
Saccolaimus flaviventris				♦			

Table 2 Bats recorded in the Leadville area.

♦ = 'definite' - at least one call was attributed unequivocally to the species at the site

□ = 'possible' - calls like those of the species were recorded, but were not reliably identified

Site/detector name:	LV_Bustard	LV_Firetail	LV_Lionfish	LV_Lotus
Rhinolophus megaphyllus		♦		
Chalinolobus dwyeri	♦	♦	♦	
Chalinolobus gouldii	♦	♦	♦	♦
Chalinolobus morio				□
Falsistrellus tasmaniensis				□
Nyctophilus sp.		♦		♦
Scoteanax rueppellii		♦		♦
Scotorepens balstoni		♦		♦
Scotorepens orion		♦		♦
Vespadelus regulus	♦	♦	□	♦
Vespadelus vulturnus	♦	♦	♦	♦
Miniopterus orianae	□	□		
Austronomus australis		♦	♦	♦
Ozimops petersi	♦	♦		♦
Ozimops planiceps	♦	♦	♦	♦
Ozimops ridei	♦	□	♦	□
Saccolaimus flaviventris	♦			

Table 3 Bats recorded in the Mount Hope area.

♦ = ‘definite’ - at least one call was attributed unequivocally to the species at the site

□ = ‘possible’ - calls like those of the species were recorded, but were not reliably identified

Site/detector name:	MH_Bustard	MH_Firetail-1	MH_Firetail-2	MH_Lionfish	MH_Lotus 1	MH_Lotus 2	MH_Spicebush	MH_Toadfish	MH_Wedgie	MH_Wolverine
Chalinolobus dwyeri		♦			♦			♦		
Chalinolobus gouldii	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Chalinolobus morio	□	♦	♦	♦	♦	♦	♦	♦	♦	♦
Falsistrellus tasmaniensis								□	□	
Nyctophilus sp.	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Scoteanax rueppellii		♦	♦	□	♦		♦	♦	♦	□
Scotorepens balstoni	♦	♦	♦	♦	♦	♦	♦	♦	♦	
Scotorepens orion	□	□	□	□	□		♦	♦	♦	□
Vespadelus darlingtoni		♦	♦	□	♦	♦	□	□	♦	
Vespadelus regulus	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Vespadelus vulturnus	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Miniopterus orianae	□	♦	♦	♦	♦	□	♦	□	□	♦
Austronomus australis	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Ozimops petersi	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Ozimops planiceps	♦	♦	♦	♦	♦	♦	♦	♦	♦	
Ozimops ridei	♦	♦	♦	□	♦	♦	♦	♦	♦	
Saccolaimus flaviventris	♦							♦		

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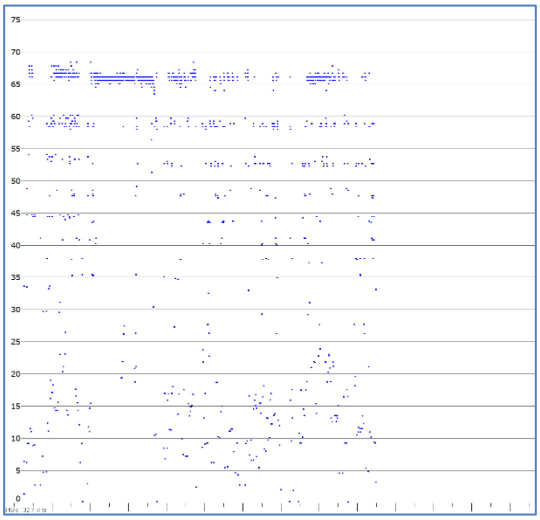
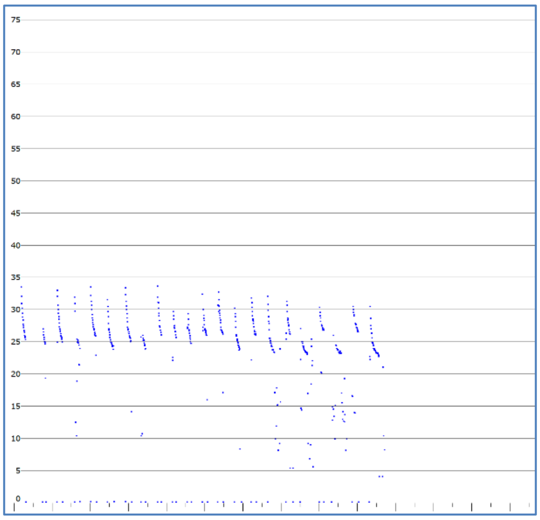
Reinhold, L., Law, B., Ford, G. and Pennay, M. (2001). *Key to the bat calls of south-east Queensland and north-east New South Wales*. Department of Natural Resources and Mines, Brisbane.

van Dyck, S., Gynther, I. and Baker, A. (ed.) (2013). *Field Companion to the Mammals of Australia*. New Holland; Sydney.

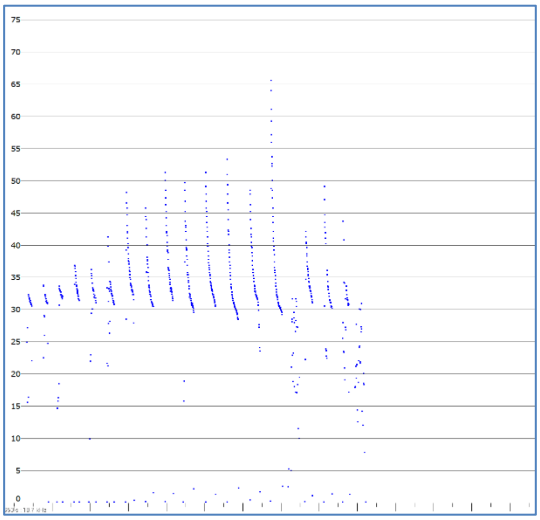
Appendix 1 Representative call sequences from the Coolah area surveys, summer 2020-21.
Scale *x*-axis =10 milliseconds per tick-mark; time between pulses compressed



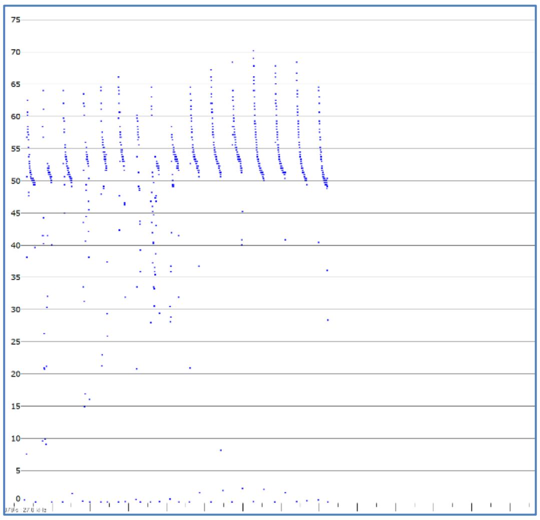
Rhinolophus megaphyllus



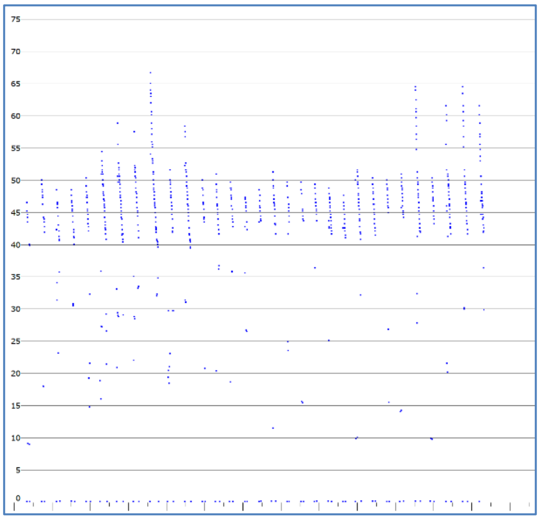
Chalinolobus dwyeri



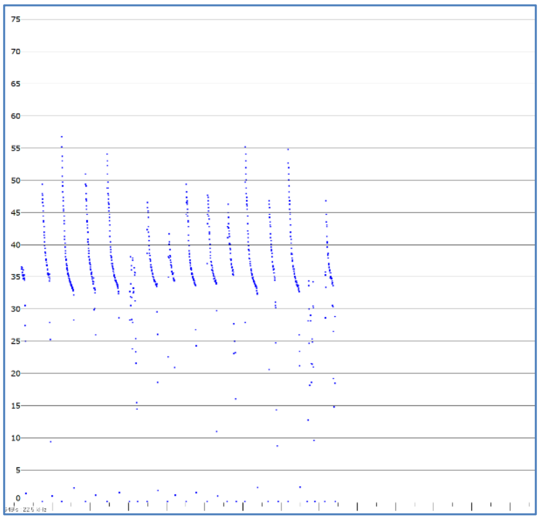
Chalinolobus gouldii



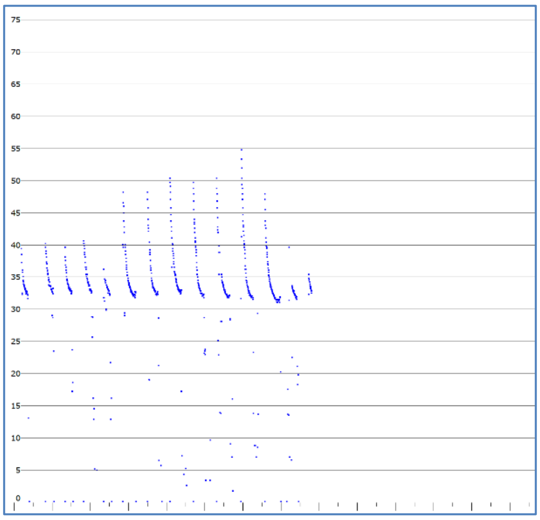
Chalinolobus morio



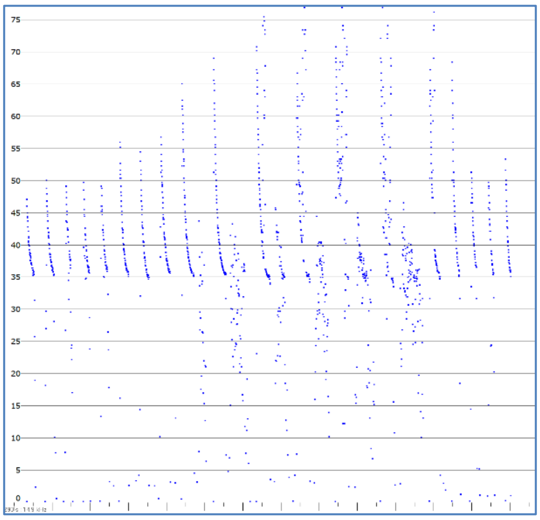
Nyctophilus sp.



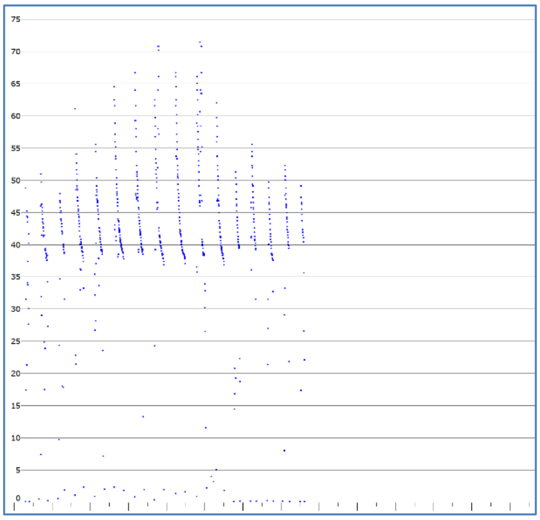
Scoteanax rueppellii



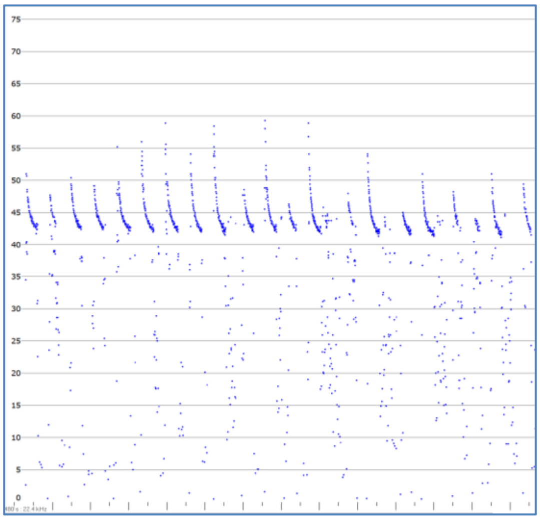
Scotorepens balstoni



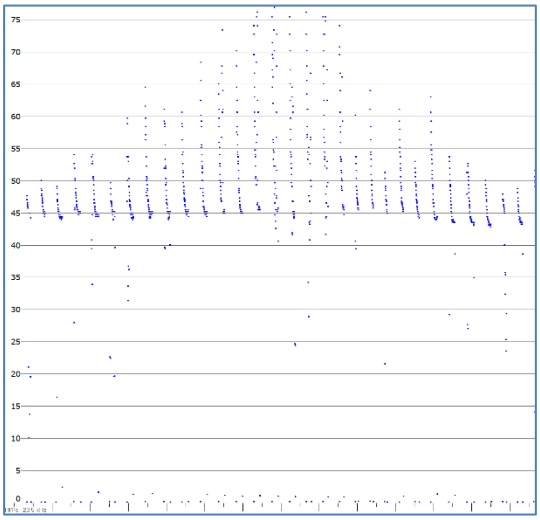
Scotorepens orion



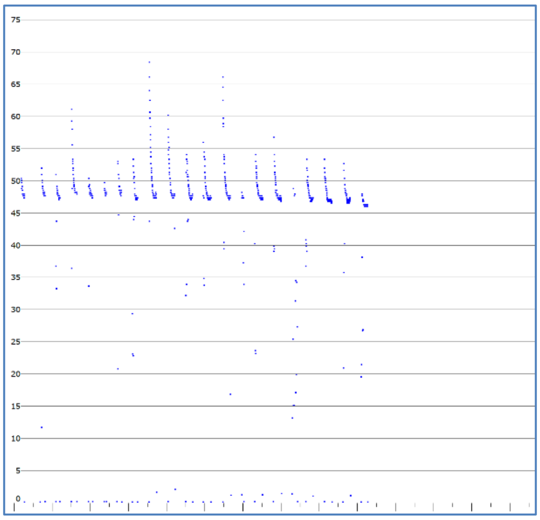
Possibly *Falsistrellus tasmaniensis*



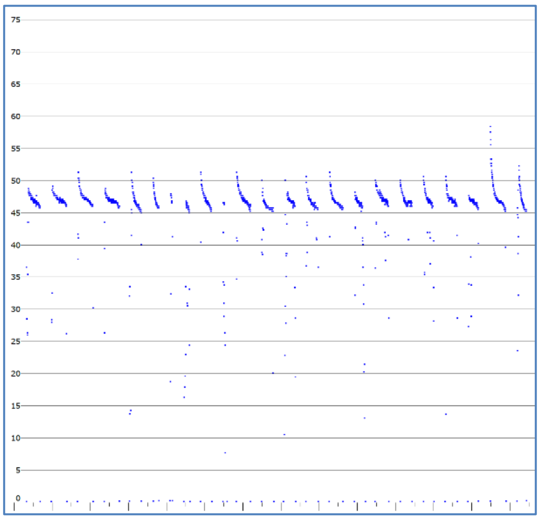
Vespadelus darlingtoni



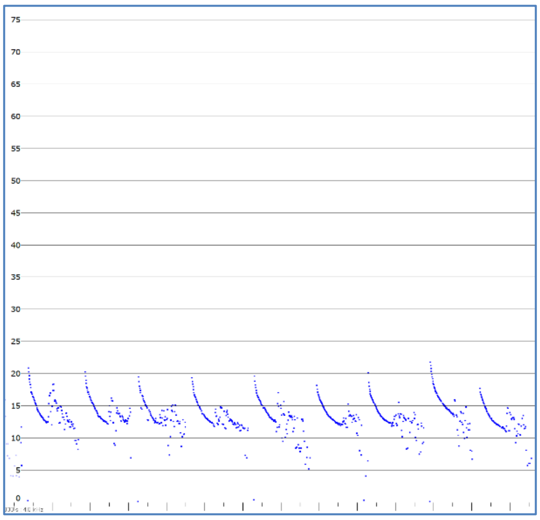
Vespadelus regulus



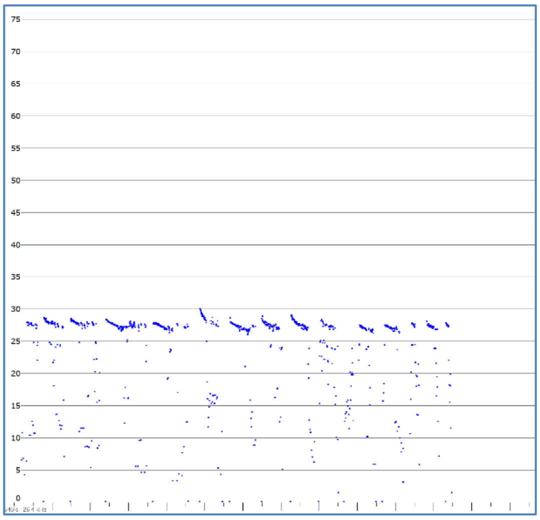
Vespadelus vulturnus



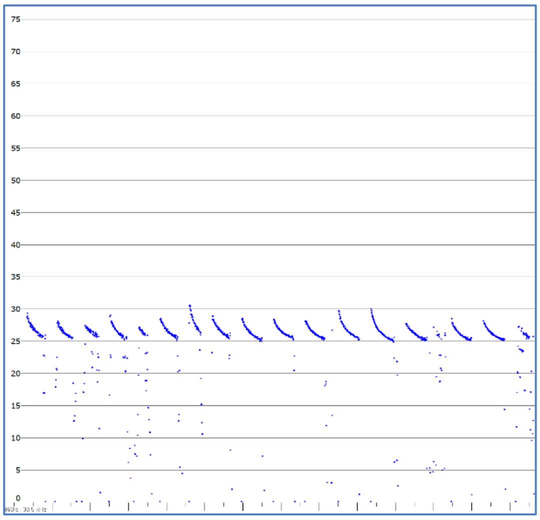
Miniopterus orianae



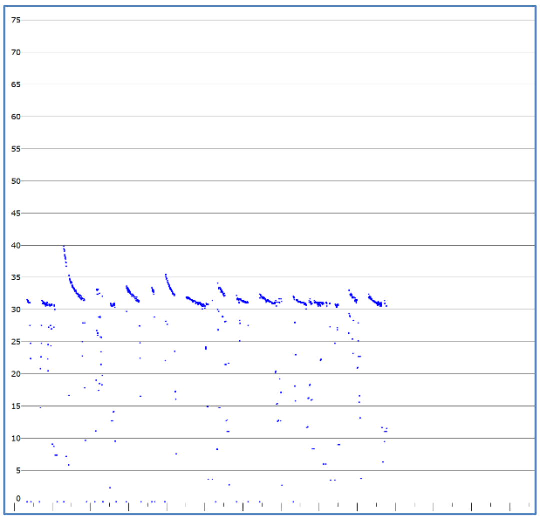
Austronomus australis



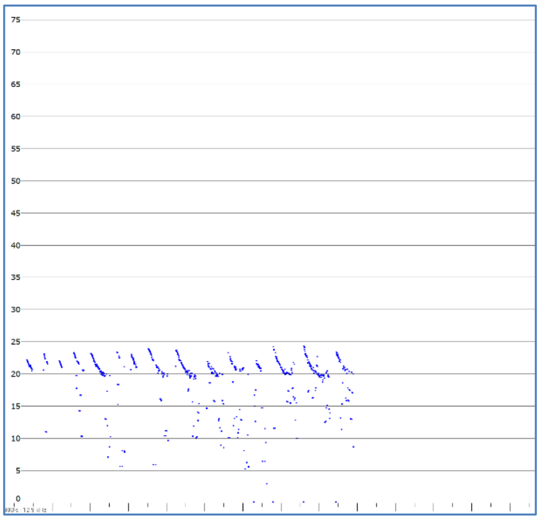
Ozimops petersi



Ozimops planiceps



Ozimops ridei



Saccolaimus flaviventris

Microbat Call Identification Report

Prepared for ("Client"):	Eco Logical Australia
Survey location/project name:	Coolah Met-masts
Survey dates:	28th August – 14th September 2021
Client project reference:	
Job no.:	ELA-2103
Report date:	7 October 2021

Methods

Data received

Balance! Environmental received 5459 full-spectrum ultrasonic acoustic files (WAV files) recorded using six Song Meter SM4BAT detectors (Wildlife Acoustics, Maynard MA, USA). The detectors were deployed at two meteorological monitoring masts (met-masts), with microphones positioned at ground level (0 m), 50 m and 100 m height above ground. The total deployment period was from 28th July 2021 to 14th September 2021, with a few days' variation between the two sites (see **Table 1**).

Call analysis and species identification

Call analysis was performed in *Anabat Insight* (Titley Scientific, Brisbane), with all WAV files first processed through a generic noise filter to exclude files with only non-bat noise. Files that passed the noise filter were then run through a Decision Tree Analysis to group and label similar calls based on zero-crossing analysis metrics (e.g. characteristic frequency (Fc), pulse duration (Dur) and time between pulses (TBC)). The Decision Tree also set aside any call files that contained fewer than three measurable pulses ("short calls").

Each Decision Tree group was reviewed manually to confirm or adjust species labels, with the "short call" group only reviewed if there were obvious species gaps or few identifiable calls for a site. Species identification was based on comparison of call spectrograms and derived metrics with those of regionally relevant reference calls and published call descriptions (Reinhold *et al.* 2001; Pennay *et al.* 2004).

The likelihood of species' presence on site was confirmed by referring to the *BatMap* application (Australasian Bat Society 2021) and other published distributional information (e.g. Churchill 2008; van Dyck et al. 2013).

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 at the Coolah met-masts, July-September 2021.

Location	Height m	Detector	Start date - time	End date - time
Girragulang Road	0	Wedgie	3/08/2021 - 17:26	10/09/2021 - 06:06
Girragulang Road	50	S4U11765	28/07/2021 - 17:20	10/09/2021 - 0 6:18
Girragulang Road	100	S4U11925	28/07/2021 - 17:20	10/09/2021 - 06:18
Mount Hope	0	Wombat	4/08/2021 - 17:27	14/09/2021 - 06:01
Mount Hope	50	S4U11737	28/07/2021 - 17:20	14/09/2021 - 06:12
Mount Hope	100	S4U11746	28/07/2021 - 17:20	14/09/2021 - 06:12

Results & Discussion

A total of 2080 bat calls were identified in 2060 WAV files.

More than 81% (1697) of the calls were positively identified to one of 11 distinct species or the *Nyctophilus* genus (see **Table 2**). Species within the latter genus cannot be reliably differentiated in call data and at least two species may be present in the study area (*N. geoffroyi* and *N. gouldi*).

Two threatened species were identified, including: *Miniopterus orianae oceanensis* (Eastern Bent-winged Bat); and *Saccolaimus flaviventris* (Yellow-bellied Sheath-tailed Bat).

The other 383 "unresolved" calls had characteristics potentially attributable to two or more species and were assigned to six multi-species groups (**Table 2** lower portion). One of the "unresolved" call groups potentially represents an additional species – *Ozimops lumsdenae*; however, it is possible that the 142 calls assigned to this group are simply low frequency variants of *O. planiceps*, which was the most frequently detected species at all elevations and both sites.

O. lumsdenae is a listed threatened species in New South Wales and, if present at Coolah, would be at the extreme southerly limit of its known geographic range.

Sample call spectrograms of each species and unresolved call-group are shown in **Appendix 1**.

Table 2 Bats recorded at three elevations at the Coolah met-masts; 28 July – 14 September 2021. Number of calls allocated per species or unresolved group.

Site:	**Girragulang Road**			**Mount Hope**			Species Total
Height (m):	**0**	**50**	**100**	**0**	**50**	**100**	
Positively identified calls							
Chalinolobus gouldii	159	6	3	141	26	4	339
Nyctophilus sp.	10						10
Scotorepens balstoni				1			1
Vespadelus darlingtoni	1				2	4	7
Vespadelus regulus	8	4	1	18	29	12	72
Vespadelus vulturnus	28			13	2	1	44
Miniopterus orianae	4	1	1	7	20	16	49
Austronomus australis	37	10	3		18	14	82
Ozimops petersi	11	1	2	1	10	14	39
Ozimops planiceps	246	108	120	47	230	146	897
Ozimops ridei	11	11	31	2	57	43	155
Saccolaimus flaviventris	2						2
Unresolved calls							
C. gouldii / Ozimops sp.	9	7	6	33	19	5	79
O. planiceps / ***O. lumsdenae***	56	17	31	4	23	11	142
O. petersi / O. ridei	8	6	10	1	19	13	57
V. darlingtoni / V. regulus	5			1	6	4	16
V. regulus / V. vulturnus	7	1		17	3	3	31
Vespadelus sp. / ***M. orianae***	6	4	3	15	17	13	58
Detector Total	608	176	211	301	481	303	2080

Comparison of bat activity at three elevations

Bat activity levels varied considerably between the two sites and between elevations at each site (see **Figure 1**). At Girragulang Road, bat activity at ground level (mean detection rate of 16.0 calls per detector-night) far exceeded that at 50m (3.9 calls/d-n) and 100m (4.7 calls/d-n), whereas the 50m microphone at Mount Hope detected higher bat activity (9.8 calls/d-n) than those at ground level (7.2 calls/d-n) and 100m (6.2 calls/d-n).

The relative contributions of individual species to activity levels at each elevation are somewhat consistent between the two sites (see **Figure 2**). While most species were detected at all three elevations, activity was dominated by the free-tailed bats (*Ozimops* spp.) at 50m and 100m, where more than 70% of the detected calls were from these high-flying, open-space-foraging specialists. Vespertilionid species adapted to foraging within or close to vegetation (e.g., *Chalinolobus gouldii* and *Vespadelus* spp.) were more prominent at ground level, although the open-space specialists still contributed ~60% of the ground-level calls at Girragulang Road.

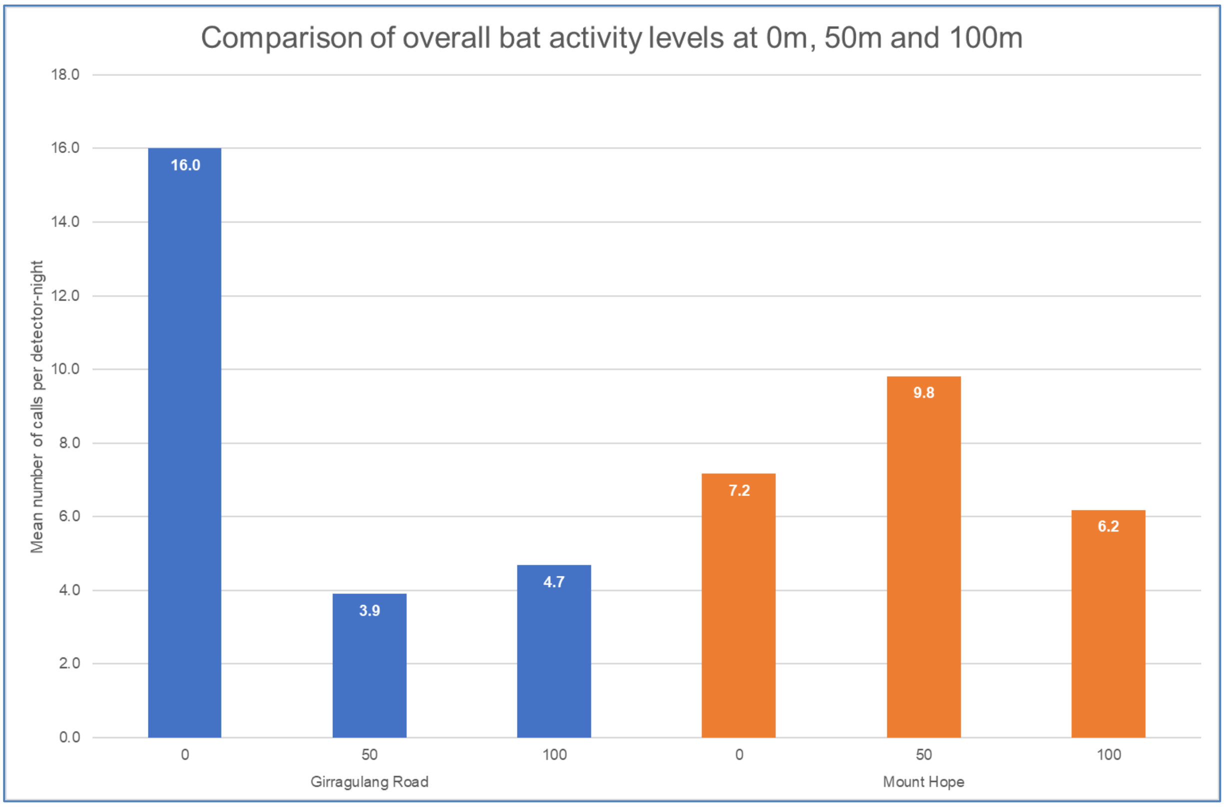


Figure 1 Comparison of bat activity levels at three heights above ground at the two Coolah met-masts.

Threatened species and elevation

The detection of just two *S. flaviventris* calls reflects the rarity of this species at the Coolah locality at the time of year during which this survey was undertaken (i.e., late winter/early spring). That it was detected only by the ground-level unit at Girragulang Road is perhaps indicative that the species will forage close to the ground in treeless habitats, but it is also known to forage at elevations that would put it within the rotor sweep zone of wind turbines. Being a summer migrant to southern Australia (Churchill 2008), it is possible that *S. flaviventris* will feature more prominently in call data recorded over coming months at Coolah.

The proportion of *M. orianae oceanensis* detections was greater at 50m and 100m for the Mount Hope site (see **Figure 2** and **Figure 3**). This may be of concern in terms of the implied turbine collision risk for the species if activity is more concentrated in the rotor sweep zone; however, the overall detection rate for the species was very low (<1 call per detector-night) at all altitudes and both sites (see **Figure 3**). Consequently, the likelihood of significant impact to the species is very low, at least during the late winter/early spring period represented by the present dataset.

Caution required in interpreting elevational activity comparisons

No attempt has been made to determine if individual calls were recorded by more than one detector at each site. Consequently, it is likely there is some overlap in call detections at each altitude and, therefore, considerable error in the relative activity levels discussed above.

In the right atmospheric conditions (e.g., low temperature and low humidity), some high amplitude (loud) low frequency, calls, such as those of the molossid species, could be detected at distances of 30-50m, or even more. Therefore, an *O. planiceps* (call frequency ~25 kHz) foraging at 50m could be recorded on all three detectors. Conversely, a higher frequency, lower amplitude (quieter) call (e.g., from *V. vulturnus*) is less likely to be detected simultaneously by multiple microphones.

With these basic assumptions, it is conceivable that the illustrated altitudinal differences in activity level are more reliable for *Vespadelus* spp., *Nyctophilus* spp. and perhaps *C. gouldii*, but less reliable for *Austronomus australis* and *Ozimops* spp.

However, the "detectability" at each microphone of a single call from a given species will be complicated by a range of factors, including orientation of the bat relative to each microphone, what the bat is doing at the time (e.g., a quiet bat making a louder call than usual), and variation in temperature and humidity at the different elevations, relative to where the bat is flying.

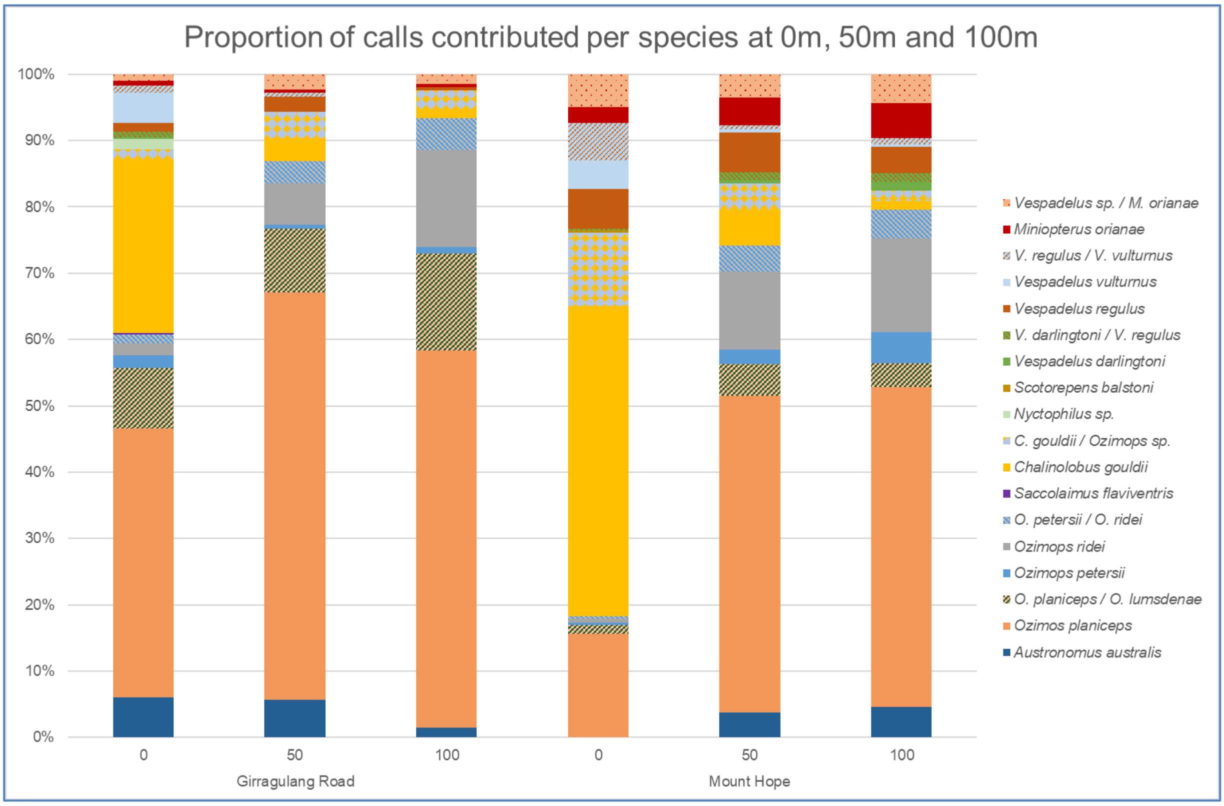


Figure 2 Relative proportions of total bat activity contributed by each species.

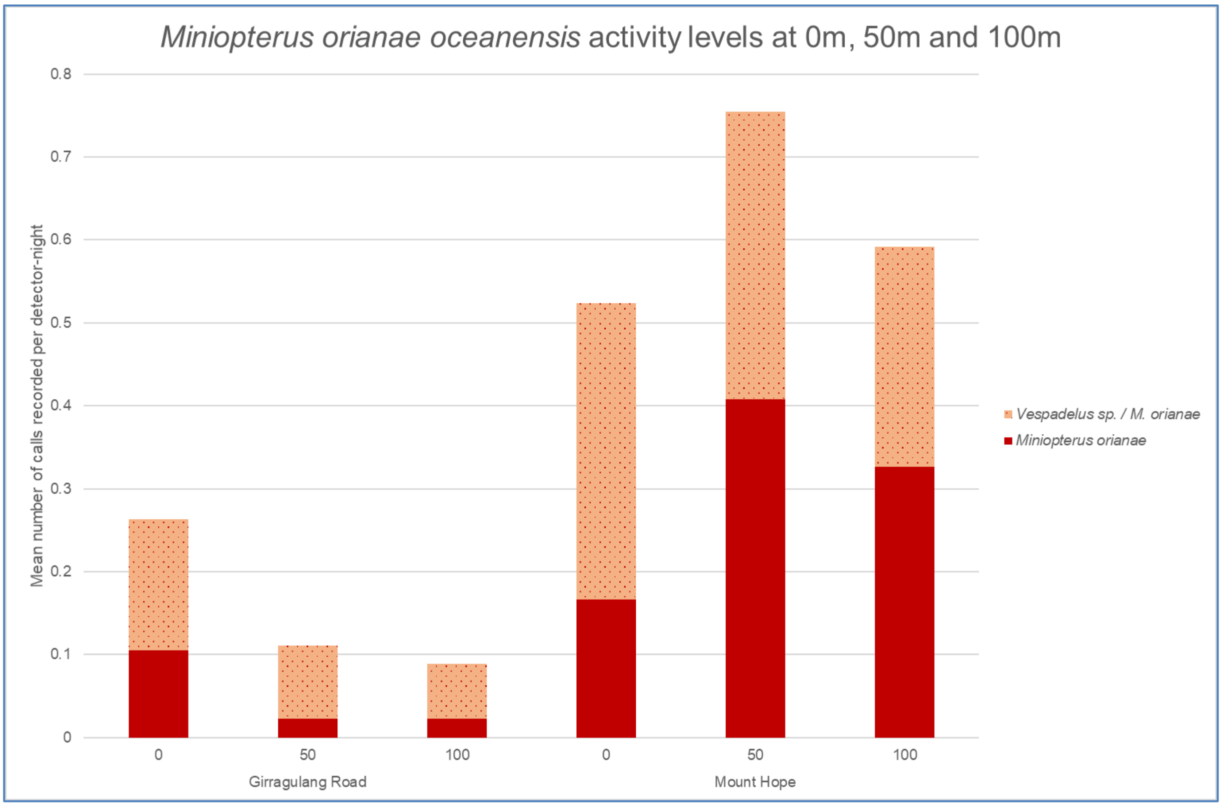


Figure 3 *Miniopterus orianae oceanensis* activity levels at the Coolah met-masts.

Temporal variation in bat activity levels

Total bat activity varied substantially between nights over the survey period (**Figure 4** and **Figure 5**). Several distinct peaks and troughs in activity were mirrored by the two sites, which suggests these changes in activity were probably driven by weather conditions.

While ground-level activity dominated the recordings on most nights at Girragulang Road (**Figure 4**), the opposite was true for the Mount Hope site (**Figure 5**), where activity levels at 50m and 100m were much higher than at ground level for most nights. There were, however, several significant shifts in activity levels, particularly at Mount Hope, where most activity switched from elevation (50m and 100m) to ground-level (0m) on 22nd August and again on 10th ad 11th September. Similar shifts, but in the opposite direction (i.e., from ground-level to elevation), occurred at Girragulang Road on 14th and 21st August.

The reasons for these shifts in bat activity have not been further investigated in this analysis; however, the changes may indicate altered foraging height preferences in response to changing weather conditions (e.g., bats foraging closer to ground when conditions are windy) and/or prey availability (e.g., warmer nights may result in greater insect abundance higher above ground).

References

Armstrong, K.N., Reardon, T.B., and Jackson, S.M. (2020). *A current taxonomic list of Australian Chiroptera.* Version 2020-06-09. http://ausbats.org.au/species-list/4593775065.

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van Dyck, S., Gynther, I. and Baker, A. (ed.) (2013). Field Companion to the Mammals of Australia. New Holland; Sydney.

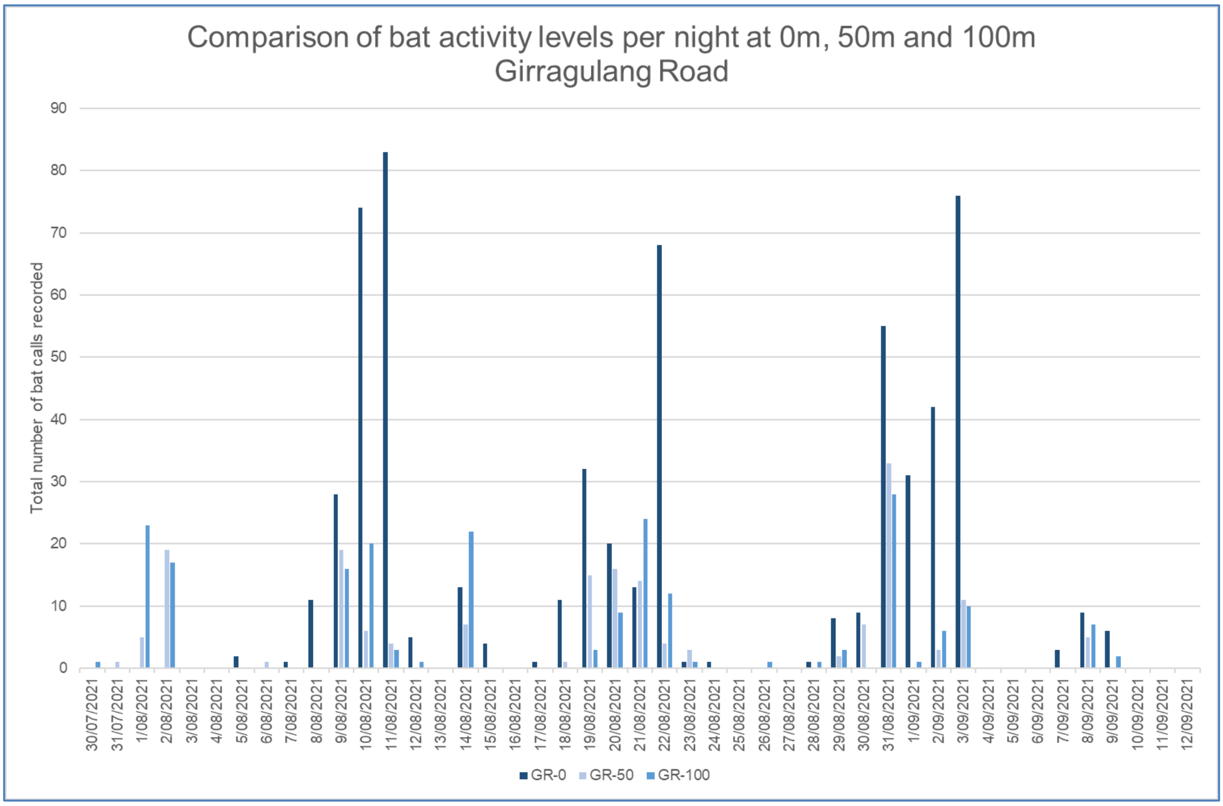


Figure 4 Nightly bat activity at three heights above ground for the Girragulang Road met-mast. Note that was no ground level (0m) detection before 3rd August.

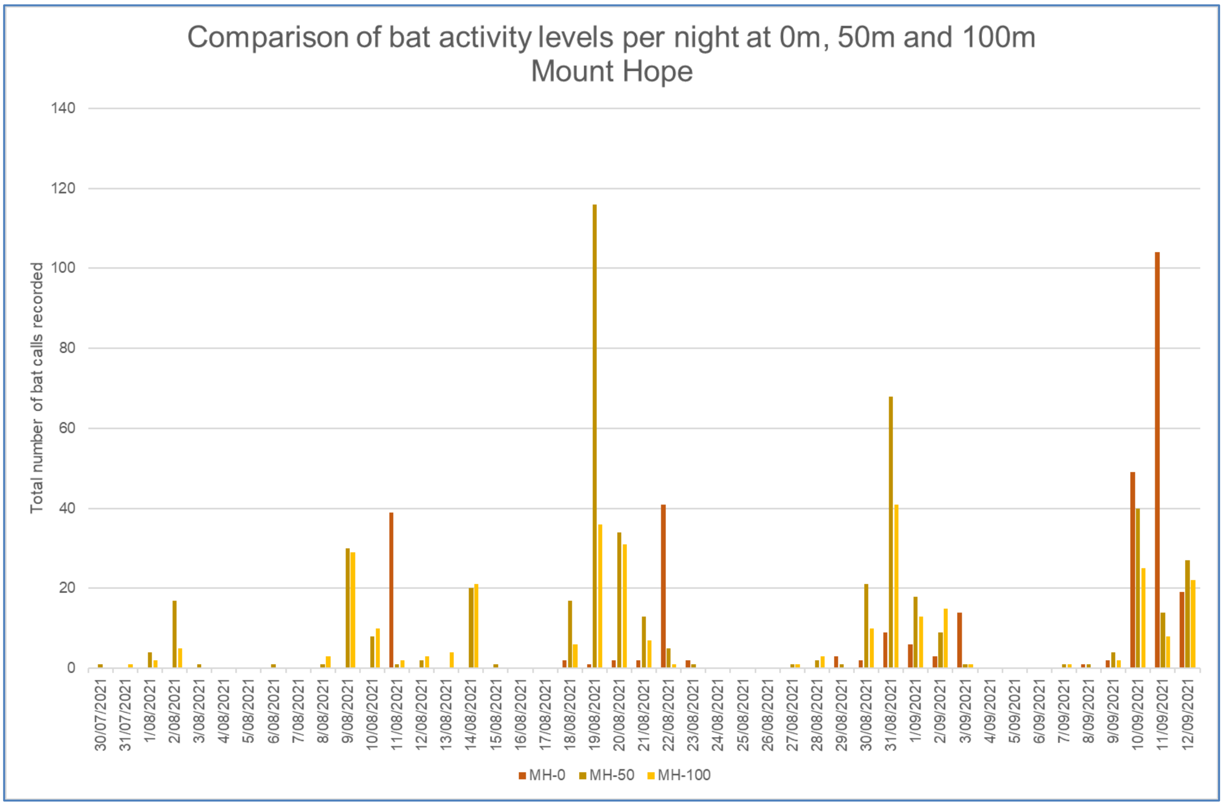
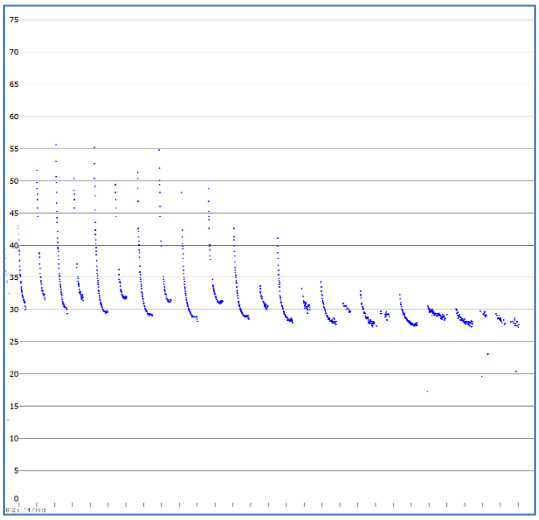
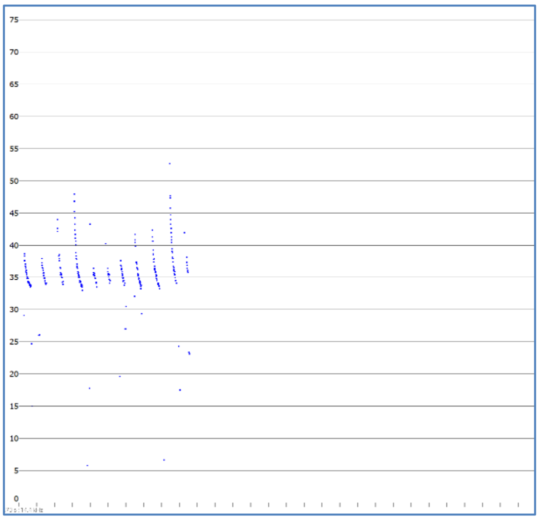


Figure 5 Nightly bat activity at three heights above ground for the Mount Hope met-mast. Note that was no ground level (0m) detection before 4th August.

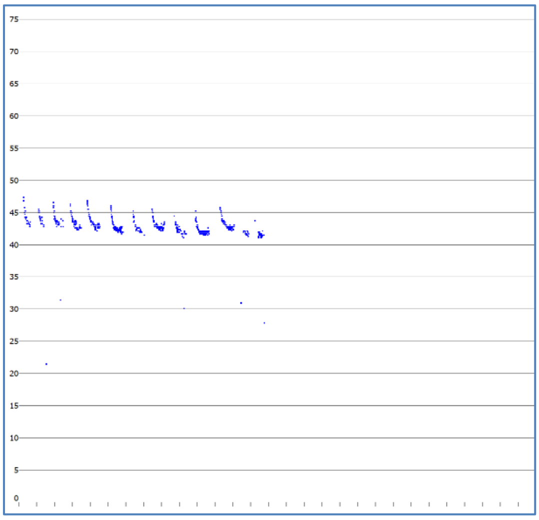
Appendix 1 Representative sonograms from the Coolah met-masts dataset.
X-axis (time)=10 msec per tick; time between pulses removed



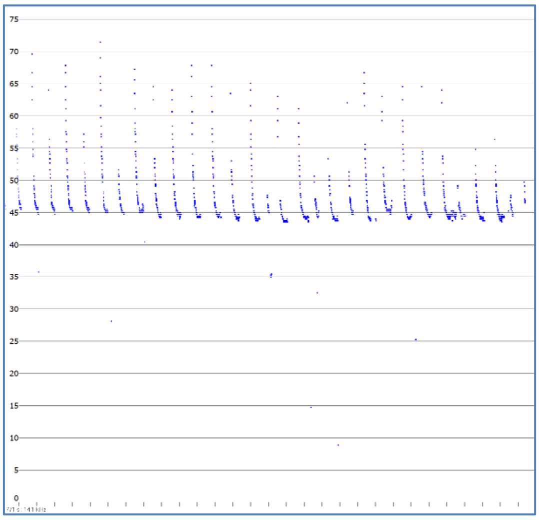
Chalinolobus gouldii



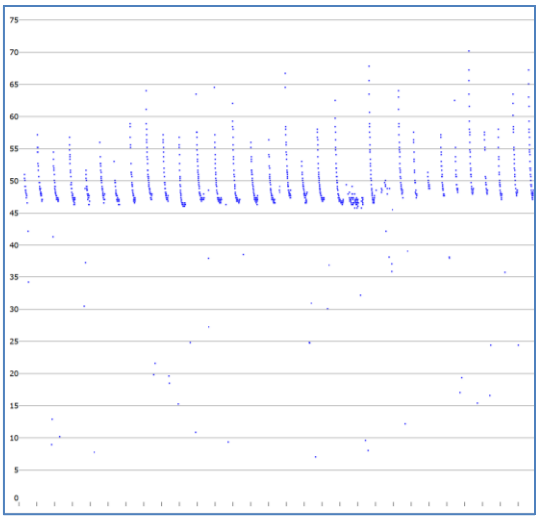
Scotorepens balstoni



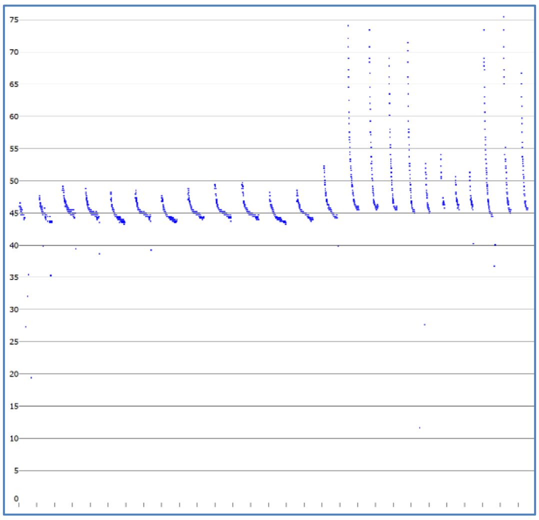
Vespadelus darlingtoni



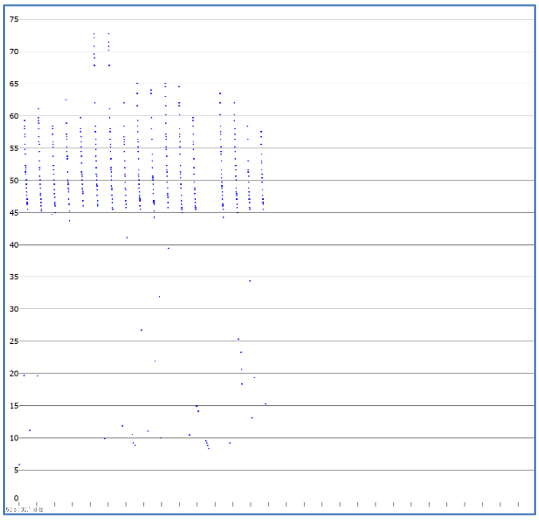
Vespadelus regulus



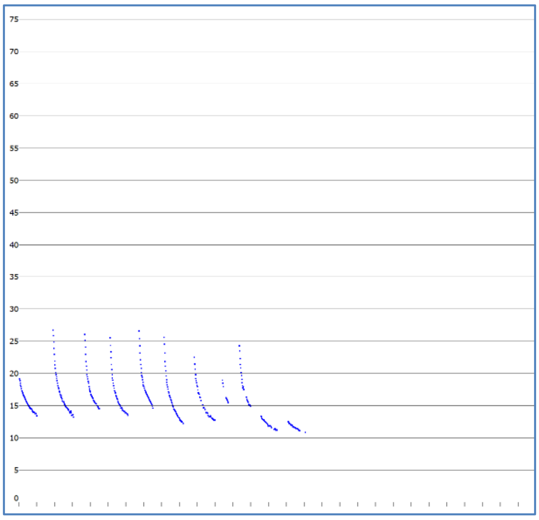
Vespadelus vulturnus



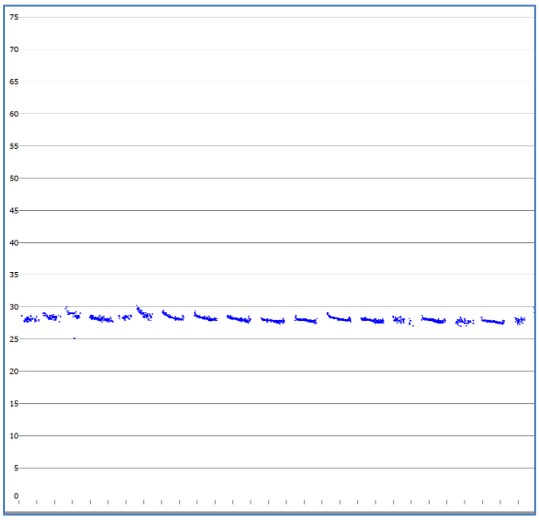
Miniopterus orianae



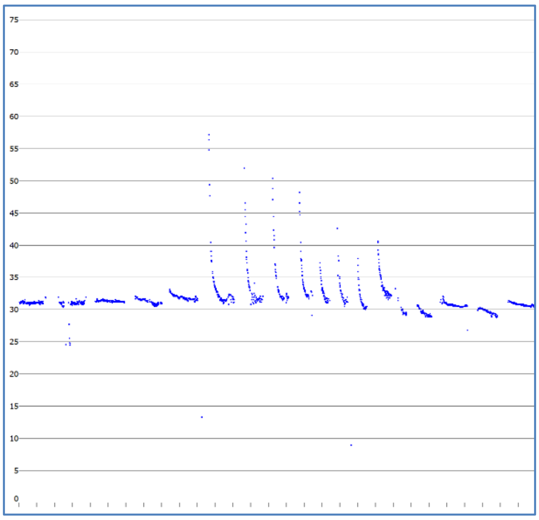
Nyctophilus sp.



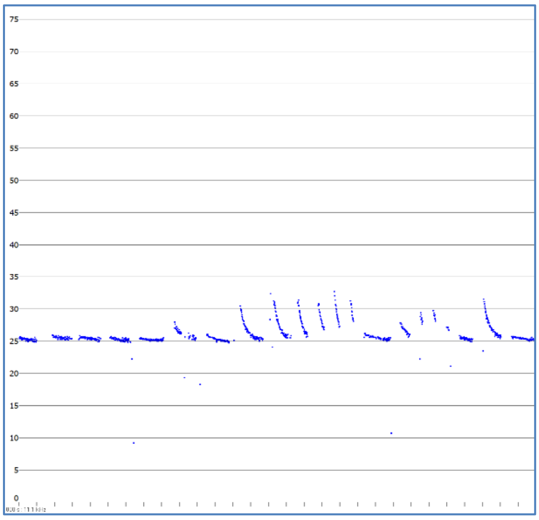
Austronomus australis



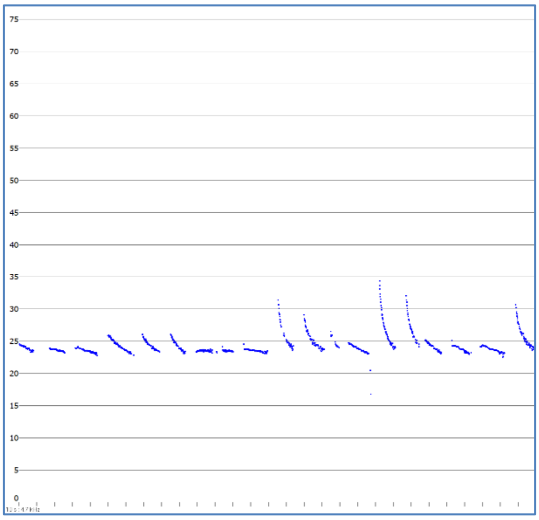
Ozimops petersi



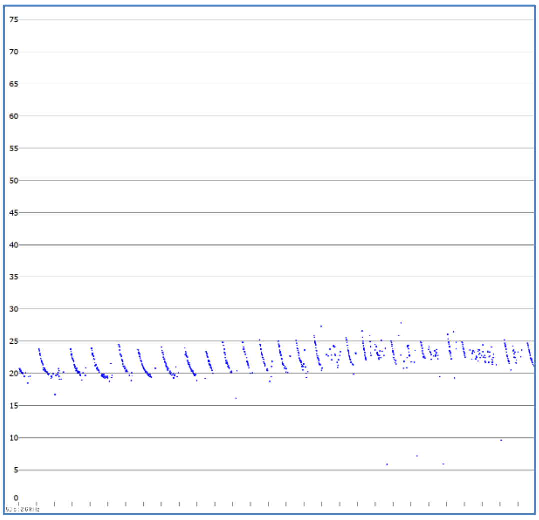
Ozimops ridei



Ozimops planiceps



O. planiceps / O. lumsdenae



Saccolaimus flaviventris

Appendix K Reference call library

Masked Owl reference calls were sourced from the following:

- Bird Observers Club of Australia, 2007. A Field Guide to Australian Birdsong (CD Edition).
- Stewart, D.A., 2007. Nocturnal Bird & Mammal Calls of NE-NSW.
- eBird.org contributors
    - Adrian Boyle
    - Chris Attewell
    - Chris Rehberg | Sydney Birding
    - Elliot Leach
    - Greg McLachlan
    - Matteo Grilli
    - Michael Daley
    - Mick Jerram
    - Pieter de Groot Boersma
    - Ramit Singal
    - Richard Fuller
- birdsinbackyards.net – *Tyto novaehollandiae*
    - Fred Van Gessel
- owlpages.com
    - Ed McNabb
- xeno-canto.org contributors
    - Boyd Wykes
    - Greg McLachlan
    - Marc Anderson
    - Mark Carter
    - Mike FitzGerald
    - Nigel Jackett
    - Pieter de Groot Boersma
    - Simon Gorta

Barking Owl reference calls were sourced from the following:

- Bird Observers Club of Australia, 2007. A Field Guide to Australian Birdsong (CD Edition)
- Stewart, D.A., 2007. Nocturnal Bird & Mammal Calls of NE-NSW.
- eBird.org contributors
    - Allan Pratt
    - Andrew Sides

  - Anonymous
  - Bradley Hacker 🦜
  - Chris Attewell
  - Chris Rehberg | Sydney Birding
  - Claire Anderson
  - Dan Pendavingh
  - Darron Gedge
  - David Vickers
  - Doug Hendricks
  - Elliot Leach
  - Holger Woyt
  - Ian Starling
  - Ivor Preston
  - James Lambert
  - Josep del Hoyo
  - Michael Dahlem
  - Murray Kelman
  - Niels Poul Dreyer
  - T B Bands
  - Thalia and Darren Broughton
  - Tim Healy
  - Valerie La May
  - Vicki Powys

- dibird.com contributors
  - Greg McLachlan
  - Marc Anderson
  - Nigel Jackett
  - Pieter de Groot Boersma
  - Simon Gorta
- birdsinbackyards.net – *Ninox connivens*
  - Fred Van Gessel
- iNaturalist.org contributors
  - Alicia Powell
  - d_kurek
  - maria_and_david
  - Will Ford
  - xeno-canto
  - Marc Anderson
  - Niels Poul Dreyer

Appendix L Koala SAT survey results

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Tree 1	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	30	150	38	200	80	120	140	100	120	80	60	80	80
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 2	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	50	150	36	112	80	80	40	150	100	65	35	80	30
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 3	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	50	90	32	59	80	110	40	180	120	60	40	90	40
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 4	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	30	60	33	78	80	80	50	150	150	60	75	50	30
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 5	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	50	80	15	91	120	65	50	80	150	65	60	95	40

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 6	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	60	50	16	98	60	30	60	150	200	90	65	85	45
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 7	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	30	30	29	51	120	90	70	80	150	95	70	80	40
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	Y - BTP	N	N
Tree 8	Species	E. albemol	E. albemol	E. albemol	B. populneus	E. albemol	E. albemol	E. albemol	B. populneus	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	30	15	22	18	150	120	35	80	60	80	70	60	35
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 9	Species	E. albemol	E. albemol	E. albemol	B. populneus	E. albemol	E. albemol	E.albens	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	40	50	38	74	50	80	110	100	60	55	90	90	60
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Tree 10	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	E. albemol	E. albemol	E. albemol	A. floribunda	E. albemol
	DBH	20	50	24	55	80	65		200	180	60	95	70	100
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 11	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	E. albemol	B. populneus	E. albemol	E. albemol	E. albemol
	DBH	30	20	28	107	80	30		120	200	100	100	70	25
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 12	Species	E. albemol	C. endlicheri	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	Kurrajong	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	20	80	56	50	120	80		80	120	115	100	70	35
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	Y	N
Tree 13	Species	E. albemol	E. albemol	E. albemol	brachychiton populneus	E. albemol	E. albemol		Stag	E. albemol	B. populneus	E. albemol	E. albemol	E. albemol
	DBH	60	30	27	123	50	50		90	120	65	50	100	55
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Tree 14	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	E. albemol	B. populneus	E. albemol	E. albemol	E. albemol
	DBH	60	60	29	117	60	160		90	50	45	115	80	40
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 15	Species	E. albemol	E. albemol	E. albemol	B. populneus	E. albemol	E. albemol		B. populneus	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	80	30	25	48	20	115		90	50	100	55	70	45
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 16	Species	E. albemol	E. albemol	E. albemol	B. populneus	E. albemol	E. albemol		B. populneus	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	40	50	22	69	120	25		80	100	105	115	75	35
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 17	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		B. populneus	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	40	50	23	49	60	40		80	200	110	40	60	60
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Tree 18	DBH	80	50	32	44	80	100		150	80	100	55	70	30
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 19	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	E. albemol	B. populneus	E. albemol	E. albemol	E. albemol
	DBH	30	80	29	37	60	35		150	120	45	50	90	50
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 20	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	50	15	55	146	120	110		200	80	120	80	100	40
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 21	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	30	120	27	53	60	40		90	200	80	90	80	40
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 22	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	Stag	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	60	50	28	89	60	100		100	60	80	50	100	40
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Tree 23	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	E. albemol	E. albemol	E. albemol	A. floribunda	E. albemol
	DBH	50	50	25	45	150	90		150	60	50	60	60	35
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 24	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	Stag	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	80	100	26	80	60	80		60	150	70	50	80	40
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 25	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	E. albemol	B. populneus	E. albemol	E. albemol	E. albemol
	DBH	50	90	40	68	80	100		60	80	45	50	105	30
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 26	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	80	120	65	67	80	30		200	60	90	75	95	30
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 27	Species	Stag	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	50	120	44	200	80	35		60	50	100	65	95	40
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
	Scat present	N	N	N	N	N	N		N	N	N	N	N	Y - BTP
Tree 28	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol		E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	100	120	38	41	60	120		120	120	80	90	70	35
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 29	Species	E. albemol	E. albemol	E. albemol	B. populneus	E. albemol	E. albemol		E. albemol	E. albemol	B. populneus	E. albemol	E. albemol	E. albemol
	DBH	100	120	42	86	80	105		90	80	70	70	50	35
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N
Tree 30	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	B. populneus		E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol
	DBH	60	80	35	40	30	45		50	100	90	45	40	35
	Koala present	N	N	N	N	N	N		N	N	N	N	N	N
	Scat present	N	N	N	N	N	N		N	N	N	N	N	N

		Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26
Tree 1	Species	E. albemol	E. albemol	E. albemol	E. albens	E. albemol	E. dwyeri	E. punctata	A. floribunda	E. blakelyii	E. albemol	E. albemol	E. punctata	A. floribunda
	DBH	80	100	70	130	110	45	45	50	120	65	60	25	60
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 2	Species	E. albemol	E. albemol	B. populneus	E. albens	E. albemol	E. dwyeri	A. floribunda	A. floribunda	A. floribunda	E. albemol	E. albemol	A. Floribunda	E. albemol
	DBH	105	50	50	25	200	40	30	12	30	90	40	20	50
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 3	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. dwyeri	E. punctata	A.floribunda	E. blakelyii	E. albemol	E. albemol	A.floribunda	E. albemol
	DBH	115	40	60	70	150	25	40	20	70	70	60	25	100
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 4	Species	B. populneus	E. albemol	E. albemol	A. floribunda	E. albemol	A. floribunda	E. punctata	A. floribunda	E. blakelyii	A. floribunda	E. albemol	A.floribunda	E. albemol
	DBH	40	40	60	100	50	70	45	25	30	30	50	25	50

		Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 5	Species	B. populneus	E. albemol	E. albemol	E. rossii	E. albemol	E. dwyeri	E. punctata	A. floribunda	E. blakelyii	E. albemol	E. albemol	E.punctata	E. albemol
	DBH	50	45	80	130	80	35	50	20	35	90	60	30	40
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 6	Species	E. albemol	E. crebra	E. albemol	B. populneus	E. albemol	E. dwyeri	E. punctata	E. blakelyii	E. blakelyii	E. albemol	E. albemol	A.floribunda	E. albemol
	DBH	105	80	145	140	120	35	35	30	40	45	30	15	20
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 7	Species	E. albemol	E. crebra	E. albemol	A.floribunda	E. albemol	A.floribunda	E. crebra	A.floribunda	A.floribunda	E. albemol	E. albemol	E.punctata	E. crebra
	DBH	90	55	45	110	60	20	45	25	20	90	30	20	20
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	Y - BTP	N	N	N	N	N	N	N	N	N	N	N	N

		Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26
Tree 8	Species	E. albemol	E. crebra	E. albemol	B. populneus	A.floribunda	E. dwyeri	A. floribunda	E. blakelyii	E. blakelyii	E. albemol	E. albemol	E.punctata	E. albemol
	DBH	85	40	40	100	100	45	35	30	40	110	40	45	20
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 9	Species	E. albemol	E. albemol	E. albemol	E.albens	A.floribunda	E. dwyeri	A. floribunda	A. floribunda	A. floribunda	E. albemol	E. albemol	A. floribunda	E. albemol
	DBH	70	70	40	40	160	35	40	25	30	95	30	13	15
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 10	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. dwyeri	A. floribunda	A. floribunda	E. blakelyii	E. albemol	E. albemol	E. punctata	E. albemol
	DBH	40	45	50	110	160	25	25	25	60	110	40	20	30
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	Y - BTP	N
Tree 11	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. macrorhyncha	A. floribunda	A. floribunda	A. floribunda	A. floribunda	E. albemol	E. punctata	E. crebra
	DBH	80	30	60	70	60	20	27	20	50	50	40	35	50

		Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	Y - BTP	N
Tree 12	Species	E. albemol	E. albemol	E. albemol	E. albemol	E. albemol	E. macrorhyncha	A. floribunda	A. floribunda	E. blakelyii	A. floribunda	E. albemol	A. floribunda	A. floribunda
	DBH	60	50	70	200	250	25	65	35	50	100	65	12	50
	Koala present	N	N	N	N	N	N	N	N	N	N	N	N	N
	Scat present	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree 13	Species	E. albemol	E. albemol	E. albemol		A. floribunda	E. dwyeri	A. floribunda	A. floribunda	E. blakelyii	A. floribunda	E. albemol	A. floribunda	A. floribunda
	DBH	80	40	60		170	35	25	30	45	100	75	15	40
	Koala present	N	N	N		N	N	N	N	N	N	N	N	N
	Scat present	N	N	N		N	N	N	N	N	N	N	N	N
Tree 14	Species	E. albemol	E. albemol	E. albemol		E. albemol	E. macrorhyncha	A. floribunda	A. floribunda	A. floribunda	E. albemol	E. albemol	A. floribunda	A. floribunda
	DBH	95	30	75		150	50	50	25	20	100	75	18	15
	Koala present	N	N	N		N	N	N	N	N	N	N	N	N
	Scat present	N	N	N		N	N	N	N	N	N	N	N	N

		Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26
Tree 15	Species	B. populneus	E. crebra	E. albemol		E. albemol	E. macrorhyncha	A. floribunda	E. blakelyii	A. floribunda	E. albemol	E. albemol	A. floribunda	E. crebra
	DBH	35	65	70		200	40	45	50	60	110	60	15	40
	Koala present	N	N	N		N	N	N	N	N	N	N	N	N
	Scat present	N	N	N		N	N	N	N	N	N	N	N	N
Tree 16	Species	E. albemol	E. crebra	E. albemol		Stag	E. dwyeri	E. punctata	A. floribunda	E. blakelyii	E. albemol	E. albemol		A. floribunda
	DBH	110	60	60		180	45	25	12	40	80	100		100
	Koala present	N	N	N		N	N	N	N	N	N	N		N
	Scat present	N	N	N		N	N	N	N	N	N	N		N
Tree 17	Species	E. albemol	E. crebra	E. albemol		A. floribunda	E. dwyeri	A. floribunda	A. floribunda	A. floribunda	E. albemol	E. albemol		A. floribunda
	DBH	80	60	40		80	35	20	10	20	50	50		60
	Koala present	N	N	N		N	N	N	N	N	N	N		N
	Scat present	N	N	N		N	N	N	N	N	N	N		N
Tree 18	Species	E. albemol	E. crebra	E. albemol		E. albemol	E. macrorhyncha	A. floribunda	A. floribunda	E. blakelyii	E. albemol	E. albemol		E. melliodora
	DBH	100	50	80		100	90	25	20	35	25	50		50

		Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26
	Koala present	N	N	N		N	N	N	N	N	N	N		N
	Scat present	N	N	N		N	N	N	N	N	N	N		N
Tree 19	Species	B. populneus	E. crebra	E. albemol			A. floribunda	A. floribunda	A. floribunda	E. blakelyii	E. albemol	E. albemol		E. albemol
	DBH	50	40	40			45	25	15	30	60	40		150
	Koala present	N	N	N			N	N	N	N	N	N		N
	Scat present	N	N	N			N	N	N	N	N	N		N
Tree 20	Species	E. albemol	E. albemol	E. albemol			A. floribunda	E. punctata	A. floribunda	E. blakelyii	E. albemol	E. albemol		E. crebra
	DBH	45	45	50			25	30	15	50	100	30		45
	Koala present	N	N	N			N	N	N	N	N	N		N
	Scat present	N	N	N			N	N	N	N	N	N		N
Tree 21	Species	E. albemol	E. albemol	E. albemol			A. floribunda	A. floribunda	A. floribunda	A. floribunda	E. albemol	E. albemol		E. albemol
	DBH	40	75	90			55	15	20	35	50	20		65
	Koala present	N	N	N			N	N	N	N	N	N		N
	Scat present	Y - BTP	N	N			N	N	N	N	N	N		N

		Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26
Tree 22	Species	E. albemol	E. albemol	E. albemol			E. dwyeri	E. punctata	E. blakelyii	A. floribunda	E. albemol	E. albemol		E. melliodora
	DBH	45	55	60			80	20	50	40	80	50		30
	Koala present	N	N	N			N	N	N	N	N	N		N
	Scat present	N	N	N			N	N	N	N	N	N		N
Tree 23	Species	E. albemol	E. albemol	E. albemol			E. dwyeri	E. punctata	A. floribunda	A. floribunda	E. albemol	E. albemol		E. crebra
	DBH	40	50	110			50	45	20	30	50	50		65
	Koala present	N	N	N			N	N	N	N	N	N		N
	Scat present	N	N	N			N	N	N	N	N	N		N
Tree 24	Species	E. albemol	B. populneus	E. albemol			E. macrorhyncha	A. floribunda	A. floribunda	A. floribunda	E. albemol	E. albemol		E. crebra
	DBH	45	40	110			45	13	25	30	100	50		15
	Koala present	N	N	N			N	N	N	N	N	N		N
	Scat present	N	N	N			N	N	N	N	N	N		N
Tree 25	Species	E. albemol	E. crebra	B. populneus			A. floribunda	E. punctata	A. floribunda	A. floribunda	E. albemol	E. albemol		E. crebra
	DBH	50	80	50			35	20	15	25	60	50		15

		Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26
	Koala present	N	N	N			N	N	N	N	N	N		N
	Scat present	N	N	N			N	N	N	N	N	N		N
Tree 26	Species	E. albemol	E. albemol	E. albemol			E. dwyeri	E. punctata	A. floribunda	E. blakelyii	E. albemol	E. albemol		E. crebra
	DBH	55	80	100			100	35	35	60	50	25		30
	Koala present	N	N	N			N	N	N	N	N	N		N
	Scat present	N	N	N			N	Y - BTP	N	N	N	N		N
Tree 27	Species	E. albemol	E. albemol	E. albemol			E. dwyeri	A. floribunda	E. blakelyii	A. floribunda	E. albemol	E. albemol		E. crebra
	DBH	85	40	130			25	12	40	25	40	20		35
	Koala present	N	N	N			N	N	N	N	N	N		N
	Scat present	N	N	N			N	N	N	N	N	N		N
Tree 28	Species	E. albemol	E. albemol	E. albemol			E. dwyeri	A. floribunda	A. floribunda	E. blakelyii	E. albemol	E. albemol		E. crebra
	DBH	45	95	55			65	15	15	30	60	30		75
	Koala present	N	N	N			N	N	N	N	N	N		N
	Scat present	N	N	N			N	N	N	N	N	N		N

		Site 14	Site 15	Site 16	Site 17	Site 18	Site 19	Site 20	Site 21	Site 22	Site 23	Site 24	Site 25	Site 26
Tree 29	Species	E. albemol	B. populneus	E. albemol			A. floribunda	A. floribunda	A. floribunda	E. blakelyii	E. albemol	E. albemol		A. floribunda
	DBH	65	100	45			30	18	15	25	50	30		55
	Koala present	N	N	N			N	N	N	N	N	N		N
	Scat present	N	N	N			N	N	N	N	N	N		N
Tree 30	Species	E. albemol	B. populneus	B. populneus			A. floribunda	A. floribunda	A. floribunda	E. blakelyii	E. albemol	E. albemol		E. crebra
	DBH	50	80	100			28	15	25	35	50	30		55
	Koala present	N	N	N			N	N	N	N	N	N		N
	Scat present	N	N	N			N	N	N	N	N	N		N

Appendix M Fauna species list

Class	Common	Scientific	Exotic	BC Act	EPBC Act
Aves	Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*			
Aves	Inland Thornbill	*Acanthiza apicalis*			
Aves	Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*			
Aves	Striated Thornbill	*Acanthiza lineata*			
Aves	Yellow Thornbill	*Acanthiza nana*			
Aves	Brown Thornbill	*Acanthiza pusilla*			
Aves	Buff-rumped Thornbill	*Acanthiza reguloides*			
Aves	Eastern Spinebill	*Acanthorhynchus tenuirostris*			
Aves	Brown Goshawk	*Accipiter fasciatus*			
Aves	Common Myna	*Acridotheres tristis*	*		
Aves	Australian King-Parrot	*Alisterus scapularis*			
Aves	Grey Teal	*Anas gracilis*			
Aves	Pacific Black Duck	*Anas superciliosa*			
Aves	Red Wattlebird	*Anthochaera carunculata*			
Aves	Australian Pipit	*Anthus novaeseelandiae*			
Aves	Red-winged Parrot	*Aprosmictus erythropterus*			
Aves	Wedge-tailed Eagle	*Aquila audax*			
Aves	Wedge-tailed Eagle	*Aquila audax*			
Aves	White-necked Heron	*Ardea pacifica*			
Aves	Dusky Woodswallow	*Artamus cyanopterus*		V	
Aves	White-browed Woodswallow	*Artamus superciliosus*			
Aves	Sulphur-crested Cockatoo	*Cacatua galerita*			
Aves	Fan-tailed Cuckoo	*Cacomantis flabelliformis*			
Aves	Yellow-faced Honeyeater	*Caligavis chrysops*			
Aves	Australian Wood Duck	*Chenonetta jubata*			
Aves	White-backed Swallow	*Cheramoeca leucosterna*			
Aves	Speckled Warbler	*Chthonicola sagittata*		V	
Aves	Brown Songlark	*Cincloramphus cruralis*			
Aves	Rufous Songlark	*Cincloramphus mathewsi*			
Aves	Spotted Harrier	*Circus assimilis*		V	
Aves	Grey Shrike-thrush	*Colluricincla harmonica*			
Aves	Black-faced Cuckoo-shrike	*Coracina novaehollandiae*			
Aves	White-winged Chough	*Corcorax melanorhamphos*			
Aves	White-throated Treecreeper	*Cormobates leucophaea*			

Class	Common	Scientific	Exotic	BC Act	EPBC Act
Aves	Australian Raven	*Corvus coronoides*			
Aves	Australian Raven	*Corvus coronoides*			
Aves	Little Raven	*Corvus mellori*			
Aves	Pied Butcherbird	*Cracticus nigrogularis*			
Aves	Pied Butcherbird	*Cracticus nigrogularis*			
Aves	Grey Butcherbird	*Cracticus torquatus*			
Aves	Grey Butcherbird	*Cracticus torquatus*			
Aves	Laughing Kookaburra	*Dacelo novaeguineae*			
Aves	Varied Sittella	*Daphoenositta chrysoptera*		V	
Aves	Mistletoebird	*Dicaeum hirundinaceum*			
Aves	Cicadabird	*Edolisoma tenuirostris*			
Aves	White-faced Heron	*Egretta novaehollandiae*			
Aves	Black-shouldered Kite	*Elanus axillaris*			
Aves	Blue-faced Honeyeater	*Entomyzon cyanotis*			
Aves	Galah	*Eolophus roseicapilla*			
Aves	Galah	*Eolophus roseicapilla*			
Aves	Eastern Yellow Robin	*Eopsaltria australis*			
Aves	Eastern Koel	*Eudynamys orientalis*			
Aves	Brown Falcon	*Falco berigora*			
Aves	Nankeen Kestrel	*Falco cenchroides cenchroides*			
Aves	Australian Hobby	*Falco longipennis*			
Aves	Black Falcon	*Falco subniger*		V	
Aves	Red Junglefowl	*Gallus gallus*			
Aves	Peaceful Dove	*Geopelia striata*			
Aves	White-throated Gerygone	*Gerygone olivacea*			
Aves	Musk Lorikeet	*Glossopsitta concinna*			
Aves	Little Lorikeet	*Glossopsitta pusilla*		V	
Aves	Magpie-lark	*Grallina cyanoleuca*			
Aves	Australian Magpie	*Gymnorhina tibicen*			
Aves	Australian Magpie	*Gymnorhina tibicen*			
Aves	White-throated Needletail	*Hirundapus caudacutus*			V, Migratory
Aves	Welcome Swallow	*Hirundo neoxena*			
Aves	Varied Triller	*Lalage leucomela*			
Aves	White-winged Triller	*Lalage sueurii*			
Aves	Brown Honeyeater	*Lichmera indistincta*			
Aves	Superb Fairy-wren	*Malurus cyaneus*			

Class	Common	Scientific	Exotic	BC Act	EPBC Act
Aves	Variegated Fairy-wren	*Malurus lamberti*			
Aves	Noisy Miner	*Manorina melanocephala*			
Aves	Noisy Miner	*Manorina melanocephala*			
Aves	Lewin's Honeyeater	*Meliphaga lewinii*			
Aves	Brown-headed Honeyeater	*Melithreptus brevirostris*			
Aves	White-naped Honeyeater	*Melithreptus lunatus*			
Aves	Jacky Winter	*Microeca fascinans*			
Aves	White-eared Honeyeater	*Nesoptilotis leucotis*			
Aves	Southern Boobook	*Ninox boobook*			
Aves	Barking Owl	*Ninox connivens*			
Aves	Crested Pigeon	*Ocyphaps lophotes*			
Aves	Rockwarbler	*Origma solitaria*			
Aves	Olive-backed Oriole	*Oriolus sagittatus*			
Aves	Golden Whistler	*Pachycephala pectoralis*			
Aves	Rufous Whistler	*Pachycephala rufiventris*			
Aves	Spotted Pardalote	*Pardalotus punctatus*			
Aves	Striated Pardalote	*Pardalotus striatus*			
Aves	Fairy Martin	*Petrochelidon ariel*			
Aves	Tree Martin	*Petrochelidon nigricans*			
Aves	Red-capped Robin	*Petroica goodenovii*			
Aves	Common Bronzewing	*Phaps chalcoptera*			
Aves	Noisy Friarbird	*Philemon corniculatus*			
Aves	Crimson Rosella	*Platycercus elegans*			
Aves	Eastern Rosella	*Platycercus eximius*			
Aves	Striped Honeyeater	*Plectorhyncha lanceolata*			
Aves	Tawny Frogmouth	*Podargus strigoides*			
Aves	Hoary-headed Grebe	*Poliocephalus poliocephalus*			
Aves	Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*		V	
Aves	Red-rumped Parrot	*Psephotus haematonotus*			
Aves	White-plumed Honeyeater	*Ptilotula penicillata*			
Aves	Brown-backed Honeyeater	*Ramsayornis modestus*			
Aves	Grey Fantail	*Rhipidura albiscapa*			
Aves	Willie Wagtail	*Rhipidura leucophrys*			
Aves	Channel-billed Cuckoo	*Scythrops novaehollandiae*			
Aves	White-browed Scrubwren	*Sericornis frontalis*			
Aves	Weebill	*Smicrornis brevirostris*			

Class	Common	Scientific	Exotic	BC Act	EPBC Act
Aves	Double-barred Finch	*Stizoptera bichenovii*			
Aves	Pied Currawong	*Strepera graculina*			
Aves	Pied Currawong	*Strepera graculina*			
Aves	Common Starling	*Sturnus vulgaris*	*		
Aves	Brown Quail	*Synoicus ypsilophora*			
Aves	Australasian Grebe	*Tachybaptus novaehollandiae*			
Aves	Straw-necked Ibis	*Threskiornis spinicollis*			
Aves	Sacred Kingfisher	*Todiramphus sanctus*			
Aves	Rainbow Lorikeet	*Trichoglossus haematodus*			
Aves	Barn Owl	*Tyto alba*			
Aves	Masked Owl	*Tyto novaehollandiae*			
Aves	Masked Lapwing	*Vanellus miles*			
Mammalia	Yellow-footed Antechinus	*Antechinus flavipes*			
Mammalia	White-striped Freetail-bat	*Austronomus australis*			
Mammalia	Cattle	*Bos sp.*	*		
Mammalia	Wild Dog	*Canus lupis familiaris*	*		
Mammalia	Feral Goats	*Capra hircus*	*		
Mammalia	Large-eared Pied Bat	*Chalinolobus dwyeri*		V	V
Mammalia	Gould's Wattled Bat	*Chalinolobus gouldii*			
Mammalia	Chocolate Wattled Bat	*Chalinolobus morio*			
Mammalia	Eastern False Pipistrelle	*Falsistrellus tasmaniensis*		V	
Mammalia	Feral Cat	*Felis catus*	*		
Mammalia	Brown Hare	*Lepus capensis*			
Mammalia	Eastern Grey Kangaroo	*Macropus giganteus*			
Mammalia	Common Wallaroo	*Macropus robustus*			
Mammalia	Red-necked Wallaby	*Macropus rufogriseus*			
Mammalia	Large Bent-winged Bat	*Miniopterus orianae oceanensis*		V	
Mammalia	House Mouse	*Mus musculus*	*		
Mammalia	Long-eared bat sp.	*Nyctophilus sp.*			
Mammalia	European Rabbit	*Oryctolagus cuniculus*	*		
Mammalia	Sheep	*Ovis sp.*	*		
Mammalia		*Ozimops petersi*			
Mammalia	South-eastern Free-tailed Bat	*Ozimops planiceps*			
Mammalia	Eastern Free-tailed Bat	*Ozimops ridei*			
Mammalia	Squirrel Glider	*Petaurus norfolcensis*		V	
Mammalia	Black Rat	*Rattus rattus*	*		

Class	Common	Scientific	Exotic	BC Act	EPBC Act
Mammalia	Eastern Horseshoe-bat	*Rhinolophus megaphyllus*			
Mammalia	Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*		V	
Mammalia	Greater Broad-nosed Bat	*Scoteanax rueppellii*			
Mammalia	Inland Broad-nosed Bat	*Scotorepens balstoni*			
Mammalia	Eastern Broad-nosed Bat	*Scotorepens orion*			
Mammalia	Feral Pig	*Sus scrofa*			
Mammalia	Short-beaked Echidna	*Tachyglossus aculeatus*			
Mammalia	Common Brushtail Possum	*Trichosurus vulpecula*			
Mammalia	Vespadelus darlingtoni	*Vespadelus darlingtoni*			
Mammalia	Southern Forest Bat	*Vespadelus regulus*			
Mammalia	Little Forest Bat	*Vespadelus vulturnus*			
Mammalia	Wombat	*Vombatus ursinus*			
Mammalia	Red Fox	*Vulpes vulpes*	*		
Mammalia	Swamp Wallaby	*Wallabia bicolor*			
Reptillia	Eastern Snake-necked Turtle	*Chelodina longicollis*			
Reptillia	Eastern Bearded Dragon	*Pogona barbata*			
Reptillia	Bearded Dragon	*Pogona barbata*			
Reptillia	Red-bellied Black Snake	*Pseudechis porphyriacus*			
Reptillia	Eastern Brown Snake	*Pseudonaja textilis*			

Appendix N Staff CVs

Name	Qualifications	Experience
Croake, Rebecca	BAM Accredited Assessor – BAAS #21008 Bachelor of Environmental Science (Rehabilitation), University of New England, 2016 Bachelor of GeoScience (Fossil Fuels), University of New England, 2017	Rebecca is a Biodiversity Assessment Method (BAM) Accredited Assessor and performs a wide range of tasks within ELA including ecological monitoring and surveys, environmental impact assessments, targeted threatened species surveys and management plan preparation.
Devereaux, Janene	BAM Accredited Assessor – BAAS#19045 Bachelor of Science (Marine Science and Sustainable Resource Management) – 2009 – University of Newcastle	Janene has worked in Environmental Consulting for over 10 years, with 6 years in terrestrial ecology. She has experience in flora and fauna surveys, targeted threatened species surveys, data management and reporting. Janene is also experienced in project management, client communication and team management. Janene is also an accredited assessor under the Biodiversity Assessment Method.
Gorrell, Lily	Bachelor of Natural Resource Management (Honours), University of New England, 2007 BioBanking Assessor, Major Projects FBA and Biocertification Assessor BAM Accredited Assessor (BAAS17101)	Lily is a senior ecologist with over ten years' experience. Since graduating with a Bachelor of Natural Resource Management (Honours) in 2007, Lily has worked as a Research Assistant for the UNE, an Environmental Officer for the Department of Transport and Main Roads in Toowoomba (QLD), as an Ecologist with a private consultancy in Nelson Bay and for the last 6 years as an Ecologist in the Newcastle office with Eco Logical Australia.
Keane, Elise	Master of Environmental Management and Sustainability, Monash University 2017 Bachelor of Environmental Science (Wildlife and Conservation Biology), Deakin University 2013	Elise joined the Eco Logical Australia (ELA) Mudgee team in September 2018, bringing with her extensive survey experience in a range of ecological assessment techniques. Since this time, she has developed her ecology skills, performing a wide range of tasks including ecological monitoring and surveys, environmental impact assessments, targeted threatened species surveys, and associated reporting. In performing these tasks, Elise has developed knowledge and skills relevant to the environment and biodiversity of the Central West region of NSW
Kelly, Tomas	Bachelor of Science – Physical Geography/Environmental Science Major, University of Wollongong (2014)	Five years experience in ecological monitoring and surveys, environmental impact assessments, targeted threatened species surveys, management plan preparation and associated reporting
Lawrie, Mike	Bachelor of Environmental Science and Management – University of Newcastle 2011 Master of Environment (Specialisation in Environmental Science) – Macquarie University 2016	Mike is an ecologist with over 4 years of experience in ecological consulting. Mike has worked on projects in a variety of sectors including roads, electrical, infrastructure, residential, agriculture and mining

Name	Qualifications	Experience
McKenzie, Daniel	Bachelor of Environmental Science and Management (Honours), University of Newcastle, 2011	targeted threatened fauna and flora surveys, ecological assessments, biodiversity monitoring projects, Bio-banking assessments, pre-clearing surveys and supervision of land clearing operations
Metzler, Lachlan	Bachelor of Commerce with a Bachelor of Science, Macquarie University 2020	Lachlan joined the Eco Logical Australia (ELA) Mudgee team in 2021, bringing with him extensive survey experience in a range of ecological assessment techniques. Since this time, Lachlan has developed his ecology skills, performing a wide range of tasks including ecological monitoring and surveys, environmental impact assessments, targeted threatened species surveys and associated reporting
Montgomery, Sophie	Bachelor of Environmental Science & Management (Sustainability) University of Newcastle 2020	Sophie joined the Eco Logical Australia (ELA) Newcastle team in December 2020, as a Graduate Ecologist. Sophie has a background in remote sensing, ecologically trained artificial intelligence research and development for fauna and flora species identification and field surveys.
Ng, May-le	Bachelor of Environmental Engineering (Hons) – University of Western Australia	May-Le is Senior Ecologist with 15 years of work experience in the consulting, resource and public sectors. She is skilled in fauna surveys, threatened species management planning, environmental impact studies, environmental auditing, acoustic monitoring, water resource management and hydrology.
Pursche, Alex	Doctor of Philosophy, University of New South Wales 2013 Bachelor of Science, Class 1 Honors, University of New South Wales (2007) BAM Accredited Assessor 17021	Alex is a senior ecologist at Eco Logical Australia with over ten years experience in consulting ecology. Alex has been the primary author on six Biodiversity Assessments for SSD/SSI in NSW including assessments under the FBA and BAM.
Scanlan, Liam	Bachelor of Science (Honours), University of the Sunshine Coast 2016 Bachelor of Science (Envirmental Studies), University of Tasmania 2015 Certificate III Conservation and Land Management, 2018	Liam joined the Eco Logical Australia (ELA) Newcastle team in 2019, bringing with him a background in native flora, conservation and restoration.
Schmidt, Tom	Bachelor of Environmental Science and Management (Living Systems), University of Newcastle, 2009 Bachelor of Environmental Science (Honours – First Class), Deakin University, 2017	Tom has extensive field experience on large projects in regional and remote areas of New South Wales, Victoria and Queensland which has led to the development of strong skills in field logistics including preparation of survey plans, safety documentation and journey management plans.
Sullivan, Martin	Bachelor of Science (Biodiversity and Conservation), Macquarie University, 2004 Accredited Biobanking Assessor under the NSW Threatened Species Conservation Act 1995	Principal Ecologist and Discipline Leader Ecology & Impact Assessment with a high level of technical expertise, I am responsible for leading large multidisciplinary teams to deliver nationally significant projects for key clients in Government, resources, infrastructure and urban development sectors

Name	Qualifications	Experience
Watts, Dan	Bachelor of Science (Biology), University of Sydney, (Honours Class 1) 2013. BAM Accredited Assessor	Dan is an ecologist with approximately six years' experience in ecological consulting and environmental field work, with project experience across coastal NSW with a focus in the South Eastern Highlands, North West Slopes and Lake Macquarie areas.

Appendix O Biodiversity credit report

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021959/BAAS17021/22/00032036	VoW BBS - TxL	24/11/2021
Assessor Name	**Report Created**	**BAM Data version ***
Alexander Pursche	27/04/2022	50
Assessor Number	**BAM Case Status**	**Date Finalised**
BAAS17021	Finalised	27/04/2022
Assessment Revision	**Assessment Type**	
2	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 SAII	Ecosystem credits

Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley												
7	483_Moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	32.1	32.1	3.7	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	75

8	483_Low	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	20.5	20.5	1.8	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	23
											Subtotal	**98**
Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion												
5	479_Burnt	Not a TEC	60.5	60.5	12	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		271
6	479_Moderate	Not a TEC	68.5	68.5	3.7	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		96
											Subtotal	**367**

BAM Credit Summary Report

Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion												
3	281_Good	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	76.9	76.9	3.3	PCT Cleared - 67%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	159

4	281_Moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	89	89.0	0.74	PCT Cleared - 67%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	41
											Subtotal	**200**
White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes												
1	272_Moderate	Not a TEC	58.7	58.7	0.28	PCT Cleared - 65%	High Sensitivity to Potential Gain			1.75		7
2	272_Low	Not a TEC	25	25.0	3.3	PCT Cleared - 65%	High Sensitivity to Potential Gain			1.75		36
											Subtotal	**43**
											Total	**708**

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 SAII	Species credits
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)									
483_Moderate	32.1	32.1	0.67			Vulnerable	Vulnerable	True	16
								Subtotal	**16**
Petaurus norfolcensis / Squirrel Glider (Fauna)									
281_Good	76.9	76.9	3.2			Vulnerable	Not Listed	False	121
479_Burnt	60.5	60.5	12			Vulnerable	Not Listed	False	362
479_Moderate	68.5	68.5	3.7			Vulnerable	Not Listed	False	127
								Subtotal	**610**

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021959/BAAS17021/20/00021962	VoW BBS - WF	24/11/2021
Assessor Name	Report Created	BAM Data version *
Alexander Pursche	27/04/2022	50
Assessor Number	BAM Case Status	Date Finalised
BAAS17021	Finalised	27/04/2022
Assessment Revision	Assessment Type	
3	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 SAII	Ecosystem credits

BAM Credit Summary Report

Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley												
6	483_Good	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	70	70.0	1.7	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	73

7	483_Moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	32	32.0	173.1	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	3462

8	483_Low	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	20.3	20.3	83.5	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	1061
											Subtotal	**4596**
Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion												
4	479_Burnt	Not a TEC	60.4	60.4	5.2	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		118
5	479_Moderate	Not a TEC	67.6	67.6	3.1	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		79
											Subtotal	**197**

River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion												
1	84_Moderate	Not a TEC	25.5	25.5	1.1	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		11
											Subtotal	**11**
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion												
2	281_Moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	80.3	80.3	14.8	PCT Cleared - 67%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	741

3	281_Low	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	14.6	14.6	4.5	PCT Cleared - 67%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	0
											Subtotal	**741**
											Total	**5545**

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 SAII	Species credits
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)									
84_Moderate	25.5	25.5	0.37			Vulnerable	Vulnerable	True	7
281_Moderate	80.3	80.3	7.2			Vulnerable	Vulnerable	True	434

479_Moderate	67.6	67.6	1.7			Vulnerable	Vulnerable	True	87
483_Moderate	32.0	32.0	128.8			Vulnerable	Vulnerable	True	3092
								Subtotal	**3620**
Ninox connivens / Barking Owl (Fauna)									
281_Moderate	80.3	80.3	1.9			Vulnerable	Not Listed	False	75
479_Moderate	67.6	67.6	1.2			Vulnerable	Not Listed	False	41
483_Moderate	32.0	32.0	9.1			Vulnerable	Not Listed	False	145
								Subtotal	**261**
Petaurus norfolcensis / Squirrel Glider (Fauna)									
281_Moderate	80.3	80.3	8.3			Vulnerable	Not Listed	False	335
479_Burnt	60.4	60.4	5.2			Vulnerable	Not Listed	False	158
479_Moderate	67.6	67.6	3.1			Vulnerable	Not Listed	False	104
								Subtotal	**597**

BAM Credit Summary Report

Proposal Details

Assessment Id
00021959/BAAS17021/21/00028366

Proposal Name
VoW SBB - TxL

BAM data last updated *
24/11/2021

Assessor Name
Alexander Pursche

Report Created
27/04/2022

BAM Data version *
50

Assessor Number
BAAS17021

BAM Case Status
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Date Finalised
27/04/2022

Assessment Revision
1

Assessment Type
Major Projects

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley												
7	483_Moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	25.3	25.3	5.4	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	85

8	483_Low	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	17.6	17.6	18.6	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	204
											Subtotal	**289**
Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion												
6	479_Burnt	Not a TEC	47.3	47.3	11.3	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		200
											Subtotal	**200**

River Red Gum / River Oak riparian woodland wetland in the Hunter Valley												
1	42_Moderate	Not a TEC	100	100.0	0.66	PCT Cleared - 95%	High Sensitivity to Potential Gain			2.50		41
											Subtotal	**41**
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion												
4	281_Moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	80	80.0	10.7	PCT Cleared - 67%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	534

5	281_Low	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	6.6	6.6	10.1	PCT Cleared - 67%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	0
											Subtotal	**534**
White Box - Black Cypress Pine - red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes												
2	272_Moderate	Not a TEC	53.9	53.9	0.04	PCT Cleared - 65%	High Sensitivity to Potential Gain			1.75		1

3	272_Low	Not a TEC	21.9	21.9	9	PCT Cleared - 65%	High Sensitivity to Potential Gain			1.75		87
											Subtotal	**88**
											Total	**1152**

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 SAII	Species credits
Acacia ausfeldii / Ausfeld's Wattle (Flora)									
42_Moderate	100.0	100.0	0.6			Vulnerable	Not Listed	False	30
281_Moderate	80.0	80.0	8.9			Vulnerable	Not Listed	False	356
479_Burnt	47.3	47.3	9.3			Vulnerable	Not Listed	False	220
								Subtotal	**606**
Burhinus grallarius / Bush Stone-curlew (Fauna)									
42_Moderate	100.0	100.0	0.6			Endangered	Not Listed	False	30
281_Moderate	80.0	80.0	8.9			Endangered	Not Listed	False	356
479_Burnt	47.3	47.3	9.3			Endangered	Not Listed	False	220
								Subtotal	**606**
Callocephalon fimbriatum / Gang-gang Cockatoo (Fauna)									
42_Moderate	100.0	100.0	0.6			Vulnerable	Not Listed	False	30
281_Moderate	80.0	80.0	8.9			Vulnerable	Not Listed	False	356

479_Burnt	47.3	47.3	9.3			Vulnerable	Not Listed	False	220
								Subtotal	**606**
Calyptorhynchus lathami / Glossy Black-Cockatoo (Fauna)									
42_Moderate	100.0	100.0	0.6			Vulnerable	Not Listed	False	30
281_Moderate	80.0	80.0	8.9			Vulnerable	Not Listed	False	356
479_Burnt	47.3	47.3	9.3			Vulnerable	Not Listed	False	220
								Subtotal	**606**
Cercartetus nanus / Eastern Pygmy-possum (Fauna)									
42_Moderate	100.0	100.0	0.6			Vulnerable	Not Listed	False	30
281_Moderate	80.0	80.0	8.9			Vulnerable	Not Listed	False	356
479_Burnt	47.3	47.3	9.3			Vulnerable	Not Listed	False	220
								Subtotal	**606**
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)									
281_Moderate	80.0	80.0	4.2			Vulnerable	Vulnerable	True	252
479_Burnt	47.3	47.3	0.03			Vulnerable	Vulnerable	True	1
483_Moderate	25.3	25.3	4.9			Vulnerable	Vulnerable	True	93
								Subtotal	**346**
Commersonia procumbens / Commersonia procumbens (Flora)									
42_Moderate	100.0	100.0	0.6			Vulnerable	Vulnerable	False	30
281_Moderate	80.0	80.0	8.9			Vulnerable	Vulnerable	False	356
479_Burnt	47.3	47.3	9.3			Vulnerable	Vulnerable	False	220
								Subtotal	**606**

Cynanchum elegans / White-flowered Wax Plant (Flora)									
42_Moderate	100.0	100.0	0.6			Endangered	Endangered	False	30
281_Moderate	80.0	80.0	8.9			Endangered	Endangered	False	356
479_Burnt	47.3	47.3	9.3			Endangered	Endangered	False	220
								Subtotal	**606**
Hoplocephalus bitorquatus / Pale-headed Snake (Fauna)									
42_Moderate	100.0	100.0	0.6			Vulnerable	Not Listed	False	30
								Subtotal	**30**
Hoplocephalus stephensii / Stephens' Banded Snake (Fauna)									
42_Moderate	100.0	100.0	0.6			Vulnerable	Not Listed	False	30
								Subtotal	**30**
Lophoictinia isura / Square-tailed Kite (Fauna)									
42_Moderate	100.0	100.0	0.6			Vulnerable	Not Listed	False	23
281_Moderate	80.0	80.0	8.9			Vulnerable	Not Listed	False	267
479_Burnt	47.3	47.3	9.3			Vulnerable	Not Listed	False	165
								Subtotal	**455**
Monotaxis macrophylla / Large-leafed Monotaxis (Flora)									
42_Moderate	100.0	100.0	0.6			Endangered	Not Listed	False	30
281_Moderate	80.0	80.0	8.9			Endangered	Not Listed	False	356
479_Burnt	47.3	47.3	9.3			Endangered	Not Listed	False	220
								Subtotal	**606**
Ninox connivens / Barking Owl (Fauna)									
42_Moderate	100.0	100.0	0.6			Vulnerable	Not Listed	False	30
281_Moderate	80.0	80.0	8.9			Vulnerable	Not Listed	False	356

479_Burnt	47.3	47.3	9.3			Vulnerable	Not Listed	False	220
								Subtotal	**606**
Petauroides volans / Greater Glider (Fauna)									
42_Moderate	100.0	100.0	0.6			Not Listed	Vulnerable	False	30
281_Moderate	80.0	80.0	8.9			Not Listed	Vulnerable	False	356
479_Burnt	47.3	47.3	9.3			Not Listed	Vulnerable	False	220
								Subtotal	**606**
Petaurus norfolcensis / Squirrel Glider (Fauna)									
42_Moderate	100.0	100.0	0.66			Vulnerable	Not Listed	False	33
281_Moderate	80.0	80.0	10.7			Vulnerable	Not Listed	False	427
479_Burnt	47.3	47.3	11.3			Vulnerable	Not Listed	False	266
								Subtotal	**726**
Petrogale penicillata / Brush-tailed Rock-wallaby (Fauna)									
42_Moderate	100.0	100.0	0.6			Endangered	Vulnerable	True	45
281_Moderate	80.0	80.0	8.9			Endangered	Vulnerable	True	533
479_Burnt	47.3	47.3	9.3			Endangered	Vulnerable	True	331
								Subtotal	**909**
Phascolarctos cinereus / Koala (Fauna)									
42_Moderate	100.0	100.0	0.6			Vulnerable	Vulnerable	False	30
281_Moderate	80.0	80.0	8.9			Vulnerable	Vulnerable	False	356
479_Burnt	47.3	47.3	9.3			Vulnerable	Vulnerable	False	220
								Subtotal	**606**

Prasophyllum petilum / Tarengo Leek Orchid (Flora)									
42_Moderate	100.0	100.0	0.6			Endangered	Endangered	False	30
281_Moderate	80.0	80.0	8.9			Endangered	Endangered	False	356
479_Burnt	47.3	47.3	9.3			Endangered	Endangered	False	220
								Subtotal	**606**
Prasophyllum sp. Wybong / Prasophyllum sp. Wybong (Flora)									
42_Moderate	100.0	100.0	0.6			Not Listed	Critically Endangered	True	45
281_Moderate	80.0	80.0	8.9			Not Listed	Critically Endangered	True	533
479_Burnt	47.3	47.3	9.3			Not Listed	Critically Endangered	True	331
								Subtotal	**909**
Pteropus poliocephalus / Grey-headed Flying-fox (Fauna)									
42_Moderate	100.0	100.0	0.6			Vulnerable	Vulnerable	False	30
281_Moderate	80.0	80.0	8.9			Vulnerable	Vulnerable	False	356
479_Burnt	47.3	47.3	9.3			Vulnerable	Vulnerable	False	220
								Subtotal	**606**
Tylophora linearis / Tylophora linearis (Flora)									
42_Moderate	100.0	100.0	0.6			Vulnerable	Endangered	False	30
281_Moderate	80.0	80.0	8.9			Vulnerable	Endangered	False	356
479_Burnt	47.3	47.3	9.3			Vulnerable	Endangered	False	220
								Subtotal	**606**
Tyto novaehollandiae / Masked Owl (Fauna)									
42_Moderate	100.0	100.0	0.6			Vulnerable	Not Listed	False	30

281_Moderate	80.0	80.0	8.9			Vulnerable	Not Listed	False	356
479_Burnt	47.3	47.3	9.3			Vulnerable	Not Listed	False	220
								Subtotal	**606**
Vespadelus troughtoni / Eastern Cave Bat (Fauna)									
42_Moderate	100.0	100.0	0.6			Vulnerable	Not Listed	True	45
281_Moderate	80.0	80.0	8.9			Vulnerable	Not Listed	True	533
479_Burnt	47.3	47.3	9.3			Vulnerable	Not Listed	True	331
								Subtotal	**909**

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021959/BAAS17021/20/00021960	VoW SBB - WIND FARM	24/11/2021
Assessor Name	**Report Created**	**BAM Data version ***
Alexander Pursche	27/04/2022	50
Assessor Number	**BAM Case Status**	**Date Finalised**
BAAS17021	Finalised	27/04/2022
Assessment Revision	**Assessment Type**	
3	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 SAII	Ecosystem credits

Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley												
5	483_Moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	25.3	25.3	15.7	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	248

6	483_Low	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	17.6	17.6	38.2	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	419
											Subtotal	**667**
Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion												
3	479_Burnt	Not a TEC	47.3	47.3	6.1	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		107
4	479_Regen	Not a TEC	33.3	33.3	5.1	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		64
											Subtotal	**171**

Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion												
1	281_Moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	71.1	71.1	2.3	PCT Cleared - 67%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	103

2	281_Low	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	6.6	6.6	6.2	PCT Cleared - 67%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	0
											Subtotal	**103**
											Total	**941**

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 SAII	Species credits
Acacia ausfeldii / Ausfeld's Wattle (Flora)									
281_Moderate	71.1	71.1	1.3			Vulnerable	Not Listed	False	45
								Subtotal	**45**

Burhinus grallarius / Bush Stone-curlew (Fauna)									
281_Moderate	71.1	71.1	1.3			Endangered	Not Listed	False	45
								Subtotal	**45**
Callocephalon fimbriatum / Gang-gang Cockatoo (Fauna)									
281_Moderate	71.1	71.1	1.3			Vulnerable	Not Listed	False	45
								Subtotal	**45**
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)									
281_Moderate	71.1	71.1	1			Vulnerable	Vulnerable	True	53
479_Burnt	47.3	47.3	1			Vulnerable	Vulnerable	True	35
479_Regen	33.3	33.3	1			Vulnerable	Vulnerable	True	25
483_Moderate	25.3	25.3	1			Vulnerable	Vulnerable	True	19
								Subtotal	**132**
Commersonia procumbens / Commersonia procumbens (Flora)									
281_Moderate	71.1	71.1	1.3			Vulnerable	Vulnerable	False	45
								Subtotal	**45**
Monotaxis macrophylla / Large-leafed Monotaxis (Flora)									
281_Moderate	71.1	71.1	1.3			Endangered	Not Listed	False	45
								Subtotal	**45**
Ninox connivens / Barking Owl (Fauna)									
281_Moderate	71.1	71.1	1.3			Vulnerable	Not Listed	False	45
								Subtotal	**45**
Petaurus norfolcensis / Squirrel Glider (Fauna)									
281_Moderate	71.1	71.1	1			Vulnerable	Not Listed	False	36

479_Burnt	47.3	47.3	1			Vulnerable	Not Listed	False	24
								Subtotal	**60**
Petrogale penicillata / Brush-tailed Rock-wallaby (Fauna)									
281_Moderate	71.1	71.1	1.3			Endangered	Vulnerable	True	67
								Subtotal	**67**
Phascolarctos cinereus / Koala (Fauna)									
281_Moderate	71.1	71.1	1.3			Vulnerable	Vulnerable	False	45
								Subtotal	**45**
Prasophyllum petilum / Tarengo Leek Orchid (Flora)									
281_Moderate	71.1	71.1	1.3			Endangered	Endangered	False	45
								Subtotal	**45**
Prasophyllum sp. Wybong / Prasophyllum sp. Wybong (Flora)									
281_Moderate	71.1	71.1	1.3			Not Listed	Critically Endangered	True	67
								Subtotal	**67**
Tylophora linearis / Tylophora linearis (Flora)									
281_Moderate	71.1	71.1	1.3			Vulnerable	Endangered	False	45
								Subtotal	**45**
Tyto novaehollandiae / Masked Owl (Fauna)									
281_Moderate	71.1	71.1	1.3			Vulnerable	Not Listed	False	45
								Subtotal	**45**

Vespadelus troughtoni / Eastern Cave Bat (Fauna)									
281_Moderate	71.1	71.1	1.3			Vulnerable	Not Listed	True	67
								Subtotal	**67**

BAM Credit Summary Report

Proposal Details

Assessment Id

00021959/BAAS17021/20/00021961

Proposal Name

VoW SWS - WIND FARM

BAM data last updated *

24/11/2021

Assessor Name

Alexander Pursche

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27/04/2022

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50

Assessor Number

BAAS17021

BAM Case Status

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Date Finalised

28/03/2022

Assessment Revision

1

Assessment Type

Major Projects

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley												
7	483_Moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	30.3	30.3	2.1	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	40

8	483_Low	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	21.9	21.9	31	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	425
											Subtotal	**465**
Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion												
4	479_Burnt	Not a TEC	59.1	59.1	1.2	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		27
5	479_Moderate	Not a TEC	76.7	76.7	0.55	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		16
6	479_Regen	Not a TEC	31.4	31.4	3.5	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		41

											Subtotal	**84**
Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion												
3	478_Good	Not a TEC	66	66.0	0.11	PCT Cleared - 29%	High Sensitivity to Potential Gain			1.50		3
											Subtotal	**3**
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion												
1	281_Good	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	88.3	88.3	0.96	PCT Cleared - 67%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	53

2	281_Moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	78.1	78.1	0.3	PCT Cleared - 67%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	15
											Subtotal	**68**
											Total	**620**

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 SAII	Species credits
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)									
478_Good	66.0	66.0	0.11			Vulnerable	Vulnerable	True	5
479_Burnt	59.1	59.1	1.2			Vulnerable	Vulnerable	True	55

479_Moderate	76.7	76.7	0.55			Vulnerable	Vulnerable	True	32
479_Regen	31.4	31.4	3.5			Vulnerable	Vulnerable	True	82
483_Moderate	30.3	30.3	2.1			Vulnerable	Vulnerable	True	48
								Subtotal	**222**
Petaurus norfolcensis / Squirrel Glider (Fauna)									
281_Good	88.3	88.3	0.96			Vulnerable	Not Listed	False	42
281_Moderate	78.1	78.1	0.3			Vulnerable	Not Listed	False	12
478_Good	66.0	66.0	0.11			Vulnerable	Not Listed	False	4
479_Burnt	59.1	59.1	1.2			Vulnerable	Not Listed	False	36
479_Moderate	76.7	76.7	0.55			Vulnerable	Not Listed	False	21
								Subtotal	**115**

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