Appendix G: Rye Park wind farm Preliminary Documentation – Biodiversity Development Assessment Report

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RYE PARK WIND FARM

Biodiversity Development Assessment Report

FINAL

August 2020

RYE PARK WIND FARM

Biodiversity Development Assessment Report

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Rye Park Renewable Energy Wind Farm Pty Ltd

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Report No.	4107/R05/Final
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This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Executive Summary

Rye Park Renewable Energy Pty Ltd (which is a wholly owned subsidiary of Tilt Renewables Australia Pty Ltd) (RPRE) is seeking a modification to the existing State Significant Development (SSD) approval (SSD 6693) for the Rye Park Wind Farm Project. This includes a reduction in proposed wind turbines, increased maximum tip height, increased Rotor Swept Area (RSA), reduction of operational and maintenance facilities as well as a number of other changes to associated infrastructure.

The Development Corridor – Wind Farm is located on a long ridgeline running generally north-south, near the townships of Rye Park, north of Yass and east of Boorowa, NSW (refer to **Figures 1.1** and **1.2**). The Indicative Development Footprints span three Local Government Areas (LGA), being the Hilltops Council, Upper Lachlan Shire Council and Yass Valley Council. The Indicative Development Footprints (Wind Farm, Permanent Met Masts and External Roads) cover an area of approximately 516 hectares within the larger Development Corridors totalling approximately 1,327 hectares.

The Rye Park Wind Farm Project was originally assessed as a Major Project, under Part 3A of the NSW *Environmental Planning and Assessment Act 1979.* The project was subsequently transitioned from being a transitional Part 3A project to being state significant development (SSD) under the EP&A Act by an order made on 21 March 2014. NSW Development Consent for the Rye Park Wind Farm Project was granted on 22 May 2017 by the NSW Planning Assessment Commission (PAC) (DPE 2017) under the former Section 89E of the EP&A Act. As the Proposed Modification seeks to modify a major project approval, it requires a Biodiversity Assessment Method (BAM) assessment under the *Biodiversity Conservation Act 2016* (BC Act).

This Biodiversity Development Assessment Report (BDAR) has been prepared by Umwelt on behalf of RPRE to assess the potential biodiversity impacts of the Proposed Modification in accordance with the BAM.

The Indicative Development Footprints support four Plant Community Types (PCTs) and five species credit species, being:

- 0.78 hectares of PCT 289 Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion. **This vegetation community was not previously assessed (NGH Environmental 2014 and 2016).**
- 5.50 hectares of PCT 335 Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion. **This vegetation community was not previously assessed (NGH Environmental 2014 and 2016).**
- 37.60 hectares of PCT 350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion. **Compared with the 50.2 hectares previously assessed (NGH Environmental 2014 and 2016), this presents a decrease of 12.60 hectares.**
- 351.83 hectares of PCT 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion. **Compared with the 190.6 hectares previously assessed (NGH Environmental 2014 and 2016), this presents an increase of 161.23 hectares.**

- 3.58 hectares of habitat for striped legless lizard (*Delma impar*). **This presents a decrease of 45.92 hectares to what was previously assessed (NGH Environmental 2014 and 2016).**
- 0.03 hectares of habitat for southern myotis (*Myotis macropus*). **This species was not previously assessed (NGH Environmental 2014 and 2016).**
- 102.97 hectares of habitat for squirrel glider (*Petaurus norfolcensis*). **This species was not previously assessed (NGH Environmental 2014 and 2016).**
- 20.08 hectares of habitat for superb parrot (*Polytelis swainsonii*). **This presents decrease of 4.82 hectares to what was previously assessed (NGH Environmental 2014 and 2016).**
- 43.20 hectares of habitat for golden sun moth (*Synemon plana*). **This presents a decrease of 23.74 hectares to what was previously assessed (NGH Environmental 2014 and 2016).**

The Project will impact a total of 37.50 hectares of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act within Vegetation Zones 3 (20.08 hectares) and 4 (17.42 hectares); and 35.73 hectares of *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC* under the EPBC Act within Vegetation Zones 3 (19.38 hectares) and 4 (16.35 hectares). **Please refer to Section 3.2.3.1 with regard to updates to conservation status of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act.**

Impacts to the CEEC under the BC Act are less (**12.70 hectares**) than the impact threshold of 50.2 hectares for this TEC as identified in Consent Condition 19(a) of the existing State Approval, successfully avoiding 12.70 hectares of CEEC (BC Act) threshold. Impacts to the CEEC under the EPBC Act is 26.23 hectares more than the impact threshold of 9.5 hectares for this TEC as identified in Condition 3 of the existing Federal Approval (EPBC 2014/7163).

Following the application of avoidance and minimisation measures, the BAM assessment identified the following biodiversity credits required to offset the impacts of the Project:

- **26 ecosystem credits** for **PCT 289** Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
- **125 ecosystem credits** for **PCT 335** Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion
- **883 ecosystem credits** for **PCT 350** Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
- **5,353 ecosystem credits** for **PCT 351** Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
- **27 species credits** for **striped legless lizard** (*Delma impar*)
- **1 species credit** for **southern myotis** (*Myotis macropus*)
- **3,635 species credits** for **squirrel glider** (*Petaurus norfolcensis*)
- **579 species credits** for **superb parrot** (*Polytelis swainsonii*)
- **716 species credits** for **golden sun moth** (*Synemon plana*).

Although the Indicative Development Footprints for the Project are greater in size compared with the previously approved Project, the modified project has employed numerous steps to adequately avoid significant biodiversity values. The modified project has a smaller impact on White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act; habitat for striped legless lizard, superb parrot and golden sun moth. It is noted however that the modified project has a greater impact on *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC* under the EPBC Act, and hollow bearing trees suitable for superb parrot.

RPRE is committed to delivering a Biodiversity Offset Strategy that appropriately compensates for the unavoidable loss of biodiversity values as a result of the Project as required under the BC Act. This will be undertaken using one or more of the following options:

- The establishment and retirement of credits within Stewardship sites.
- Securing required credits through the open credit market and/or
- Payments to the Biodiversity Conservation Fund.

Glossary

BAM	Biodiversity Assessment Methodology
BC Act	NSW *Biodiversity Conservation Act 2016*
BCD	Biodiversity Conservation Division (formerly Office of Environment and Heritage) – part of NSW Department of Planning, Industry and Environment
BDAR	Biodiversity Development Assessment Report
CCS	Composition condition score (part of the BAM)
CEEC	Critically endangered ecological community
DAWE	Commonwealth Department of Agriculture, Water and the Environment (previously Department of the Environment and Energy)
Development Corridor – Permanent Met Masts	Land to which the BAM is applied to assess the biodiversity values of the land. It includes the Indicative Development Footprint – Permanent Met Masts in its entirety as well as areas of adjoining land. It does not overlap with the Development Corridor – Wind Farm, described below.
Development Corridor – Wind Farm	Land to which the BAM is applied to assess the biodiversity values of the land. It includes the Indicative Development Footprint – Wind Farm in its entirety as well as areas of adjoining land. It does not include the Indicative Development Footprint – External Roads. It does not overlap with the Development Corridor – Permanent Met Masts, described above.
DoEE	(Former) Commonwealth Department of the Environment and Energy (now DAWE)
DNG	Derived native grassland
DPIE	NSW Department of Planning, Industry and Environment
Ecosystem credit	A measurement of the value of threatened ecological communities and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity value at a development site and the gain in biodiversity value at an offset site.
EEC	Endangered ecological community
EP	Endangered population
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FCS	Function condition score (part of the BAM)
GIS	Geographic information system
HBT	Hollow bearing tree
IBRA	Interim Biogeographic Regionalisation for Australia (Version 7)
Indicative Development Footprint – External Roads	The total indicative impact zone associated with the external road upgrades associated with the Wind Farm, excluding all wind farm specific components of the Project. The *Indicative Development Footprint – Wind Farm* provides for additional detailed design that may be undertaken by RPRE once contractor(s) are established.
Indicative Development Footprint – Permanent Met Masts	The total indicative impact zone associated with the permanent met mast specific components of the Project, excluding all other wind farm infrastructure and external road upgrades. The *Indicative Development Footprint – Permanent Met Masts* provides for additional detailed design that may be undertaken by RPRE once contractor(s) are established.

Indicative Development Footprint – Wind Farm	The total indicative impact zone associated with the wind farm specific components of the Project, excluding the external road upgrades. The *Indicative Development Footprint – Wind Farm* provides for additional detailed design that may be undertaken by RPRE once specific turbine specifications and contractor(s) are established.
Indicative Development Footprints	Equivalent to the *Development Footprint* terminology in the BAM; this is a combination of the *Indicative Development Footprint – Wind Farm, Indicative Development Footprint – Permanent Met Masts* and the *Indicative Development Footprint – External Roads*, and comprises the entirety of the Indicative Development Footprint for the Rye Park Wind Farm.
LGA	Local government area
MGA	Map Grid of Australia
MNES	Matters of National Environmental Significance
NSW	New South Wales
PCT	Plant Community Type
PMST	Protected Matters Search Tool
RPRE	Rye Park Renewable Energy Pty Ltd
RSA	Rotor Swept Area
SCS	Structure condition score (part of the BAM)
SEH	South Eastern Highlands IBRA bioregion
Species credit	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 database.
SSD	State Significant Development
Strahler Stream Order	Classification system that allocates a waterway an 'order' according to the number of tributaries associated with it.
SWS	NSW – South Western Slopes IBRA bioregion
TEC	Threatened ecological community
TBDC	Threatened Biodiversity Data Collection
VIS	Vegetation Information System

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1 Introduction

1.1 Background

Rye Park Renewable Energy (RPRE) proposes to construct the Rye Park Wind Farm Project in southern NSW broadly between Yass and Boorowa. The biodiversity assessment presented here is the culmination of several years of work, comprising work prepared to support a pre-existing approval, and further work prepared for design alterations and a formal Project Modification. This section provides details on the project's approval history (including existing consent conditions), a background on the ecological surveys undertaken over several years, and details on the proposed project design and operation.

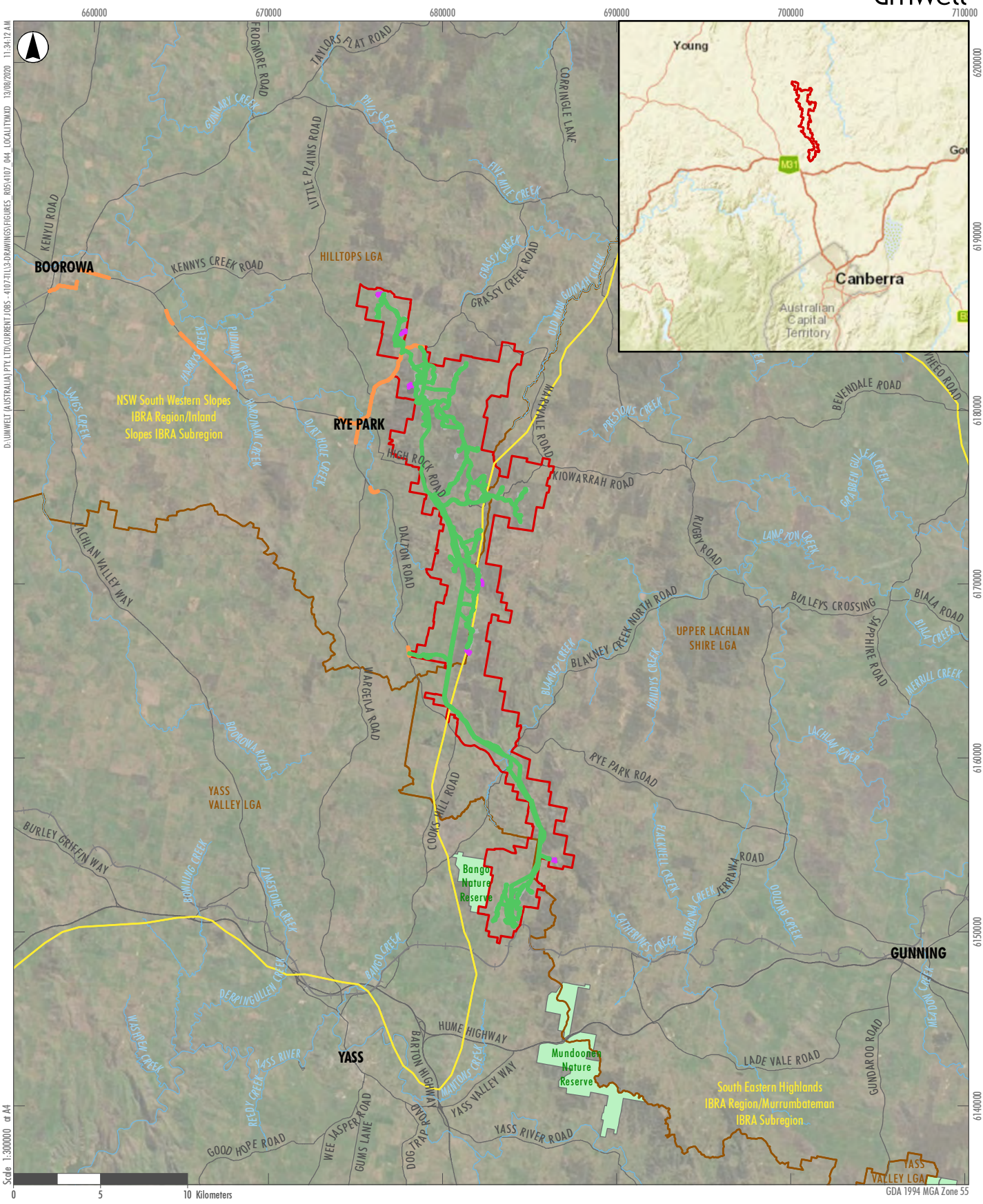
1.1.1 Location

The Development Corridor is located on a long ridgeline running generally north–south, near the townships of Rye Park, north of Yass and east of Boorowa, NSW (refer to **Figure 1.1**). The Development Corridor spans three Local Government Areas (LGAs), being the Hilltops Council, Upper Lachlan Shire Council and Yass Valley Council. The Development Corridors (Wind Farm and Permanent Met Masts) cover an area of approximately 1,327 hectares, whilst the Indicative Development Footprints (Wind Farm, Permanent Met Masts and External Roads) are proposed to impact an area of approximately 516 hectares.

It is surrounded by a mosaic of agricultural land on the valley floor and low rises, with large patches of remnant vegetation restricted to public land (including road reserves and conservation areas), upper slopes and ridgetops. Agricultural land use is dominant throughout the local region both historically and currently. These practises have resulted in the extensive clearing of native vegetation from the local region. Stock grazing (predominantly sheep and, to a lesser degree, cattle) is the dominant agricultural land use, while a variety of crops are also sown in particular areas.

The Development Corridor is located predominantly in the NSW - South Western Slopes IBRA region but it does extend slightly into the South Eastern Highlands IBRA region (refer to **Figure 1.1**). The locality is characterised by agricultural landscapes on the valley floors and low slopes that provide more fertile soil profiles. Substantial areas of intact vegetation are associated with the network of public reserves, upper slopes and ridgetops. Key land agricultural practises include stock grazing (predominantly sheep and, to a lesser degree, cattle), while a variety of crops are also sown in particular areas.

A number of regional roads occur within the locality, including Rye Park Road linking the small township of Rye Park with the larger regional town of Boorowa, NSW. The main thoroughfares between Rye Park and the major regional town of Yass, NSW are Wargeila Road, Dalton Road, Cooks Hill Road and Blakney Creek South Road. However, most relevant to the Development Corridor are Rye Park Road, Dalton Road and Blakney Creek South Road. The Main Southern Railway extends in proximity to the southernmost tip of the Development Corridor but will remain unaffected by the Project. The Hume Highway is located approximately 7 kilometres south of the southernmost tip of the Development Corridor.



Legend

- Rye Park Wind Farm Project Area
- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- IBRA Region/Subregion Area
- Local Government Area (LGA)
- Nature Reserve
- Raod
- Railway
- Watercourses

FIGURE 1.1

Locality Plan

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

1.1.2 Approval History

The Rye Park Wind Farm Project was originally assessed as a Major Project, under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The project was subsequently transitioned to a state significant development (SSD) under the EP&A Act by an order made on 21 March 2014. NSW Development Consent for the Rye Park Wind Farm Project was granted on 22 May 2017 by the NSW Planning Assessment Commission (PAC) (DPE 2017) under the former Section 89E of the EP&A Act.

The Project has a long history in the NSW planning approval system. An application for project approval for the Project was lodged with DPIE (formerly DPE) in January 2011 (Epuron 2011) under Part 3A of the EP&A Act. The Environmental Assessment was then prepared, lodged and placed on public exhibition from 2 May 2014 until 4 July 2014 (Epuron 2014). This included the original Biodiversity Assessment prepared by NGH Environmental (2014). Following the period of public exhibition, the Project received 115 submissions in response to the Environmental Assessment and 244 in the response to submissions.

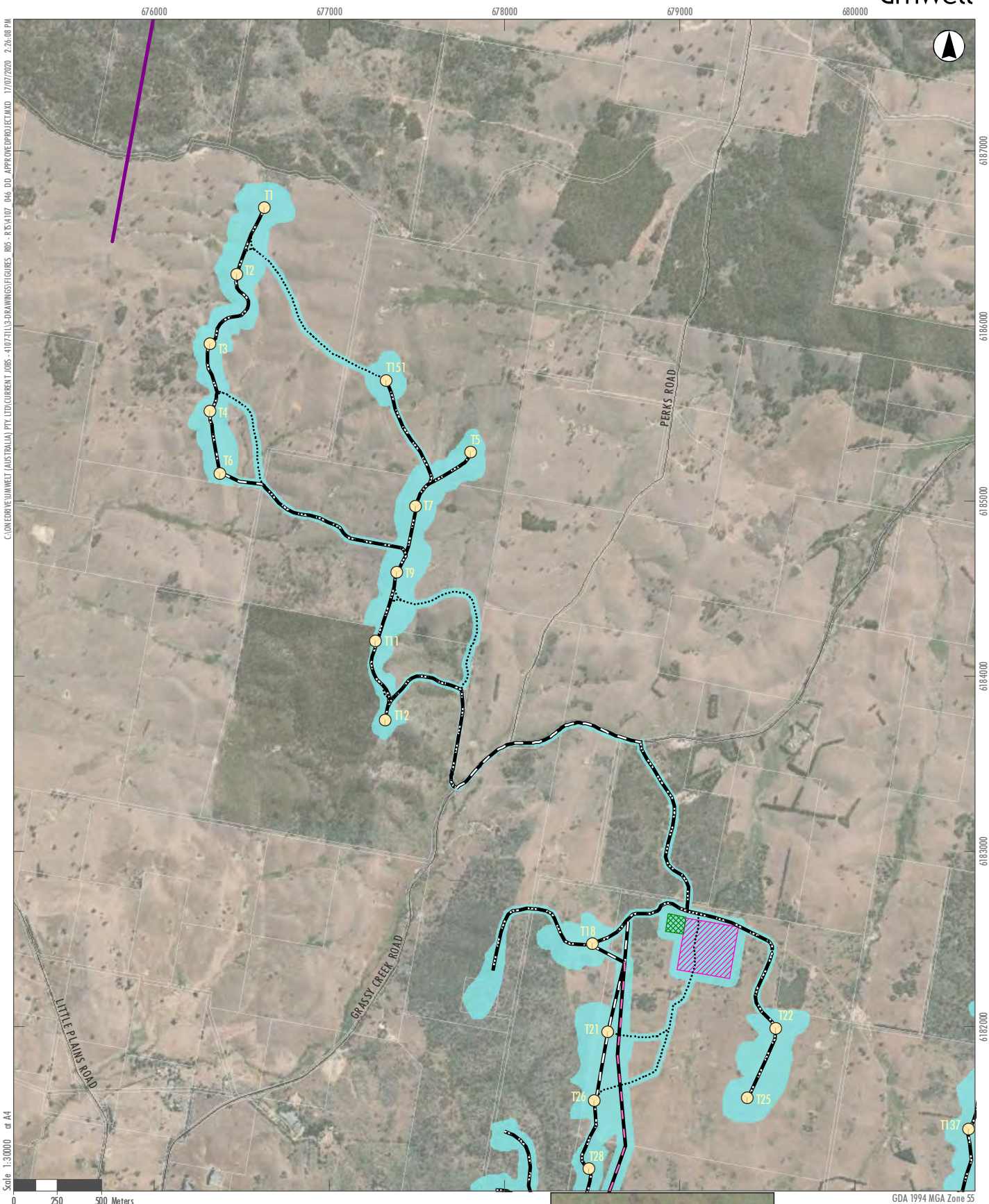
On 12 May 2016 the Project lodged its Response to Submissions (Epuron 2016). A Biodiversity Assessment Addendum was prepared and included as part of the Response to Submissions (NGH Environmental 2016).

In late 2014, Rye Park Wind Farm (Rye Park Renewable Energy Pty Ltd) was acquired by Tilt Renewables Australia Pty Ltd (previously known as Trustpower Australia Limited [1]).

The Project received state approval on 22 May 2017 and federal approval on 6 December 2017. Refer to **Sections 1.1.2.1** and **1.1.2.2** below for the respective development consents.

The approved project is presented in **Figure 1.2**.

[1] Tilt Renewables was established in October 2016, as the result of the demerger from Trustpower Limited.



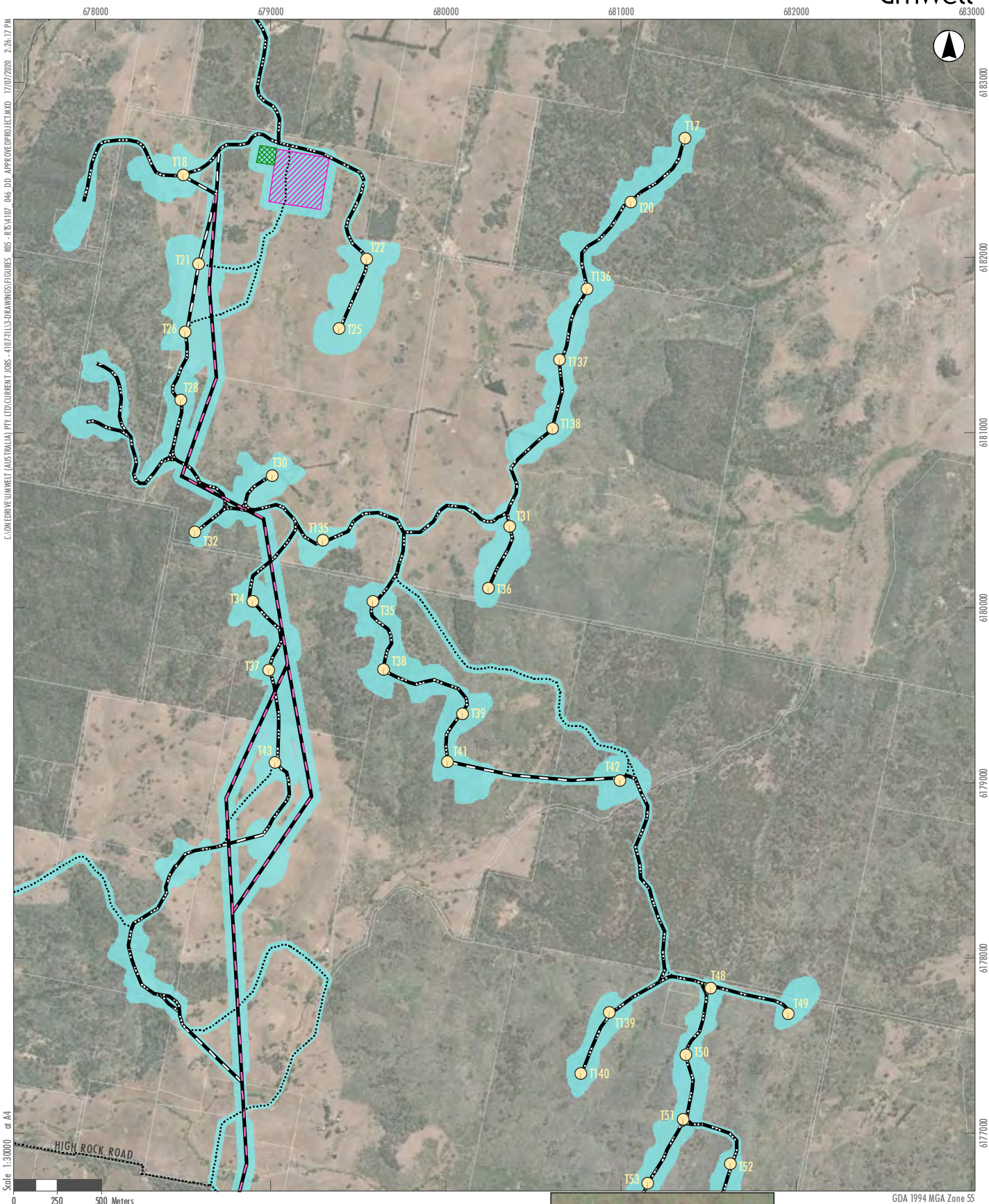
Legend

- PAC Approved Development Corridor
- PAC Approved Turbine Locations
- Property Boundaries
- Watercourses
- Major Roads
- Access Tracks
- Overhead Powerline
- TxL Connection
- Underground Cabling
- Concrete Batch Plant
- Construction Compound

FIGURE 1.2.a

Approved Project Overview

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



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Legend

- PAC Approved Development Corridor
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- Property Boundaries
- Watercourses
- Major Roads
- Access Tracks
- Overhead Powerline
- Underground Cabling
- Concrete Batch Plant
- Construction Compound

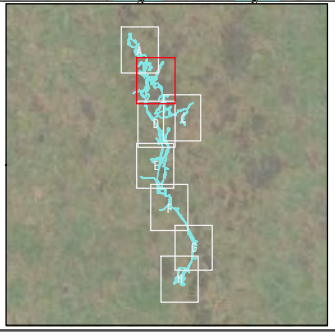
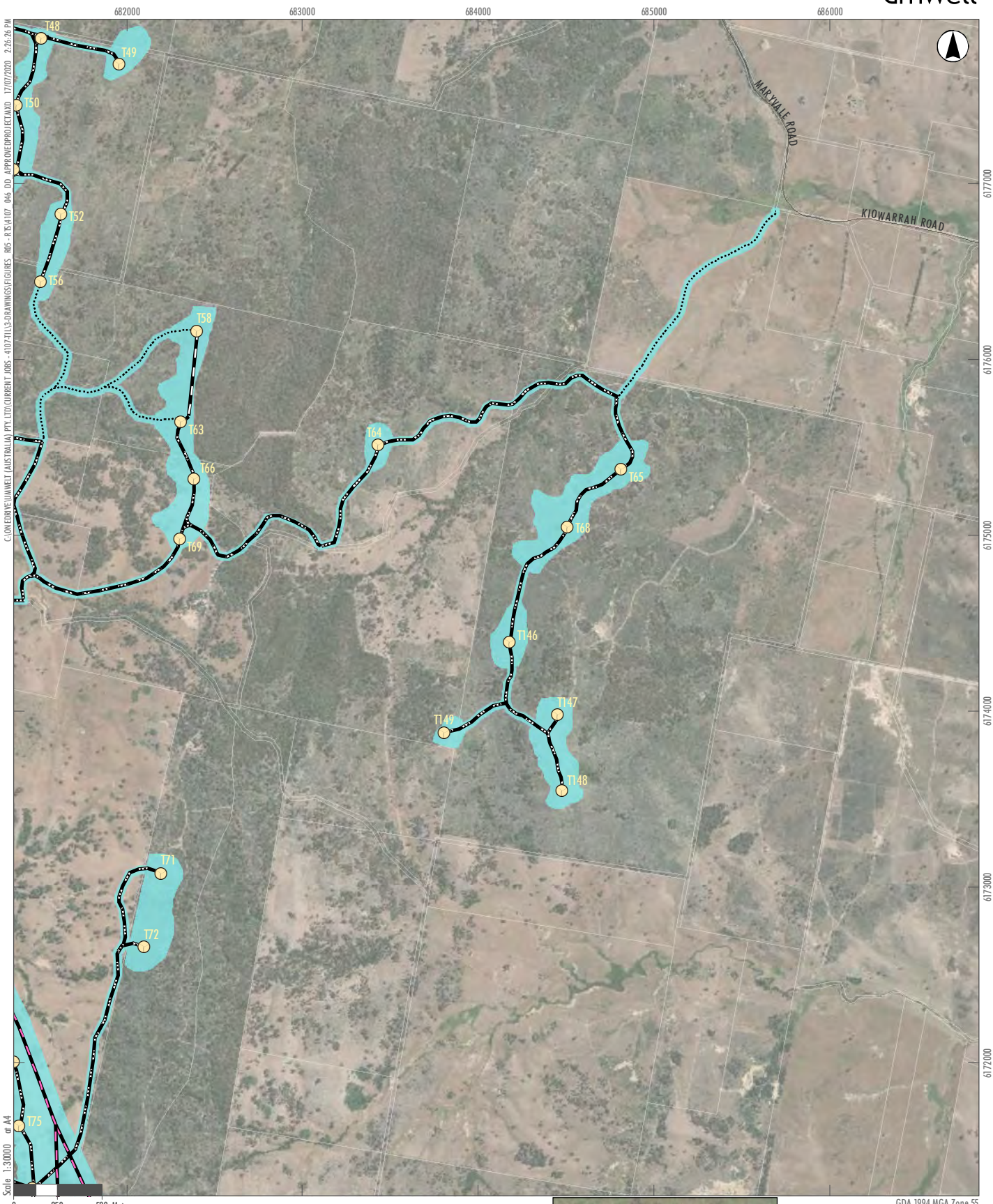


FIGURE 1.2.b

Approved Project Overview

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



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Legend

- PAC Approved Development Corridor
- PAC Approved Turbine Locations
- Property Boundaries
- Watercourses
- Major Roads
- Access Tracks
- Overhead Powerline
- Underground Cabling

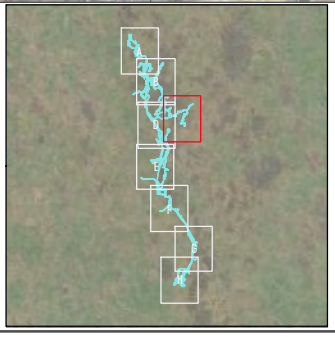
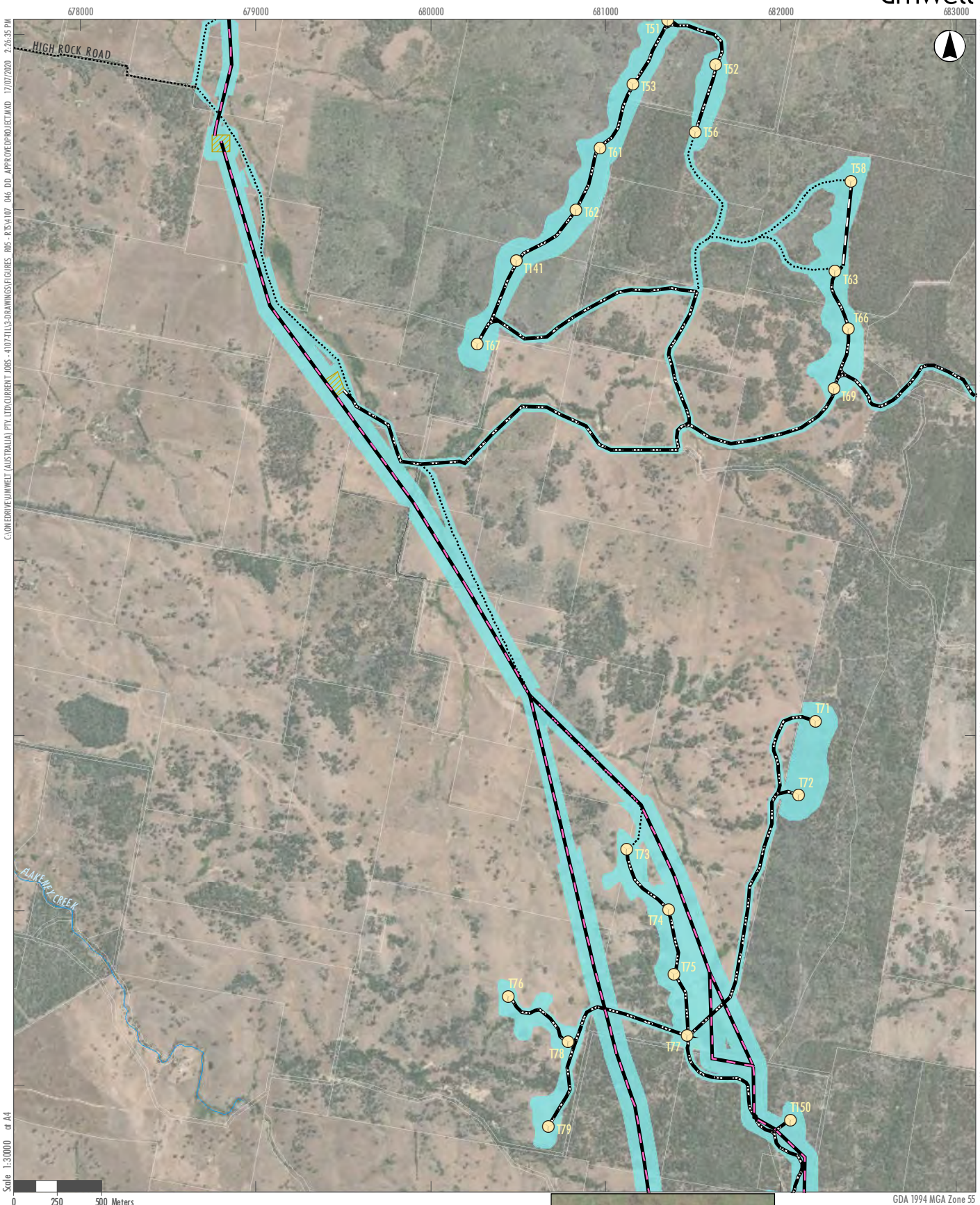


FIGURE 1.2.c

Approved Project Overview

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



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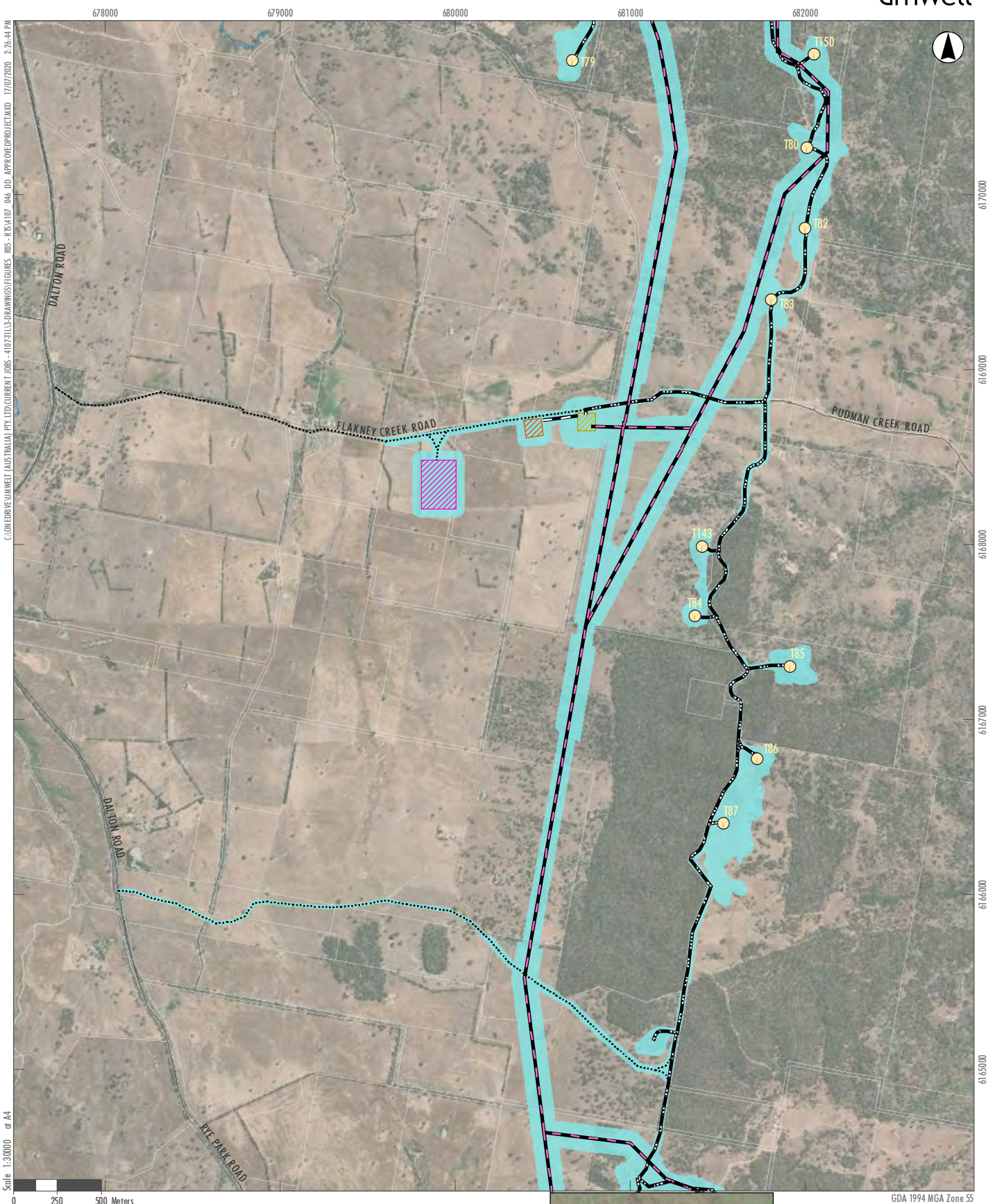
Legend

- PAC Approved Development Corridor
- PAC Approved Turbine Locations
- Property Boundaries
- Watercourses
- Major Roads
- Access Tracks
- Overhead Powerline
- Underground Cabling
- Substations

FIGURE 1.2.d

Approved Project Overview

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- PAC Approved Development Corridor
- PAC Approved Turbine Locations
- Property Boundaries
- Watercourses
- Major Roads
- Access Tracks
- Overhead Powerline
- Underground Cabling
- Construction Compound
- Project Related Buildings
- Substations

FIGURE 1.2.e

Approved Project Overview

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- PAC Approved Development Corridor
- PAC Approved Turbine Locations
- Property Boundaries
- Watercourses
- Major Roads
- Access Tracks
- Overhead Powerline
- Underground Cabling
- Project Related Buildings

FIGURE 1.2.f

Approved Project Overview

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- PAC Approved Development Corridor
- PAC Approved Turbine Locations
- Property Boundaries
- Watercourses
- Major Roads
- Access Tracks
- Overhead Powerline
- Underground Cabling

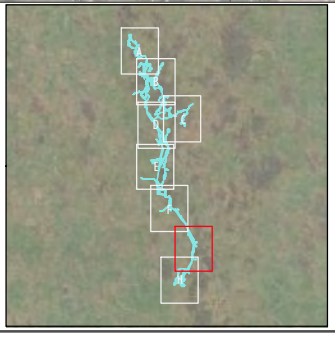
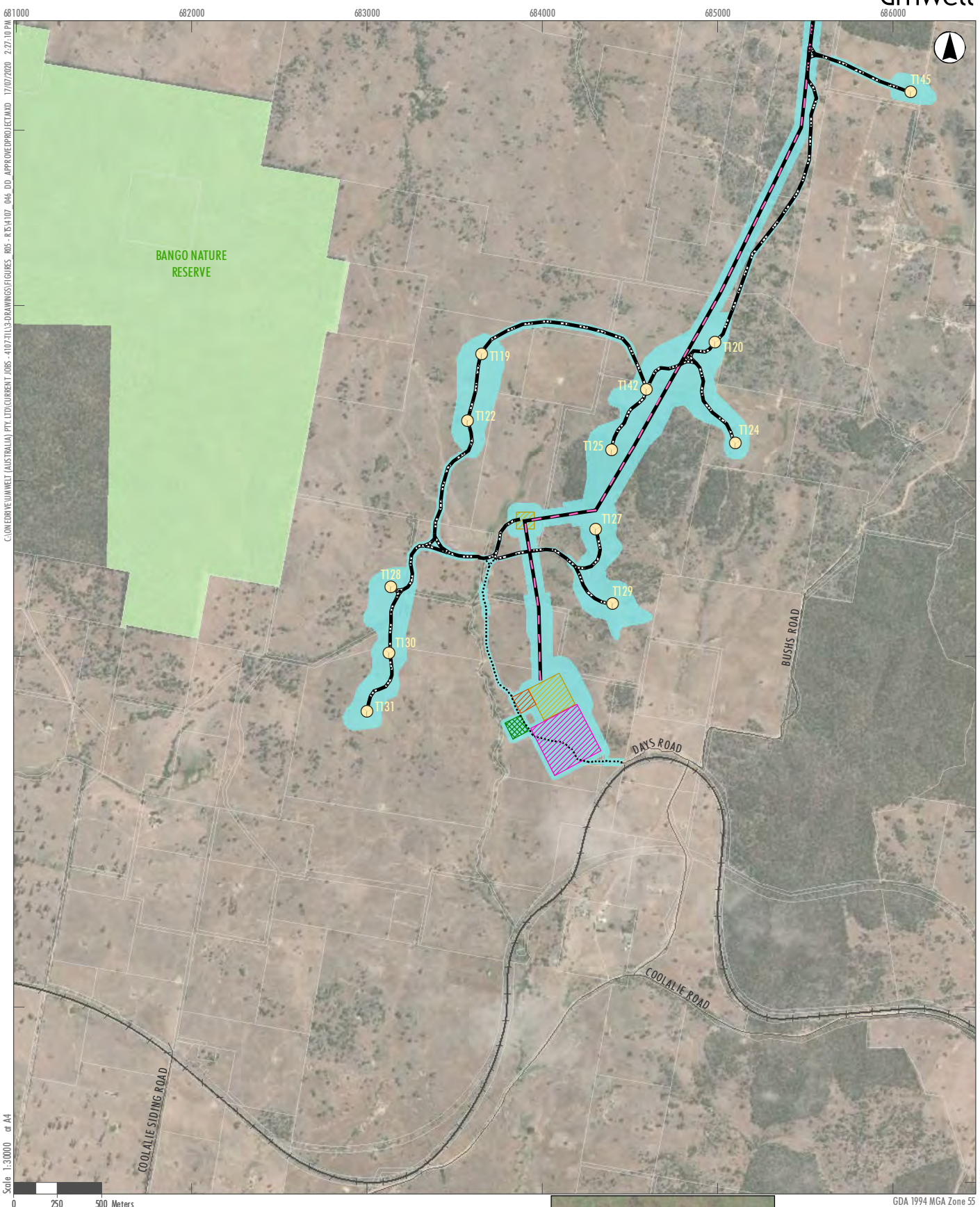


FIGURE 1.2.g

Approved Project Overview

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- PAC Approved Development Corridor
- PAC Approved Turbine Locations
- Property Boundaries
- Watercourses
- Major Roads
- Railways
- Nature Reserves
- Access Tracks
- Overhead Powerline
- Underground Cabling
- Concrete Batch Plant
- Construction Compound
- Project Related Buildings
- Substations

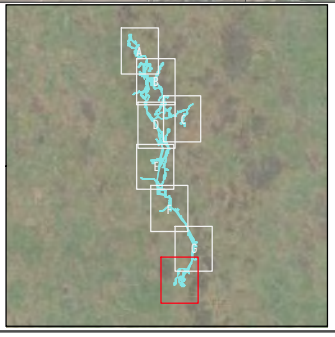


FIGURE 1.2.h

Approved Project Overview

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

1.1.2.1 State Approved Development Consent

The relevant Development Consent conditions applicable to this BDAR are presented below (DPE 2017). It is important to note that while they are listed below (**Table 1.1**) and are discussed broadly as part of this BDAR, Consent Conditions 22 and 23 are not satisfied by this document, but will be addressed by separate forthcoming documentation.

Table 1.1 State approved Development Consents (SSD 6693)

Development Consent Conditions (DPE 2017)
Consent Condition 19 – The applicant must: a. ensure that no more than 50.2 hectares of the Box Gum Woodland EEC, including Box Gum Woodland derived native grassland, is cleared for the development, unless the Secretary agrees otherwise; b. avoid impacts to the Crimson Spider Orchid (*Caladenia concolor*) and Southern Pygmy Perch (*Nannoperca australis*); c. minimise: • the impacts of the development on hollow-bearing trees and termite mounds; • the impacts of the development on threatened bird and bat populations; and • the clearing of native vegetation and key habitat within the approved disturbance footprint.
Consent Condition 20 – Prior to the commencement of construction, unless the Secretary agrees otherwise, the Applicant must: a. update the baseline mapping of the vegetation and key habitat within the final disturbance area; and b. calculate biodiversity offset credit liabilities for the development in accordance with the *Framework for Biodiversity Assessment* under the *NSW Biodiversity Offset Policy for Major projects*, in consultation with OEH, and to the satisfaction of the Department.
Consent Condition 21 – Within 2 years of the commencement of construction, unless the Secretary agrees otherwise, the Applicant must retire the required biodiversity credits, to the satisfaction of OEH. The retirement of the credits must be carried out in accordance with the NSW *Biodiversity Offsets Policy for Major Projects*, and can be achieved by: a. acquiring or retiring credits under the biobanking scheme in the TSC Act, b. making payment into an offset fund that has been established by the NSW Government, or c. providing suitable supplementary measures.

Development Consent Conditions (DPE 2017)
Consent Condition 22 – Prior to the commencement of construction, the Applicant must prepare a Biodiversity Management Plan for the development to the satisfaction of the Secretary. This plan must: a. be prepared in consultation with OEH; and b. include: • a description of the measures that would be implemented for: o minimising the amount of native vegetation clearing within the approved development footprint; o minimising the loss of key fauna habitat, including tree hollows and termite mounds; o minimising the impacts of fauna on site, including undertaking pre-clearance surveys; o minimising the potential indirect impacts on threatened: ▪ flora species, including the Crimson Spider Orchid (*Caladenia concolor*); and ▪ fauna species, including the Southern Pygmy Perch (*Nannoperca australis*), Golden Sun Moth (*Synemon plana*) and Superb Parrot (*Polytelis swainsonii*); o rehabilitating and revegetating temporary disturbance areas; o protecting native vegetation and key fauna habitat outside the approved disturbance area; o maximising the salvage of resources within the approved disturbance area – including vegetative and soil resources – for beneficial reuse (including fauna habitat enhancement) during the rehabilitation and revegetation of the site; o collecting and propagating seed (where relevant); o controlling weeds and feral pests; o controlling erosion; and o bushfire management; • a detailed program to monitor and report on the effectiveness of these measures. Following the Secretary's approval, the Applicant must implement the Biodiversity Management Plan.
Consent Condition 23 – Prior to the commissioning of any wind turbines, the Applicant must prepare a Bird and Bat Adaptive Management Plan for the development in consultation with OEH, and to the satisfaction of the Secretary. This plan must include: a. at least 12 months' worth of baseline data on threatened and 'at risk' bird and bat species and populations in the locality that could be affected by the development; b. a detailed description of the measures that would be implemented on site for minimising bird and bat strike during operation of the development, including: • minimising the availability of raptor perches; • prompt carcass removal; • controlling pests; and • using best practice methods for bat deterrence, including managing potential lighting impacts; c. trigger levels for further investigation of the potential impacts of the project on particular bird or bat species or populations; d. an adaptive management program that would be implemented if the development is having an adverse impact on a particular threatened or 'at risk' bird and/or bat species or populations; including the implementation of measures to: • reduce the mortality of those species or populations; or • enhance and propagate those species or populations in the locality; and e. a detailed program to monito and report on the effectiveness of these measures, and any bird and bat strikes on site. Following the Secretary's Approval, the Applicant must implement the Bird and Bat Adaptive Management Plan.

Umwelt note that in relation to the State Approval Consent Conditions described above, since this decision was made, the conservation status listing of 'Box Gum Woodland EEC' was updated on 17 July 2020 to a Critically Endangered Ecological Community (CEEC). It is assumed that the reference to clearance thresholds to the 'Box Gum Woodland EEC' will apply to the updated CEEC. Further information is provided below in **Section 3.2.3.**

1.1.2.2 Federal EPBC Approval

The original Project received federal approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 6 December 2017. The relevant Conditions of Approval are presented below (EPBC 2014/7163) (DoEE 2017) in **Table 1.2**. It is important to note that while this BDAR is not a requirement as part of the EPBC Approval, it does present the credit requirement for the Project as per Condition 10. Furthermore, regarding Condition of Approval 3, this BDAR presents a comparison of the potential impacts of the modified Project on Matters of National Environmental Significance (MNES) in **Section 5.5**.

Table 1.2 Federal Conditions of Approval (EPBC 2014/7163)

Federal Conditions
Condition of Approval 3 – In taking the approved action, the approval holder must not clear more than: a. 9.5 ha of Box Gum Woodland b. 66.94 ha of Golden Sun Moth habitat c. 49.5 ha of Striped Legless Lizard habitat d. 24.9 ha of foraging habitat for the Superb Parrot e. 170 hollow bearing trees within Box Gum Woodland
Condition of Approval 4 – The approval holder must protect known and potential Superb Parrot nest trees in Box Gum Woodland by: a. Only conducting blasting and clearing within 100 m of known and potential nest trees from February to August (outside breeding season); and b. Locating onsite infrastructure no closer than 100 m from known and potential nest trees
Condition of Approval 5 – Prior to the commencement of construction, the approval holder must submit to the Minister detailed plans of the final layout as required by condition 10 of Schedule 2 of the State Approval. Construction must not commence unless the Minister is satisfied that the procedure for micro-siting turbines and onsite infrastructure has minimised impacts to protected matters and avoided high use areas for Superb Parrot. The detailed plans of the final layout must identify buffer areas around all onsite infrastructure (as per Appendix D of the final preliminary documentation), on the basis that impacts may occur even if the vegetation remains.
Condition of Approval 6 – In meeting the requirements of condition 20 and 22 of Schedule 3 of the State Approval, the approval holder must also address protected matters. The Biodiversity Management Plan (BMP) must be submitted to the Minister for approval. Construction must not commence unless the BMP has been approved by the Minister. The approved BMP must be implemented. The BMP must include, but is not limited to: a. Evidence that baseline mapping has been conducted to verify the extent of impact on protected matters and hollow bearing trees within the final development footprint. Surveys must have regard to the Commonwealth Listing Advice for the protected matter and must be conducted by a qualified ecologist in accordance with the most recent publication of survey methods. b. Spatial maps, description and quantification f the final disturbance footprint in relation to proposed impacts to protected matters, including the number, type of hollow bearing trees and size of hollows to be removed. c. Management measures to ensure the protection and maintenance of habitat for protected matters during the construction and operational phases of the approved action. This must include a commitment to avoid clearing near nest trees during the breeding season for the Superb Parrot (September to January) to minimise disturbance to the species.

Federal Conditions
Condition of Approval 7 – In meeting the requirements of condition 23 of Schedule 3 of the State Approval, the approval holder must ensure that the Bird and Bat Adaptive Management Plan (BBAMP) addresses impacts to the Superb Parrot. The BBAMP must be submitted to the Minister for approval. The approved BBAMP must be implemented. The BBAMP must, in addition to trigger levels for further investigation, identify trigger levels to shut down any turbines when there is a high risk of collision based on monitoring data and, if applicable, the results of research conducted as part of condition 15 on Superb Parrot habitat use and breeding ecology. The results of the monitoring program must be submitted as part of the annual report in condition 18.
Condition of Approval 8 – Upon the direction of the Minister, the approval holder must shut down any specified wind turbines within specified periods if the Minister considers that, based on monitoring and compliance reporting required by condition 18, they are having an impact on protected matters, in particular the Superb Parrot, greater than the trigger levels specified by condition 7 that cannot be mitigated to a level acceptable to the Minister.
Condition of Approval 9 – In meeting the requirements of condition 26 of Schedule 3 of the State Approval, the approval holder must avoid and minimise the clearance and trimming of roadside vegetation along proposed transport routes to the site for the transport of turbine components and associated infrastructure. Prior to the clearance and trimming of roadside vegetation for the transport of the turbine components and associated infrastructure, the approval holder must submit a Roadside Vegetation Management Plan to the Minister for approval. The approved plan must be implemented. In order to protect foraging and potential breeding habitat for the Superb Parrot, the plan must include the following requirements: a. Final clearance footprint outlining vegetation to be cleared and lopped and evidence that impacts to protected matters will be minimised. b. Evidence that clearing will be within the limits allowable for this approval specified in condition 3. c. Identified of responsible parties who will manage the native vegetation clearance and trimming process. d. Evidence that clearing and trimming of hollow bearing trees in the roadside vegetation has been minimised.
Condition of Approval 10 – Within two years of commencement of construction, to compensate for impacts on protected matters, the approval holder must acquire or retire like-for-like biodiversity credits or fund a biodiversity action that benefits the protected matter impacted, to the satisfaction of the Minister. This must be carried out in accordance with the NSW Biodiversity Offsets Policy for Major Projects, by acquiring or retiring credits under the BioBanking scheme in the *NSW Threatened Species Conservation Act 1995*. The approval holder must not commission any wind turbines until the required credits have been acquired or retired.
Condition of Approval 11 – Prior to the commencement of construction the approval holder must submit the final BioBanking Statement as it relates to relevant protected matters to the Minister for acceptance. Note: relevant protected mattes for this condition are Box Gum Woodland, Golden Sun Moth, Superb Parrot and Striped Legless Lizard.
Condition of Approval 12 – Prior to the commissioning of any wind turbines, the approval holder must submit the BioBanking Credit Retirement Report to the Minister.

Federal Conditions
Condition of Approval 13 – Prior to the commissioning of any wind turbines, the approval holder must submit a copy of the BioBanking Agreement(s) to the Minster for acceptance. The approval holder must ensure that the BioBanking Agreement(s) for the BioBank site(s) include measures for the long term management of protected matters including but not limited to: a. Specific reference to Box Gum Woodland, Golden Sun Moth, Superb Parrot, Striped Legless Lizard, and hollow bearing trees. b. A textual description of the offset sites, including offset attributes, shapefiles, and a map clearly defining the location and boundaries of the proposed offset sites. Establishment of baseline data and documentation of key biodiversity threats and opportunities at each site. c. A detailed description of the management actions and responsibilities designed to protect and improve the ecological quality of Box Gum Woodland and habitat of threatened species on the offset sites. d. Key milestones, performance indicators and timeframes for each management action. e. A monitoring program to determine the effectiveness of the management actions. f. Corrective actions and contingency measures to be implemented where monitoring of the offset site shows that management actions are not effectively achieving key milestones or prescribed performance indicators are not being met or are unlikely to be met.
Condition of Approval 14 – To compensate for impacts on EPBC Act listed Superb Parrot, the approval holder must ensure the biodiversity offset strategy compensates for impacts on hollow bearing trees that are: a. Cleared for construction; and b. Located within the buffer areas for wind turbines described in condition 5. For each hollow bearing tree removed or retained within buffer areas around each turbine, the approval holder must legally protect and secure 10 hollow bearing trees from the same vegetation class within the South-west Slopes of NSW Importance Bird Area. The approval holder must submit the final number of hollow bearing trees to be impacted or removed to the Minister for acceptance as part of condition 6. Prior to the commissioning of any wind turbines, the approval holder must submit evidence to the Minister's satisfaction of the final number of hollow bearing trees to be legally protected and secured. If the required number of hollow bearing trees cannot be protected within the BioBank site(s) established under condition 13, then additional hollow bearing trees must be legally protected and secured to meet the required offset ratio for hollow bearing trees.
Condition of Approval 15 – To compensate for potential cumulative impacts on Superb Parrot, the approval holder must prepare and implement a Superb Parrot Population Monitoring Program (SPPMP) in collaboration with the National Superb Parrot Recovery Team. The SPPMP must be submitted to the Minister for approval prior to commencement of construction. Construction must not commence unless the Minister has approved the SPPMP. The approved SPPMP must be implemented. The SPPMP must contribute to better understanding Superb Parrot habitat use and breeding ecology within the South-west Slopes of NSW Important Bird Area as defined by Birdlife Australia, with a focus on identification of key breeding sites, and a better understanding of local movement patterns during the breeding season and landscape scale movements between the key breeding areas and winter foraging grounds. **The approval holder must provide at least $50,000 each year for five years to fund the conservation research activities outlined in the SPPMP. The first year's contribution must be made within 30 calendar days for the commencement of construction. The SPPMP must be consistent with the National Recovery Plan for the Superb Parrot *Polytelis swainsonii* (2011). The SPPMP must include specific project monitoring objectives, indicative timetable for activities, nomination of persons or organisations responsible for carrying out the activities, and outline commitments to the provision and timing of funding.**

1.1.2.3 Public Exhibition of the Modification

The Modification Report, including the Biodiversity Development Assessment Report (BDAR) for the Rye Park Wind Farm Project – Modification 1 (SSD-6693-Mod-1), was placed on public exhibition from 13 May to 3 June 2020 (21 days).

During the public exhibition period, the Department of Planning, Industry and Environment (DPIE) received a total of 151 submissions including 17 from government agencies, 7 from organisations and 127 from the Public. Whilst 127 Public Submissions were received, 22 of these submissions were duplications (resulting from multiple submissions being lodged by the same person). Accordingly, the total number of Public Submissions was 105, with 85 of these being made by people who objected to the Project and 20 being made by people who supported the Project.

This revised BDAR has been updated in response to relevant submissions, some of which included the provision of additional information. Furthermore, this revised BDAR is the technical document to support the Submissions Report, which contains a summary of relevant sections of this BDAR. The Submissions Report has been prepared by Umwelt on behalf of Tilt and seeks to address the issues raised in agency and community submissions.

1.1.3 Ecology Surveys

As part its long project assessment and approval history, the Project has been subject to numerous ecological surveys, assessment and consideration of potential or likely impacts. The surveys completed by NGH Environmental, as part of the approvals process (including response to submissions), were completed in 2011, 2012, 2013, 2014, 2015 and 2016, all of which include multiple survey rounds (NGH Environmental 2014 and 2016a).

Although the survey effort completed by NGH Environmental was undertaken several years ago, it forms a key part of the extensive work completed for the project that led to the state and federal Project approvals, and is therefore still relevant.

Following approval of the project, Umwelt has worked closely with RPRE in relation to the proposed modification, discussed below in **Section 1.2**. A key part of this included completing a detailed review in 2017 of the previous ecological surveys that were undertaken in order to determine what additional surveys would be required for the project. Based on this review as well as the extent of the modification, Umwelt has since undertaken surveys during 2017, 2018, 2019 and 2020. These are discussed below in **Section 2**. The additional surveys undertaken by Umwelt were primarily focussed on:

- Collection of the necessary Biodiversity Assessment Method (BAM) Vegetation Integrity Plots throughout the Development Corridor and Indicative Development Footprint – External Roads
- Revision and preparation of vegetation mapping and associated PCT allocation throughout the Development Corridor and Indicative Development Footprint – External Roads
- Bird and bat utilisation surveys throughout the Development Corridor
- BAM species credit surveys throughout the Development Corridor for particular species
- BAM species credit surveys throughout the Indicative Development Footprint – External Roads.

1.2 Proposed Modification

RPRE is seeking a modification to the existing State Significant Development (SSD) approval (SSD 6693) for the Rye Park Wind Farm Project (the Project). In summary, the modification includes a reduction in the number of wind turbines, an increase in turbine height, change in clearance limits / split of clearance limits between the wind farm and external road upgrades, and the selection of the preferred external truck route, increase in the rotor swept area (RSA), reduction of operational and maintenance facilities, reduction of substations, changes to the internal access track and cabling network and removal of construction truck routes. All relevant details of the modification are provided below in **Table 1.3**.

The Proposed Modification of the existing approval (SSD 6693) is shown on **Figures 1.3** and **1.4** and includes the components described in **Table 1.3.** A series of other changes to the project that are a result of refined design are described in **Table 1.4**.

Since submission and exhibition of the BDAR for the Rye Park Wind Farm Project – Modification 1 (SSD-6693-Mod-1), the Indicative Development Footprint – Wind Farm has undergone minor amendments resulting from the following design changes:

- an alternative alignment for the section of transmission line crossing Blakney Creek South Road
- six permanent meteorological masts are proposed throughout the Project
- minor amendments to the external transport route, near the township of Rye Park, NSW.

Table 1.3 Rye Park Wind Farm Modification

Parameter	Approved Project	Modification Application	Extent of Modification
Modification			
Number of turbines	92	80	Reduced by 12 turbines (13%)
Rotor diameter	130 m	170 m	Increased by 40 m (31%)
Maximum tip height	157 m	200 m	Increased by 43 m (27%)
Minimum blade ground clearance	27 m	30 m	Increased by 3 m (11%)
RSA per turbine	13,267 m^2	22,698 m^2	Increased by 9,431 m^2 (71%)
Total RSA for wind farm	1,220,564 m^2	1,815,840 m^2	Increased by 595,276 m^2 (49%)
Development Corridor	1,646 ha	1,327 ha	Reduction by 319 ha
External Construction Truck Routes	Not Assessed	1 route	Nil

Table 1.4 Rye Park Wind Farm Refined Design

Parameter	Approved Project	Modification Application	Extent of Change
Refined Design			
Project Area			
Indicative Development Footprint – Wind Farm	256.8 ha	489 ha	Increase 232.2 ha
Indicative Development Footprint – Permanent Met Masts	-	9.17	n/a
Indicative Development Footprint – External Roads	-	18.66 ha	n/a
Internal Access Tracks			
Internal tracks average width (Temporary)	12 m[2]	30 m	Increase by 18 m
Internal tracks average width (Permanent)	5.5 m	5.5 m	Nil
Internal tracks total length	103,400 m	89,060 m	Decrease by 14,340 m
Internal tracks Impact area (Temporary)	124.08 ha	267.2 ha	Increase 143.12 ha
Underground Cabling			
Underground cabling Length	82,350 m[3]	60,324 m	Decrease 22,026 m
Underground cabling Width (Temporary)	12m	15m	Increase 3 m
Underground Cabling area (Temporary)	98.8 ha	90.5 ha	Decrease 8.3ha
Transmission Line Up to 330kV[4]			

[2] During the original environmental assessment, access tracks were given a nominal width of 12m. However, this did not account for the cut and fill required and to construct the project, the widths would likely have been larger.

[3] The approved underground cabling length is calculated based on the approved development plan as there was no specific total length of underground cabling identified in the RTS report. This length of underground cabling is independent of the length of internal access tracks.

[4] The approved project provisioned for a 330kV line. The modified project now proposes a 132Kv line, but may be revised up to 330kV.

Parameter	Approved Project	Modification Application	Extent of Change
Within Woodland and Forest Vegetation (Vegetation Zones 3, 5 and 7)			
Transmission line (Full easement) length	12,510m	6,925m	Decrease of 5,585m
Transmission line (Full easement) width	60m	40m	Decrease of 20m
Transmission line (Full easement) area	73 ha	28.21ha	Decrease of 44.79ha
Within Grassland and Shrubby Vegetation (Vegetation Zones 2, 4, 6, 8, 9 and 10)			
Transmission line (track, poles and string pads) length	18,810m	20,106m	Increase of 1,296m
Transmission line (track, poles and string pads) width	4m for tracks (poles not considered)	12m for tracks and 20m for poles	Increase of 8m for tracks (no comparison for poles)
Transmission line (track, poles and string pads)[5] area	10.3 ha	26.79ha	Increase of 16.49ha
Transmission Line 33kV			
Within Woodland and Forest Vegetation (Vegetation Zones 3, 5 and 7)			
Transmission line (Full easement) length	694m	736m	Increase of 42m
Transmission line (Full easement) width	30m	20m	Decrease by 10m
Transmission line (Full easement) area	2ha	1.44ha	Decrease by 0.56ha
Within Grassland and Shrubby Vegetation (Vegetation Zones 2, 4, 6, 8, 9 and 10)			
Transmission line (track, poles and string pads) length	5,681m	7,085m	Increase of 1,404m
Transmission line (track, poles and string pads) width	4m for tracks (poles not considered)	12m for tracks and 20m for poles	Increase of 8 m for tracks (no comparison for poles)
Transmission line (track, poles and string pads) area	2.2ha	9.59ha	Increase of 7.39ha

[5] Site disturbance for transmission line poles and string pads were not accounted for in the original environmental assessment and approved project

Parameter	Approved Project	Modification Application	Extent of Change
Ancillary Infrastructure			
Operation and maintenance facility	2 facilities	1 facility	Decrease by 1 facility
Collector substations	3 substations	1 substation	Decrease by 2 substations
Batch plants	2 batch plants	3 batch plants	Increase by 1 facility
Construction compounds	3 construction compounds	3 construction compounds	Nil

1.2.1 Development Corridor Information

There are two Development Corridors discussed as part of this BDAR totalling approximately 1,327 hectares, being the Development Corridor – Wind Farm and Development Corridor – Permanent Met Masts.

The Development Corridor – Wind Farm encompasses the Indicative Development Footprint – Wind Farm in its entirety as well areas of adjoining land (refer to **Figure 1.3**). It does not include the Indicative Development Footprint – External Roads, Development Corridor – Permanent Met Masts and Indicative Development Footprint – Permanent Met Masts. The Development Corridor – Wind Farm was considered in full during the application of the BAM to allow further avoidance and minimisation measures to be employed by RPRE.

The Development Corridor – Wind Farm considered in this document is different to that which was approved (NGH Environmental 2014 and 2016). It is understood that the changes to the corridor have been made in response to the revised indicative design, to limit disturbance and allow for avoidance of areas of sensitivity. The approved development corridor totalled 1,646 hectares, while the Development Corridor – Wind Farm currently being assessed totals approximately 1,275 hectares.

Key changes to the Development Corridor – Wind Farm have been made in response to the removal 12 turbines and their associated hardstands, replacement of a 330kV transmission line with a 132kV (noting that further revision), transmission line realignment off a section of ridgeline, removal of access along Flakney Creek Road and replacement with access via internal access track (on the Cotter Property), reduction in substation and operational facilities.

The Development Corridor – Permanent Met Masts are a buffered area completely encapsulating the Indicative Development Footprint – Permanent Met Masts. It totals approximately 52 hectares, has been assessed in full within this BDAR.

1.2.2 Indicative Development Footprint Information

The Indicative Development Footprints will be subject to a range of disturbances as described earlier in this section, as well as in **Section 5.0**. The total indicative impact zone (e.g. all ground disturbance) associated with the wind farm specific components of the Project, excluding the external road upgrades and permanent met masts, is termed Indicative Development Footprint – Wind Farm (approximately 489 hectares) (refer to **Figure 1.3**).

The total indicative impact zone associated with the external road upgrades is termed Indicative Development Footprint – External Roads (approximately 19 hectares) (refer to **Figure 1.3**). The total indicative impact zone associated with the permanent met masts is termed Indicative Development Footprint – Permanent Met Masts (approximately 9 hectares) (refer to **Figure 1.3**).

Equivalent to the *Development Footprint* terminology in the BAM, the Indicative Development Footprints (516.91 hectares) is a combination of the *Indicative Development Footprint – Wind Farm*, the *Indicative Development Footprint – External Roads* and the *Indicative Development Footprint – Permanent Met Masts*, and comprises the entirety of the Indicative Development Footprint for the Rye Park Wind Farm. The Indicative Development Footprint – External Roads and Indicative Development Footprint – Permanent Met Masts have been identified separately as they were not previously considered as part of the existing approval (SSD 6693) process. All development footprints are indicative as they will be finalised through further detailed design once a turbine and preferred contractor(s) is selected. RPRE is committed to further avoiding and minimising additional biodiversity values where feasible.

This report focuses on the Indicative Development Footprints as per BAM (OEH 2017), however the consideration of biodiversity values and surveys completed have considered the wider Development Corridors. Due to the nature of wind farm projects, whereby their impact footprints are finalised at such late stages, understanding the values in surrounding land is essential to facilitating avoidance and minimisation measures through refinement and finalisation of the Development Footprints. Thus, where relevant to do so, Umwelt present and discuss the extent of work completed in the Development Corridors.

The Indicative Development Footprint – Wind Farm and Indicative Development Footprint – Permanent Met Masts occur entirely within the Development Corridors. They comprise disturbed agricultural land and remnant vegetation consistent with the Development Corridors. Intact vegetation is generally in moderate to good condition, including vegetation that has been exposed to historical disturbances, while other areas of agricultural land that have been exposed to more intensive land use practises are dominated by non-native vegetation. Such land uses include but are not limited to ploughing, tilling and pasture improvements. Broadly speaking, components of the Indicative Development Footprint – Wind Farm are consistent with the Biodiversity Assessment and Biodiversity Assessment Addendum (NGH Environmental 2014 and 2016a), comprising wind turbines, internal access tracks, transmission lines, underground cabling and a range of associated infrastructure. However there are a number of changes in the Indicative Development Footprint – Wind Farm: the extent of civil disturbance has increased, the transmission line has been modified from a 330 kV to 132 kV, turbines have been removed and a section of transmission line has been moved off a section of ridgeline.

The Indicative Development Footprint – Permanent Met Masts, which were not previously considered, are all adjacent to the Indicative Development Footprint – Wind Farm, extending slightly beyond this layer.

The Indicative Development Footprint – External Roads comprises a network of existing public roads, including sealed and un-sealed sections, as well as the associated roadside corridors. In certain sections, it extends beyond the public corridors and into private land; this is particularly the case along bends and narrow sections of road. The extent to which this occurs is considered to be minor and in most cases it extends on to land holdings already involved with the Project. In such circumstances, the private land is predominantly disturbed agricultural land, consistent with the description above for Indicative Development Footprint – Wind Farm. As external roads were not previously assessed as part of the Biodiversity Assessment and Biodiversity Assessment Addendum (NGH Environmental 2014 and 2016a), the Indicative Development Footprint – External Roads is a new component of the Project. The main modification report addresses specifically where impacts from the external road extend into private land, including specific discussion about landholder agreements.

A summary of the Development Corridor landscape is provided below in **Table 1.5**.

Table 1.5 Development Corridors Location in the Landscape

Development Corridor Location in the Landscape	
IBRA Bioregions	NSW – South Western Slopes South Eastern Highlands
IBRA Subregions	Inland Slopes (NSW – South Western Slopes) Murrumbateman (South Eastern Highlands)
Mitchell Landscape	Dalton Hills (Dominant) Boorowa Volcanics (Sub-dominant)
LGA	Hilltops Council Upper Lachlan Shire Council Yass Valley Council

Development Corridor Location in the Landscape	
Development Corridors	1,327 hectares (comprising approximately 1,275 hectares of Development Corridor – Wind Farm and approximately 52 hectares of Development Corridor – Permanent Met Masts)
Indicative Development Footprints	516.82 hectares (comprising approximately 489 hectares of Indicative Development Footprint – Wind Farm, approximately 9 hectares of Indicative Development Footprint – Permanent Met Masts and approximately 19 Indicative Development Footprint – External Roads)
Assessment Type	Linear
Lot and DP	Lot 1 DP1032776, Lot 7002 DP1033069, Lot 7001 DP1033069, Lot 14 DP1055548, Lot 3 DP1066057, Lot 2 DP1066057, Lot 4 DP1066057, Lot 1 DP1097507, Lot 4 DP1116827, Lot 7 DP1116827, Lot 5 DP1116827, Lot 1 DP113987, Lot 7301 DP1147658, Lot 1072 DP1170091, Lot 1 DP1178422, Lot 2 DP1179016, Lot 1 DP1179016, Lot 2 DP1180139, Lot 210 DP118333, Lot 4 DP1186361, Lot 1 DP1235519, Lot 1 DP134035, Lot 5 DP1810, Lot 11 DP1810, Lot 29 DP1810, Lot 28 DP1810, Lot 3 DP1810, Lot 2 DP1810, Lot 7 DP1810, Lot 1 DP1810, Lot 13 DP1810, Lot 1 DP1810, Lot 6 DP1810, Lot 12 DP1810, Lot 4 DP1810, Lot 12 DP1810, Lot 1 DP1810, Lot 30 DP1810, Lot 10 DP1810, Lot 9 DP1810, Lot 7 DP1810, Lot 8 DP1810, Lot 6 DP1810, Lot 8 DP1810, Lot 11 DP1810, Lot 5 DP1810, Lot 4 DP1810, Lot 6 DP1810, Lot 11 DP1810, Lot 10 DP1810, Lot 13 DP1810, Lot 9 DP1810, Lot 10 DP1810, Lot 3 DP1810, Lot 8 DP1810, Lot 4 DP1810, Lot 2 DP1810, Lot 12 DP1810, Lot 7 DP1810, Lot 3 DP1810, Lot 9 DP1810, Lot 2 DP1810, Lot 13 DP1810, Lot 5 DP1810, Lot 1 DP211320, Lot 1 DP219928, Lot 1 DP222985, Lot 2 DP321183, Lot 1 DP321183, Lot A DP417584, Lot F DP418849, Lot E DP418849, Lot A DP439287, Lot N DP439287, Lot B DP439287, Lot D DP440134, Lot 1 DP575206, Lot 1 DP580999, Lot 1 DP591580, Lot 2 DP591580, Lot 1 DP601586, Lot 2 DP601586, Lot 1 DP611058, Lot 4 DP661683, Lot 118 DP664556, Lot 2 DP705655, Lot 1 DP705655, Lot 107 DP754099, Lot 59 DP754099, Lot 80 DP754099, Lot 132 DP754099, Lot 117 DP754099, Lot 130 DP754099, Lot 105 DP754099, Lot 108 DP754099, Lot 101 DP754099, Lot 131 DP754099, Lot 129 DP754099, Lot 179 DP754099, Lot 60 DP754102, Lot 54 DP754102, Lot 64 DP754102, Lot 176 DP754102, Lot 55 DP754102, Lot 71 DP754102, Lot 185 DP754102, Lot 11 DP754102, Lot 12 DP754102, Lot 23 DP754102, Lot 90 DP754102, Lot 78 DP754102, Lot 24 DP754102, Lot 175 DP754102, Lot 30 DP754102, Lot 182 DP754102, Lot 79 DP754102, Lot 91 DP754102, Lot 92 DP754102, Lot 29 DP754102, Lot 134 DP754102, Lot 176 DP754102, Lot 63 DP754103, Lot 144 DP754106, Lot 143 DP754106, Lot 339 DP754106, Lot 341 DP754106, Lot 338 DP754106, Lot 361 DP754106, Lot 222 DP754122, Lot 223 DP754122, Lot 209 DP754122, Lot 32 DP754122, Lot 60 DP754135, Lot 61 DP754135, Lot 85 DP754135, Lot 321 DP754135, Lot 77 DP754135, Lot 62 DP754136, Lot 95 DP754136, Lot 15 DP754136, Lot 128 DP754136, Lot 137 DP754136, Lot 150 DP754136, Lot 129 DP754136, Lot 72 DP754136, Lot 110 DP754136, Lot 47 DP754136, Lot 131 DP754136, Lot 161 DP754136, Lot 147 DP754136, Lot 158 DP754136, Lot 48 DP754136, Lot 46 DP754136, Lot 92 DP754136, Lot 56 DP754136, Lot 61 DP754136, Lot 55 DP754136, Lot 117 DP754136, Lot 152 DP754136, Lot 96 DP754136, Lot 88 DP754136, Lot 162 DP754136, Lot 79 DP754136, Lot 93 DP754136, Lot 103 DP754136, Lot 49 DP754136, Lot 63 DP754136, Lot 126 DP754136, Lot 94 DP754136, Lot 108 DP754136, Lot 17 DP754136, Lot 34 DP754136, Lot 149 DP754136, Lot 135 DP754136, Lot 89 DP754136, Lot 18 DP754136, Lot 142 DP754136, Lot 131 DP754136, Lot 144 DP754136, Lot 143 DP754136, Lot 147 DP754136, Lot 127 DP754136, Lot 269 DP754142, Lot 281 DP754142, Lot 214 DP754145, Lot 242 DP754145, Lot 240 DP754145, Lot 118 DP754145, Lot 235 DP754145, Lot 154 DP754145, Lot 128 DP754145, Lot 145 DP754145, Lot 193 DP754145, Lot 239 DP754145, Lot 249 DP754145, Lot 3 DP818601, Lot 1 DP89902, Lot 1 DP945681, Lot B DP948754

1.3 Purpose

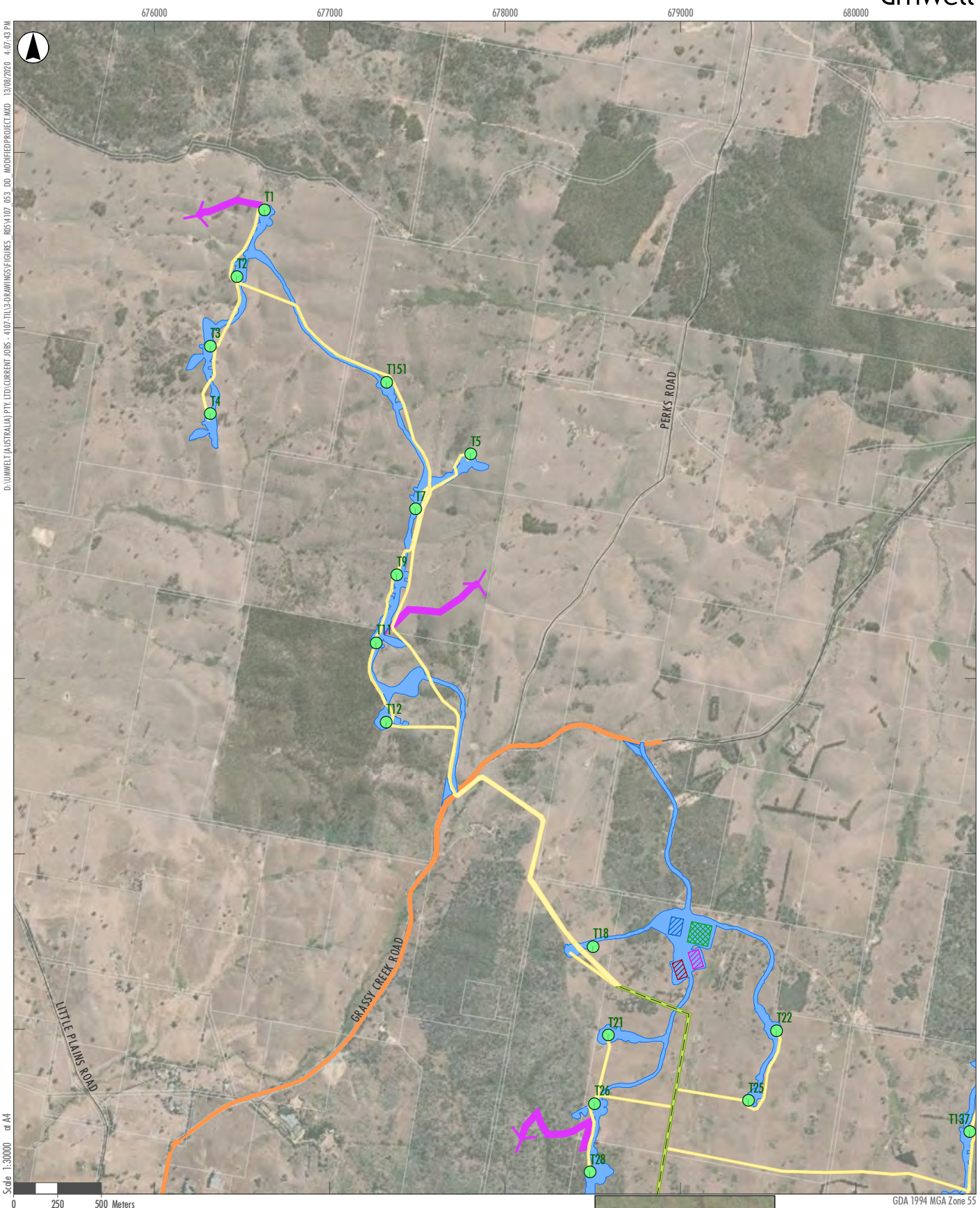
As the Proposed Modification seeks to modify a major project approval it requires a BAM assessment under the *Biodiversity Conservation Act 2016* (BC Act).

This Biodiversity Development Assessment Report (BDAR) has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of RPRE for two purposes.

Initially a BDAR was being prepared to satisfy Consent Condition 20(b) for the original project (refer to **Section 1.1.2.1** above), to "calculate biodiversity offset credit liabilities for the development in accordance with the *Framework for Biodiversity Assessment* under the *NSW Biodiversity Offset Policy for Major Projects*". Verbal and written consultation occurred with the Biodiversity Conservation Division (BCD) (formerly the Office of Environment and Heritage), DPIE and DoEE to seek approval to use the BAM in order to calculate the credit liability.

Secondly, the BDAR also assesses the potential biodiversity impacts of the Proposed Modification in accordance with the BAM.

This report provides the findings of the Biodiversity Assessment of the Proposed Modification, not the original proposed development. It does however provide comparison of the current project against the approved project where relevant. It addresses the specific requirements of the BAM (OEH 2017a).



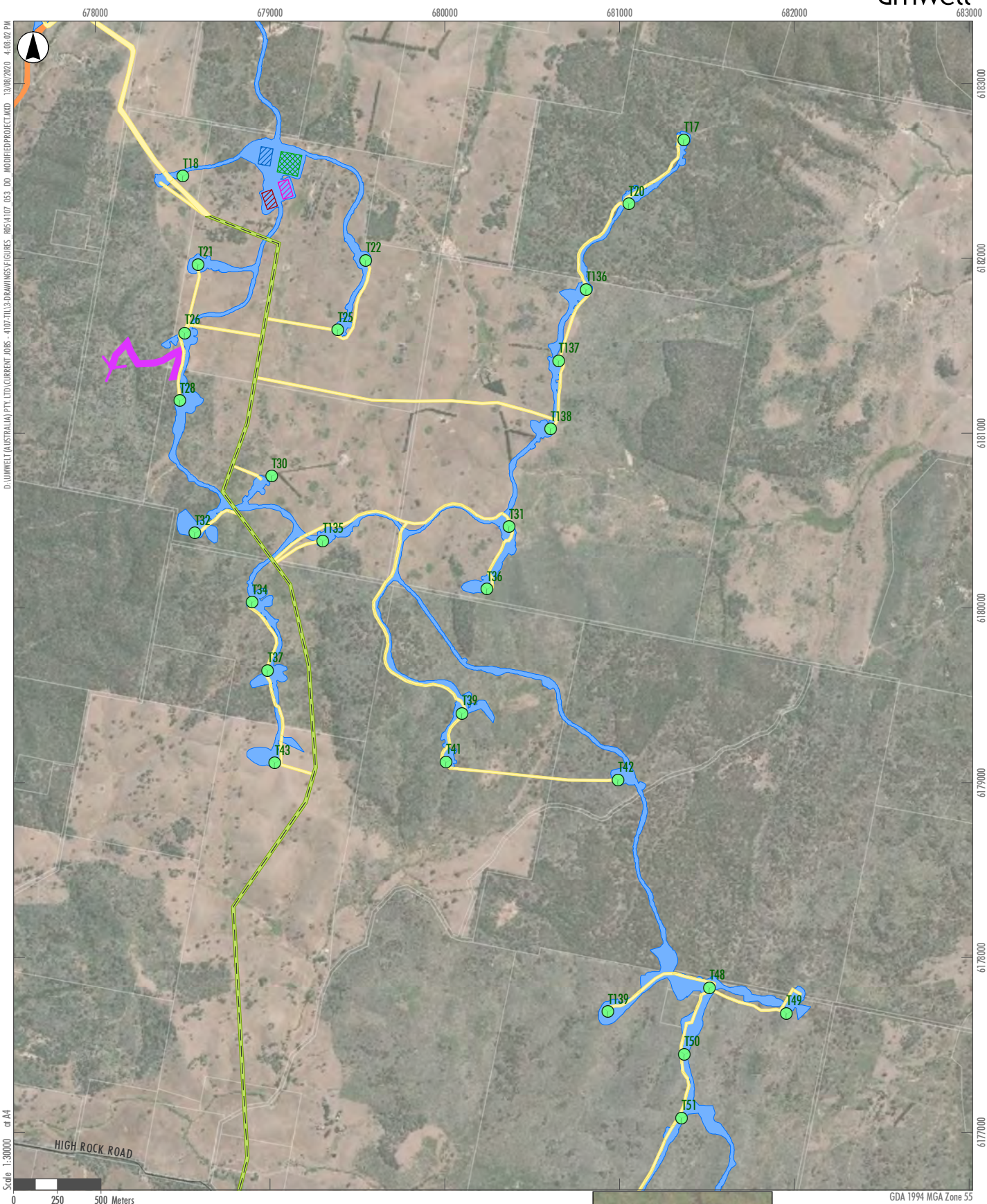
Legend

- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Civil Disturbance Area
- Total UG 33kV Electrical Disturbance Area
- 33 kV OHL Easement
- Modified Turbine Locations
- 33 kV OHL
- Concrete Batch Plant
- Construction Compound
- Laydown Area
- Project Related Buildings

FIGURE 1.3.a

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



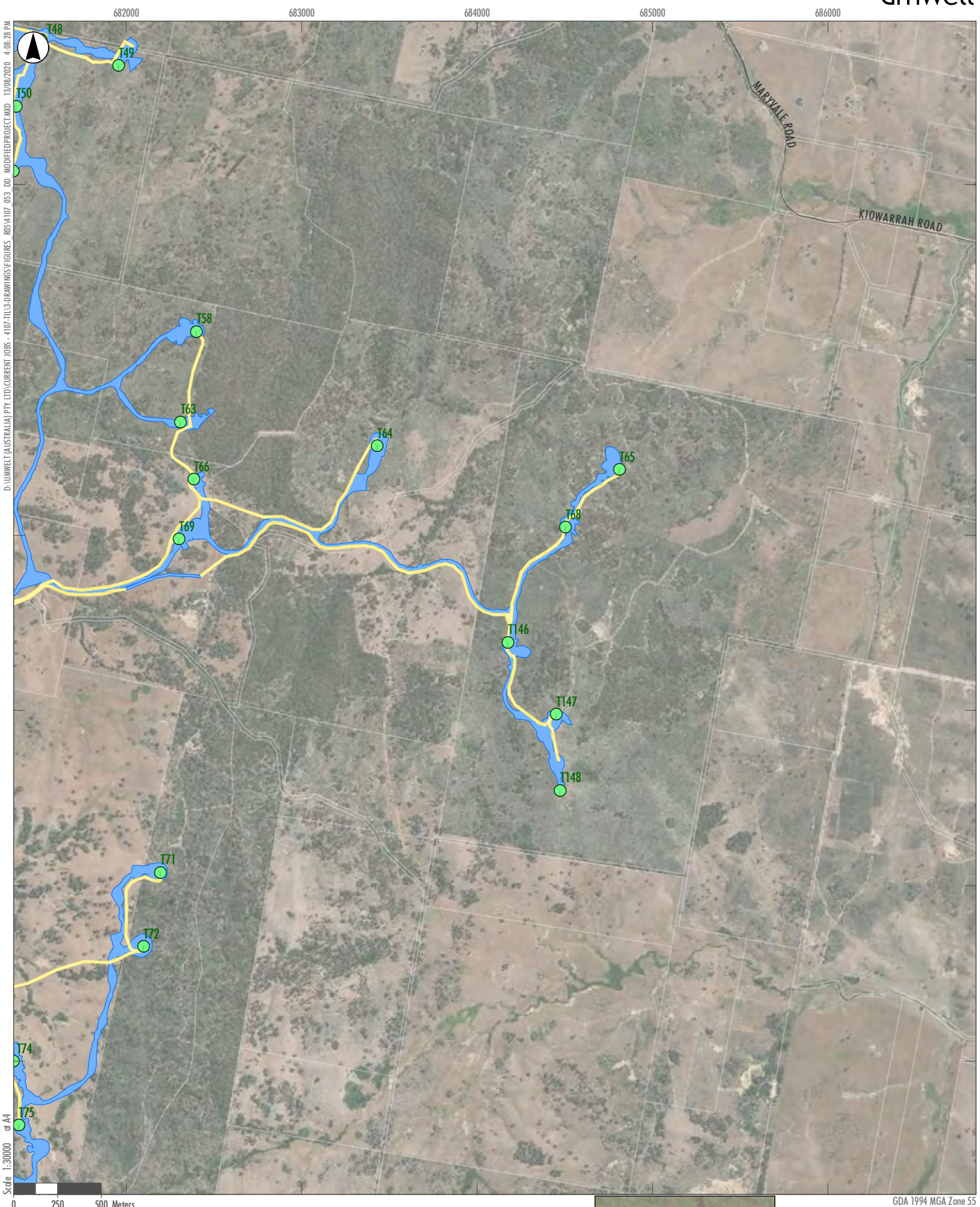
Legend

- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Civil Disturbance Area
- Total UG 33kV Electrical Disturbance Area
- 33 kV OHL Easement
- Modified Turbine Locations
- 33 kV OHL
- Concrete Batch Plant
- Construction Compound
- Laydown Area
- Project Related Buildings

FIGURE 1.3.b

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Civil Disturbance Area
- Total UG 33kV Electrical Disturbance Area
- Modified Turbine Locations

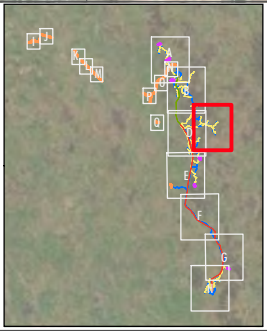
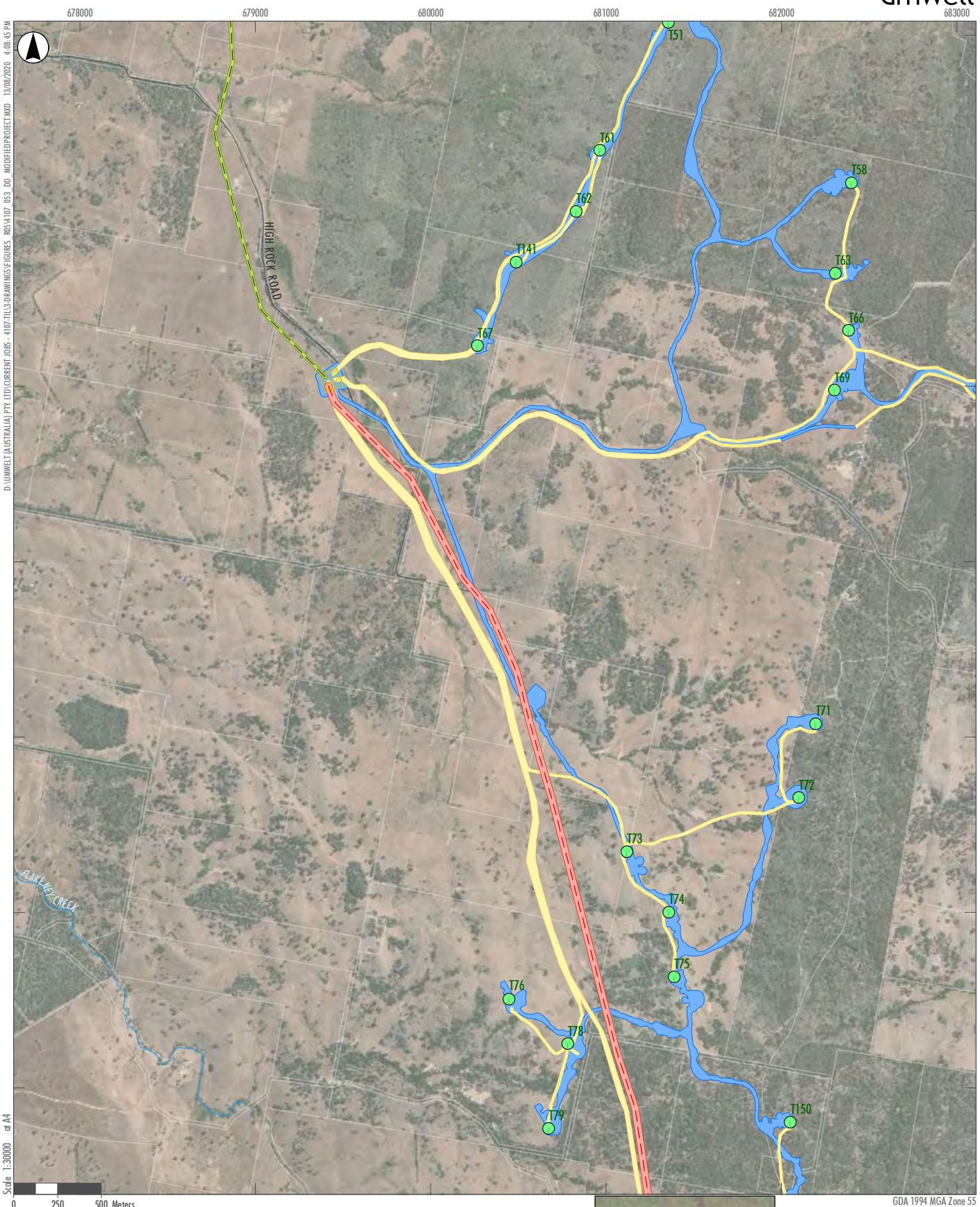


FIGURE 1.3.c

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



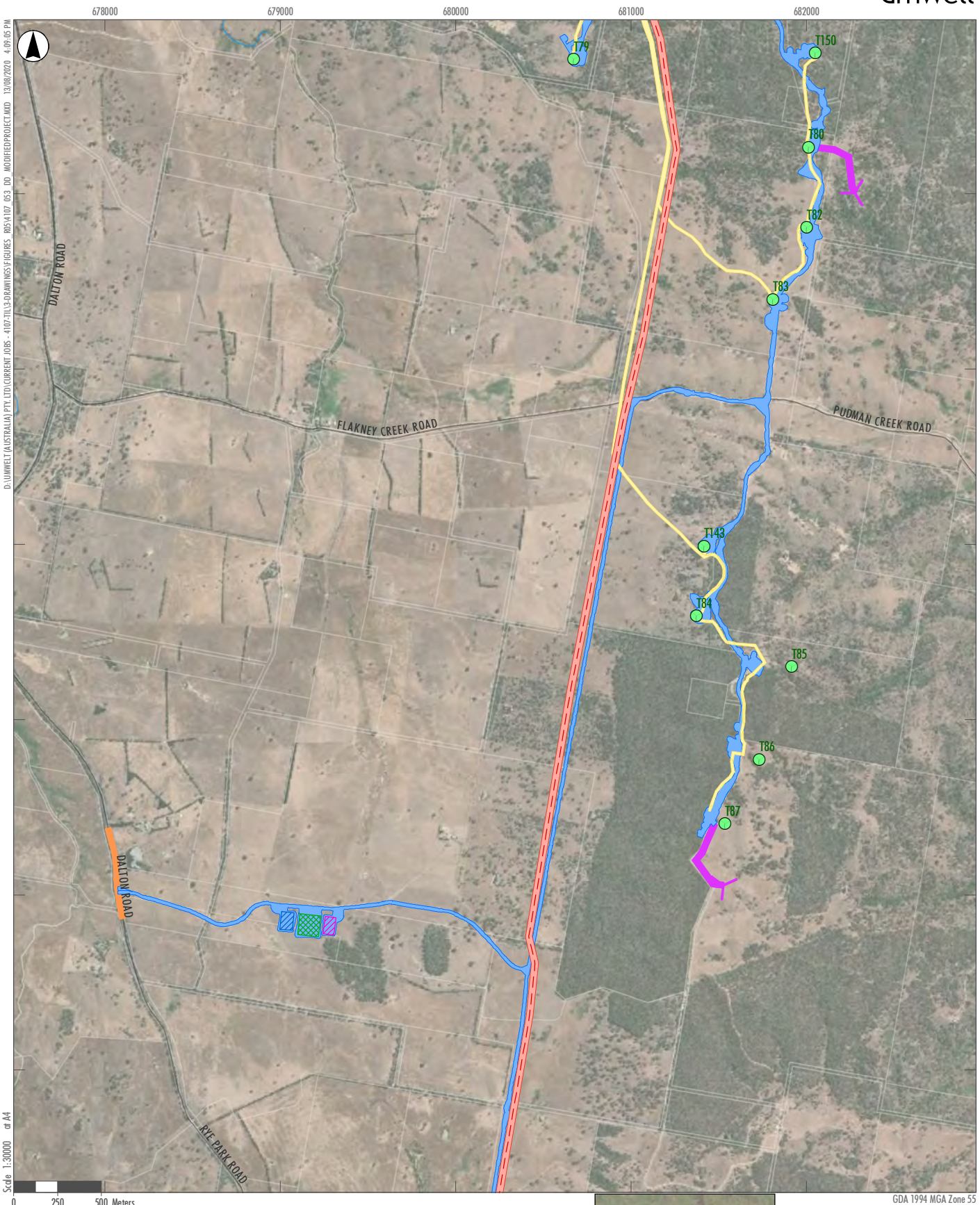
Legend

- Civil Disturbance Area
- Total UG 33kV Electrical Disturbance Area
- Up to 330 kV Transmission Line Easement
- 33 kV OHL Easement
- Modified Turbine Locations
- Up tp 330 kV Transmission Line
- 33 kV OHL
- Substations

FIGURE 1.3.d

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Civil Disturbance Area
- Total UG 33kV Electrical Disturbance Area
- Up to 330 kV Transmission Line Easement
- Modified Turbine Locations
- Up tp 330 kV Transmission Line
- Concrete Batch Plant
- Construction Compound
- Laydown Area

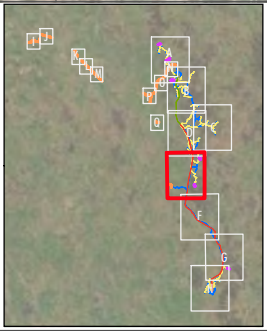


FIGURE 1.3.e

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Civil Disturbance Area
- Up to 330 kV Transmission Line Easement
- Up tp 330 kV Transmission Line

FIGURE 1.3.f

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

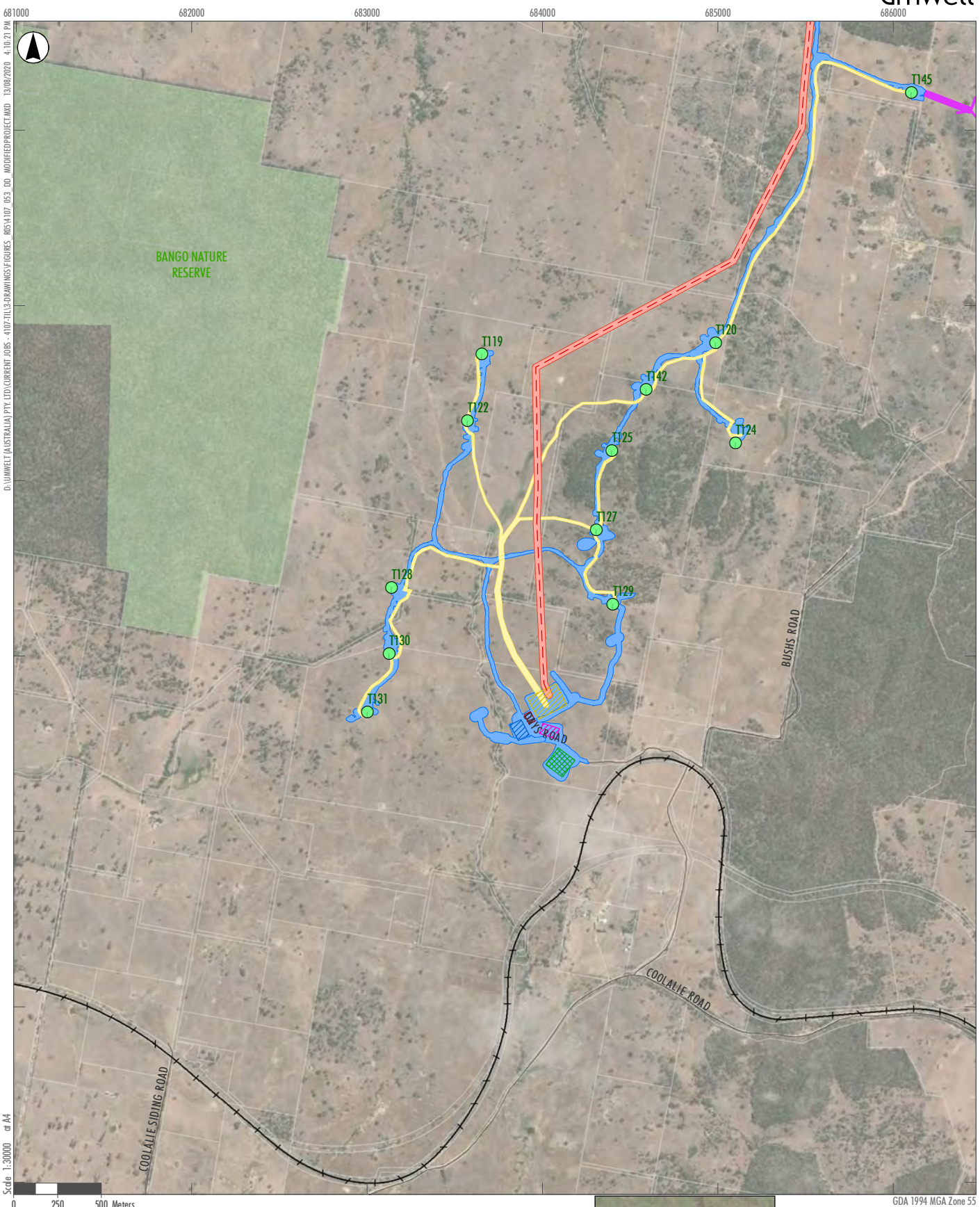
Legend

- Indicative Development Footprint - Permanent Met Masts
- Civil Disturbance Area
- Total UG 33kV Electrical Disturbance Area
- Up to 330 kV Transmission Line Easement
- Modified Turbine Locations
- Up tp 330 kV Transmission Line

FIGURE 1.3.g

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprint - Permanent Met Masts
- Civil Disturbance Area
- Total UG 33kV Electrical Disturbance Area
- Up to 330 kV Transmission Line Easement
- Modified Turbine Locations
- Up tp 330 kV Transmission Line
- Concrete Batch Plant
- Construction Compound
- Laydown Area
- Substations
- Project Related Buildings

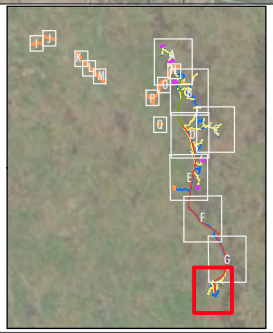


FIGURE 1.3.h

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

FIGURE 1.3.i

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

FIGURE 1.3.j

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 1.3.k

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Scale 1:10000 at A4

FIGURE 1.3.I

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

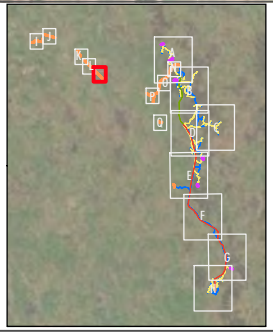
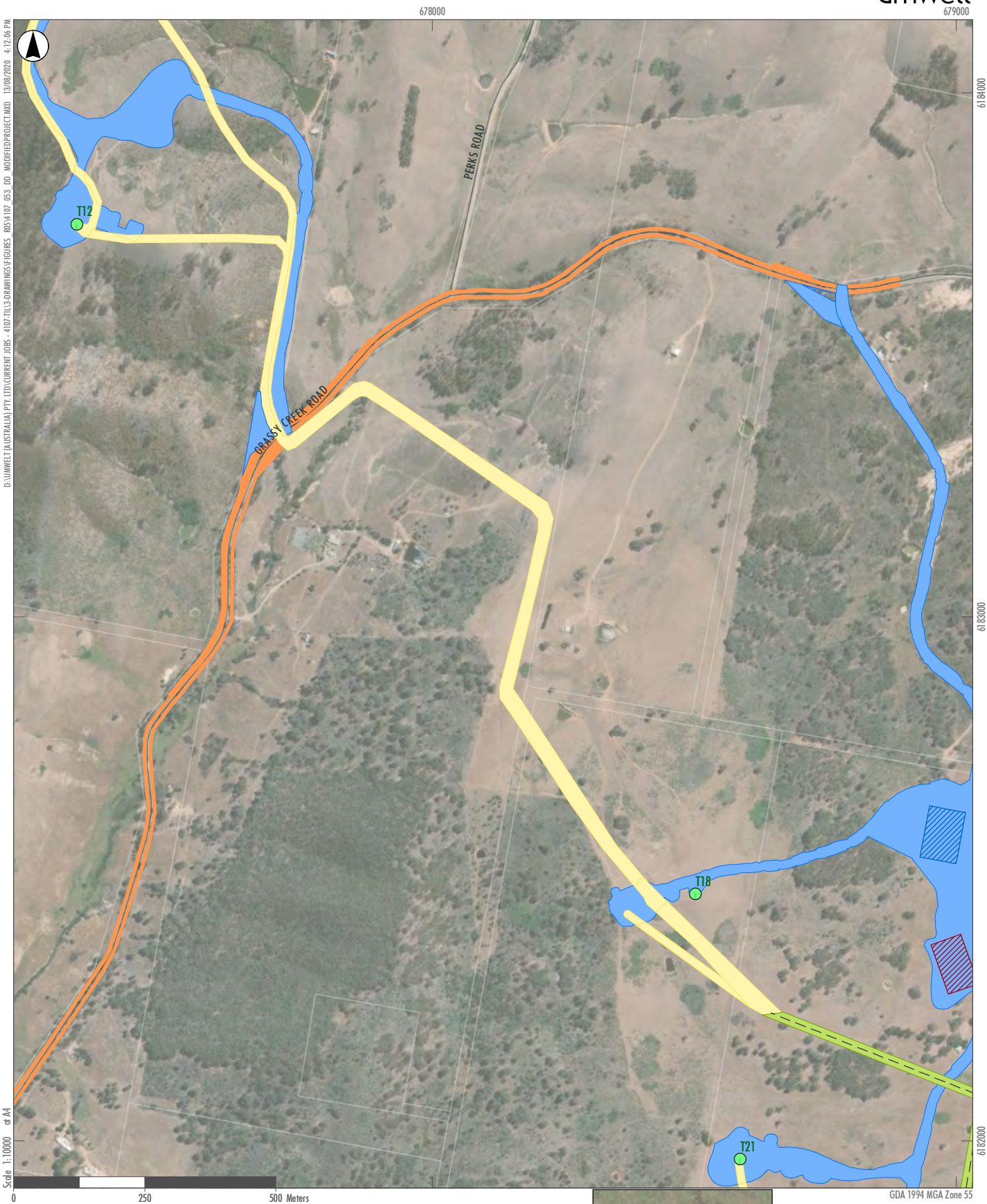


FIGURE 1.3.m

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprint - External Roads
- Civil Disturbance Area
- Total UG 33kV Electrical Disturbance Area
- 33 kV OHL Easement
- Modified Turbine Locations
- 33 kV OHL
- Laydown Area
- Project Related Buildings

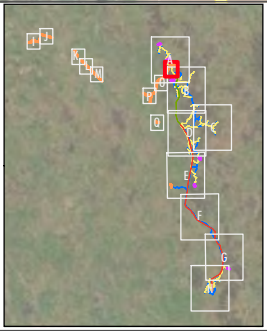


FIGURE 1.3.n

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 1.3.o

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

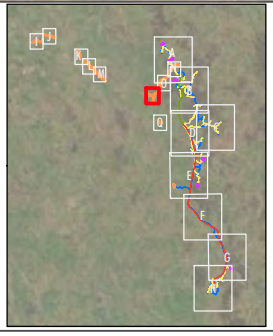


FIGURE 1.3.p

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

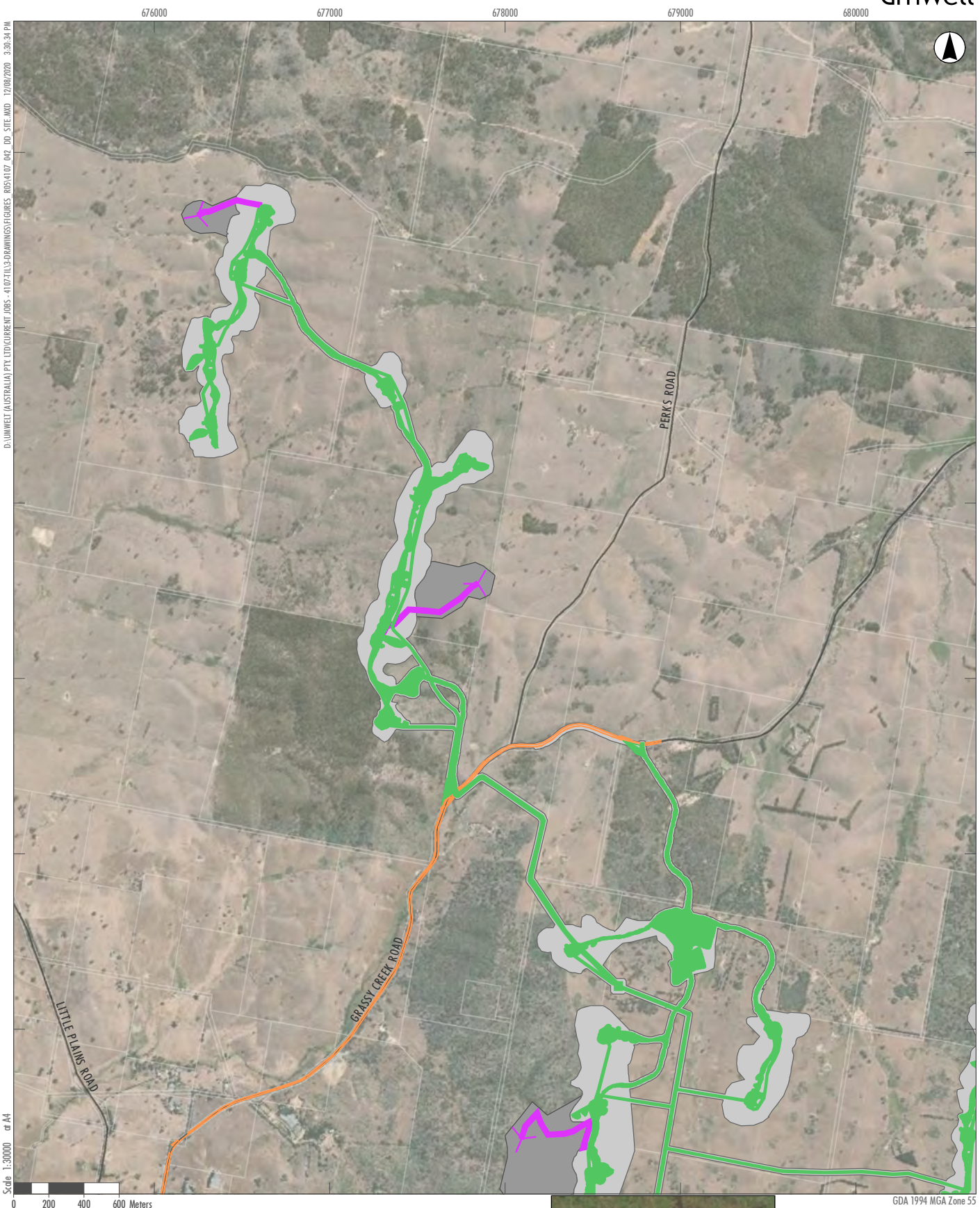
Legend

Indicative Development Footprint - External Roads

FIGURE 1.3.q

Modified Project Overview

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Property Boundaries
- Watercourses
- Major Roads

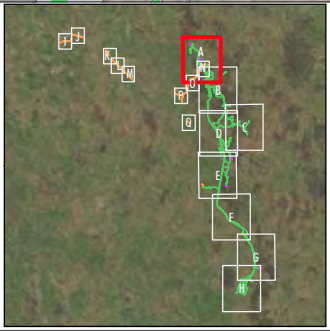
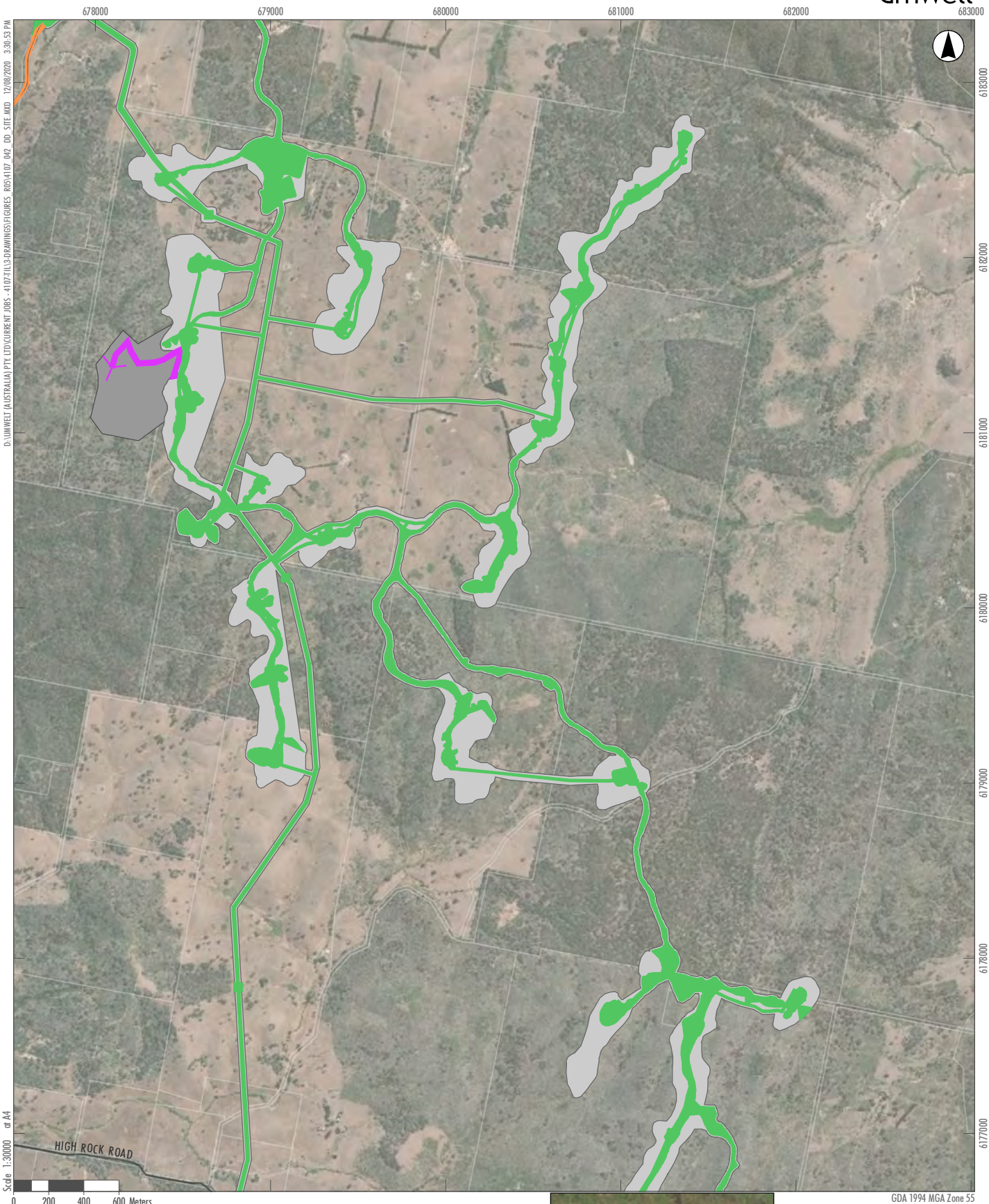


FIGURE 1.4.a

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Property Boundaries
- Watercourses
- Major Roads

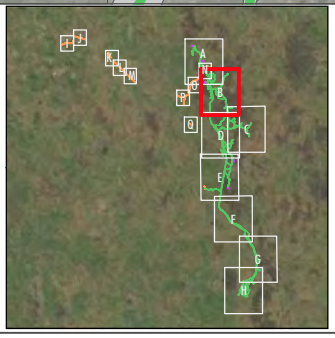


FIGURE 1.4.b

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 1.4.c

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

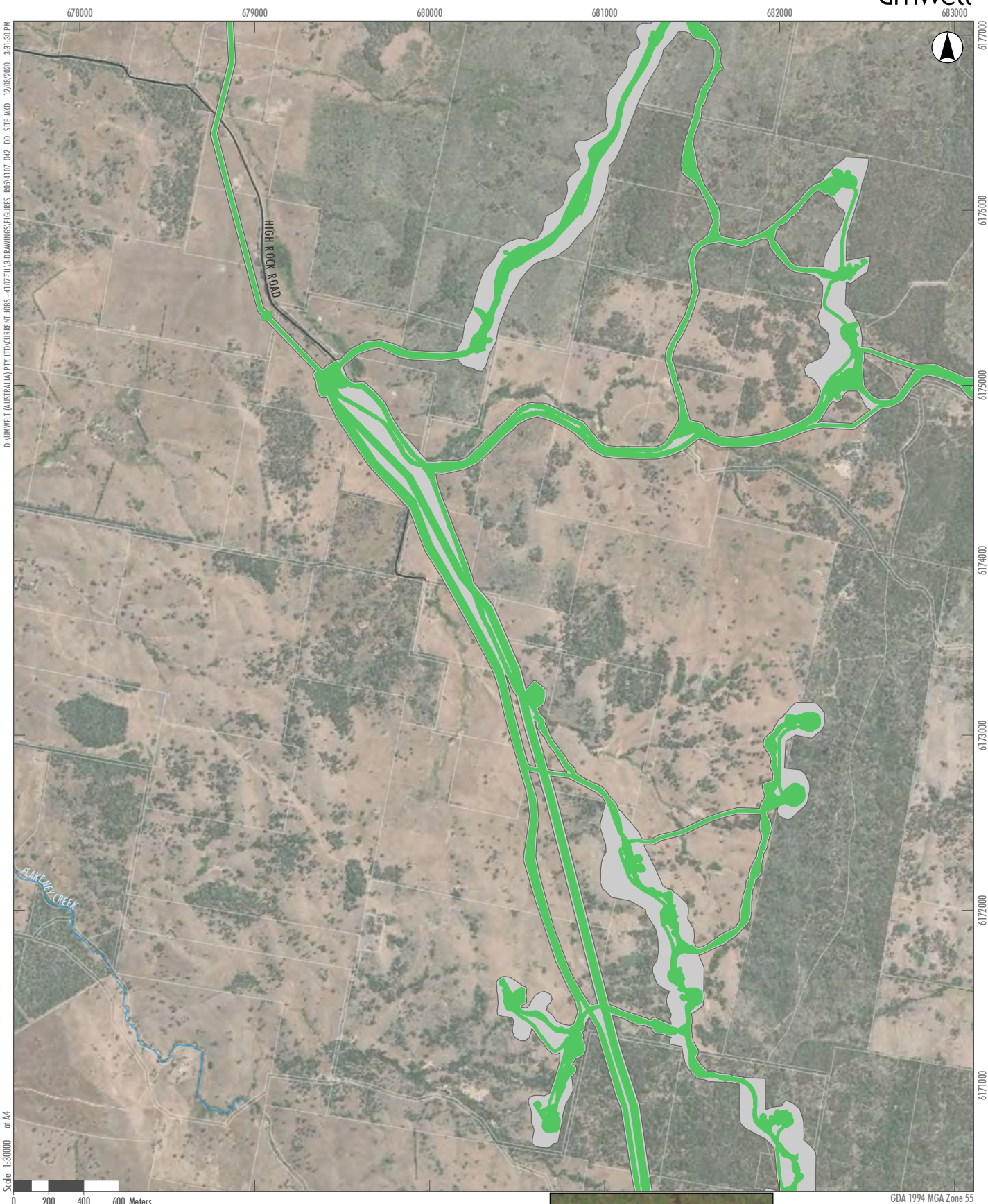
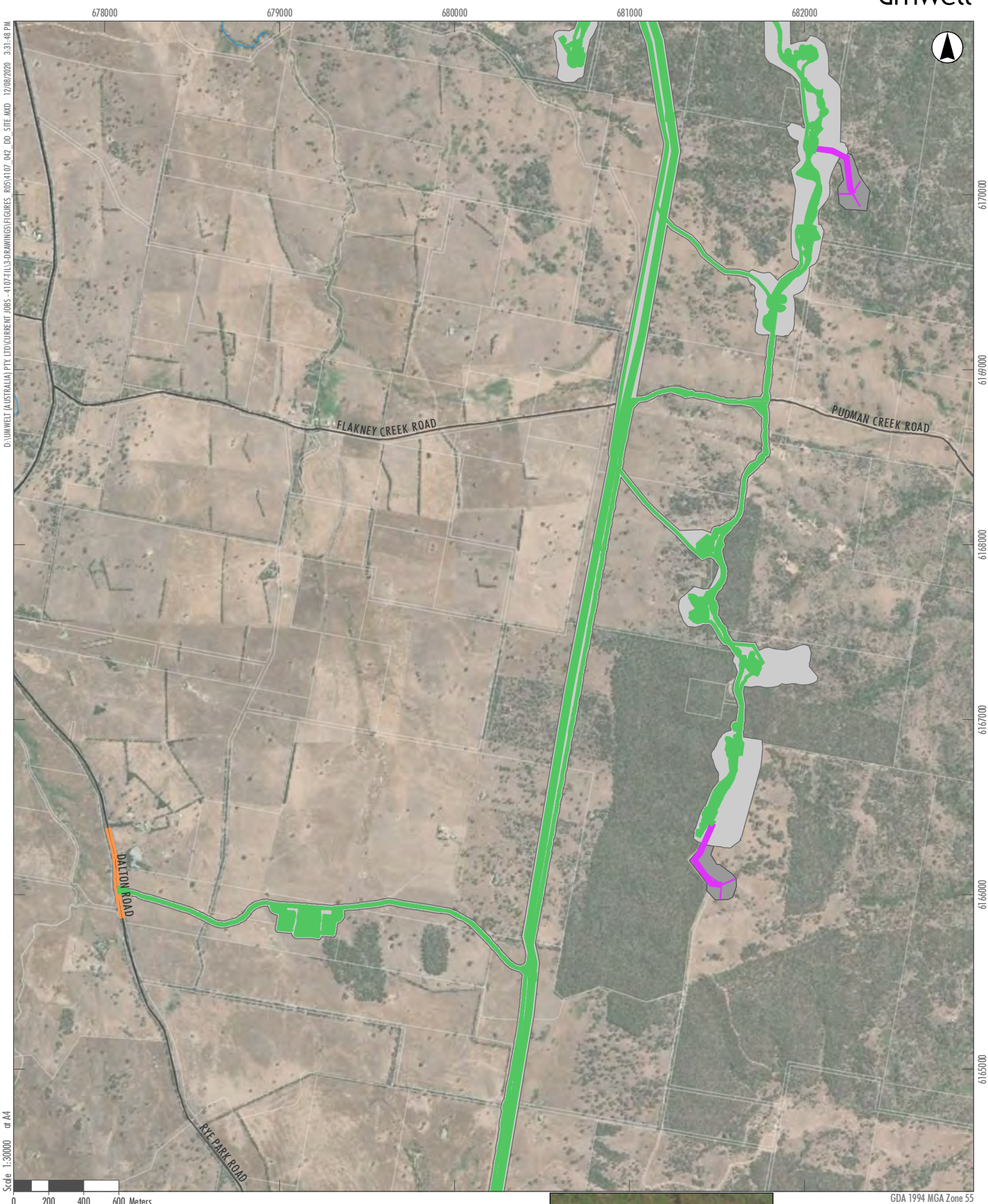


FIGURE 1.4.d

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Scale 1:30000 at A4

Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Property Boundaries
- Watercourses
- Major Roads

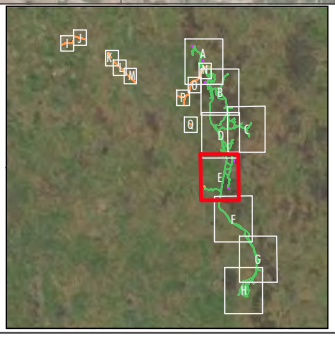


FIGURE 1.4.e

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

Scale 1:30000 at A4

Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm
- Property Boundaries
- Watercourses
- Major Roads

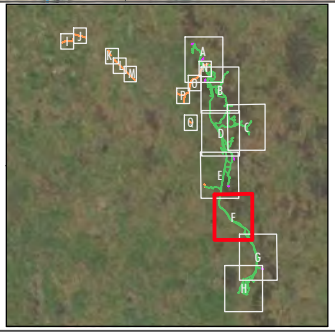


FIGURE 1.4.f

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

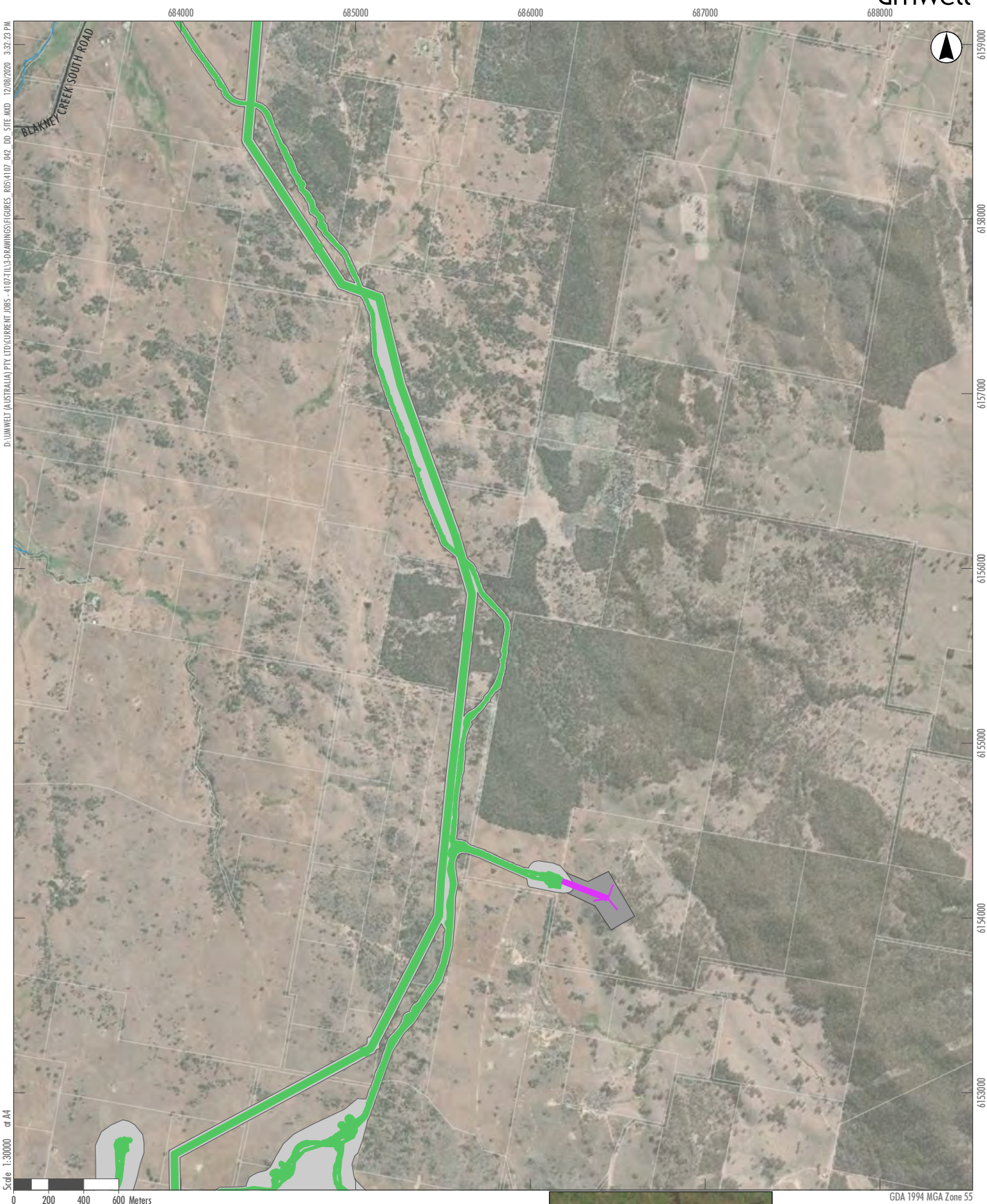
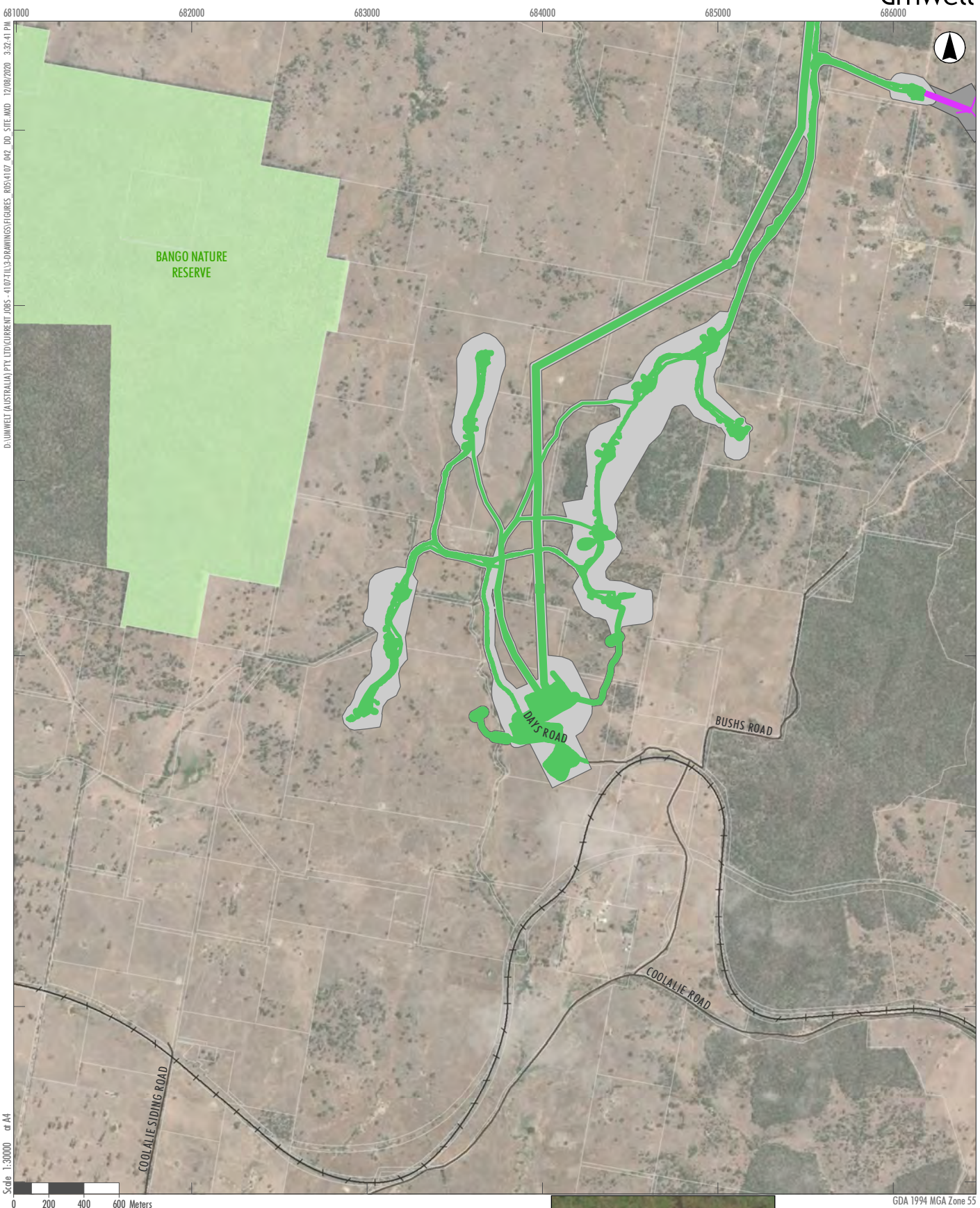


FIGURE 1.4.g

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Property Boundaries
- Watercourses
- Major Roads
- Railways
- Nature Reserves

FIGURE 1.4.h

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads
- Property Boundaries
- Watercourses
- Major Roads
- Railways

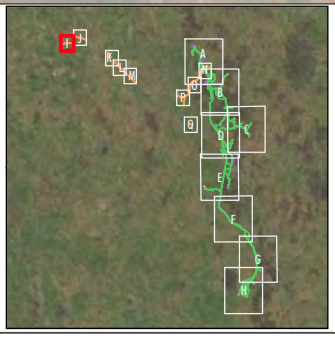


FIGURE 1.4.i

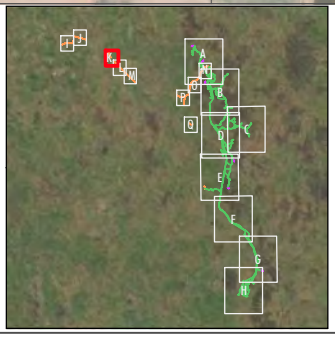
Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 1.4.j

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Scale 1:10000 at A4

D:\UMWELT (AUSTRALIA) PTY LTD\CURRENT JOBS - 4107-TIL3-DRAWINGS\FIGURES_R05\4107_042_DD_SITE.MXD 12/08/2020 3:33:36 PM

FIGURE 1.4.k

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 1.4.I

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

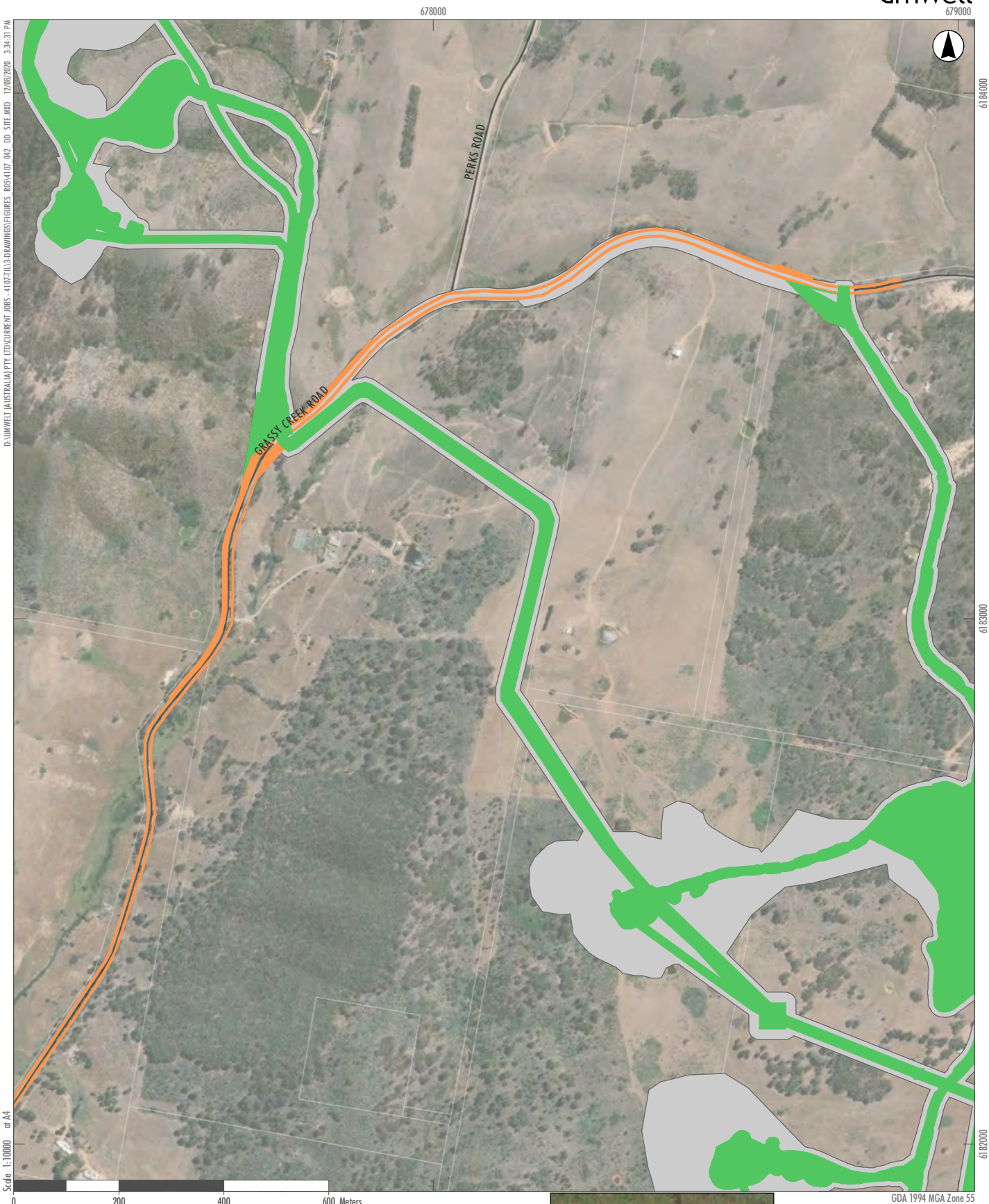
Legend

- Indicative Development Footprint - External Roads
- Property Boundaries
- Watercourses
- Major Roads

FIGURE 1.4.m

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - External Roads
- Property Boundaries
- Watercourses
- Major Roads

FIGURE 1.4.n

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 1.4.o

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

Scale 1:10000 at A4

Legend

- Indicative Development Footprint - External Roads
- Property Boundaries
- Watercourses
- Major Roads

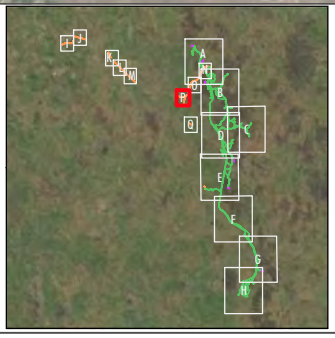


FIGURE 1.4.p

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 1.4.q

Site Map

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

1.4 Key Resources, Policies and Documents

The following key resources, policies and documents were used during the preparation of this BDAR for the Proposed Modification:

Government Guidelines and Resources

- Biodiversity Assessment Method Order 2017
- Biodiversity Assessment Method Operational Manual (Stage 2) (DPIE 2019a)
- Biodiversity Assessment Method Calculator
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities –Working Draft (DEC 2004)
- The Native Vegetation of Boorowa Shire – June 2002 (NSW NPWS 2002)
- BCD Atlas of NSW Wildlife database and mapping tool (BCD 2020a), accessed February 2020
- Threatened Biodiversity Data Collection (TBDC) (BCD 2020b), accessed February 2020
- Vegetation Information System (VIS) Classification Database (BCD 2020c), accessed February 2020
- NSW Guide to Surveying Threatened Plants (OEH 2016) and
- Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (DAWE 2020), accessed February 2020
- Draft Koala Habitat Protection Guideline and Koala Habitat Protection SEPP (DPIE 2020).

Project Assessments

- Biodiversity Assessment Rye Park Wind Farm (NGH Environmental 2014)
- Rye Park Wind Farm, Response to Submissions (SSD 6693) (Trust Power 2016)
- Biodiversity Assessment Addendum – Rye Park Wind Farm (NGH Environmental 2016a)
- Rye Park Wind Farm Crimson Spider Orchid surveys 2016: 16-035 (NGH Environmental 2016b)
- Rye Park Wind Farm Golden Sun Moth 2016 Survey Results: 16-432 (NGH Environmental 2017)
- Rye Park Wind Farm EPBC Preliminary Documentation: EPBC Ref: 2014/7163, 21 April 2017 (Epuron 2017a)
- Rye Park Wind Farm EPBC Preliminary Documentation – Supplementary Report: 7 August 2017 (Epuron 2017b)
- Rye Park Wind Farm State Development Consent (SD 6693) (DPE 2017)
- Rye Park Wind Farm Federal Approval (EPBC 2014/7163) (DoEE 2017)
- Rye Park Wind Farm Modification, Preliminary Biodiversity Assessment Method (BAM) Calculations (NGH Environmental 2019).
- Rye Park Wind Farm, Project Overview and Proposed Modification (Tilt Renewables 2019).

1.5 Report Preparation

This BDAR was prepared by Bill Wallach (Senior Ecologist), with review and technical direction from Travis Peake (National Ecology Leader). Field surveys were undertaken by a range of suitably experienced and qualified Umwelt ecologists under the supervision of Bill Wallach.

Table 1.6 below outlines the details of the Accredited BAM Assessors involved in the survey, calculations and reporting for the Project.

Table 1.6 Accredited BAM Assessors and their Role on this Project

Name	Assessor ID	Role
Travis Peake *National Ecology Leader*	BAAS17081	Review of BDAR, review of BAM calculator, technical direction and consultation with BCD
Bill Wallach *Senior Ecologist*	BAAS17068	BDAR Preparation, BAM calculator application, field surveys and consultation with BCD
David Moore *Principal Ecologist*	BAAS18066	Field surveys
Ryan Parsons *Senior Ecologist – Botanist*	BAAS17048	Field surveys
Jonathan Carr *Senior Ecologist*	BAAS18009	Field surveys
Philippa Fagan *Ecologist*	BAAS18117	Field surveys
Natasha Crook *Ecologist*	BAAS18043	Field surveys

2 Methods

2.1 Landscape Features and Site Context

Landscape features such as IBRA bioregions, IBRA subregions, NSW Mitchell Landscape regions, native vegetation extent within a 500 metre buffer area, cleared areas, rivers, streams, wetlands and connectivity features were identified within the Development Corridors, where appropriate, in accordance with Section 4.2 of the BAM (OEH 2017a).

The Project meets the definition of a Linear Shaped Development under BAM (OEH 2017), being "*development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length*". While there are certain components of the Project that may not appear linear in nature (e.g. turbine locations, substations etc), the extent of the Project spans approximately 36 kilometres from its northern to southern tip with the majority of the Development Corridor consisting of linear corridors.

Determining the 'Site Context' of the Indicative Development Footprints was calculated by assessing the native vegetation cover and patch size within the Indicative Development Footprints in accordance with Section 4.3 of the BAM (OEH 2017a).

The 500 metre buffer area was determined based on the outer extent of the Indicative Development Footprints because a centreline was not applicable for the Project as per Section 4.2.1.2 of the BAM (OEH 2017a). This approach to the 500 metre buffer actually covers a greater area than it would have if it was prepared based on a centreline. The buffer covers the full extent of all works associated with the Project, and includes the full extent of the Development Corridors. Native vegetation cover was mapped within the buffer area using the regional mapping product, Native Vegetation of Boorowa Shire – June 2002 (NSW NPWS 2002) combined with post-processed LiDAR data.

Specifically, raw C3 LAS (LiDAR) files were processed from the following NSW LPI Elevation Program datasets.

- Boorowa201709-LID1
- Yass201709-LID1

The C3 Classified LiDAR was used to differentiate Medium and High Vegetation from ground surface using the height attributes of the LAS point cloud.

This was then further processed, to remove obvious outliers, incorrect LAS classification, buildings, water features and other "noise" from the classified data. Holes were removed from the vegetation polygons using a 2 m tolerance and mapped polygons less than 200 m^2 in size were removed from the data. This final process was undertaken to reduce the occurrence of single trees being mapped as native vegetation.

2.2 Native Vegetation Assessment

2.2.1 Literature and Database Review

A review of previous documents and reports relevant to the Project was undertaken. The information obtained was used to inform survey design, and also to assist in the assessment of potentially occurring threatened and migratory species, endangered populations (EPs) and TECs. The full extent of resources, policies and documents utilised during this review are described above in **Section 1.4**.

2.2.2 Floristic and Vegetation Integrity Survey

Floristic and vegetation integrity surveys were undertaken over the following survey periods:

- 27 to 29 September 2017
- 16 to 19 October 2017
- 22 to 25 January 2018
- 12 to 16 and 26 to 28 February 2018
- 1 to 2 March 2018
- 3 to 4 April 2019
- 11 to 15 November 2019
- 13 to 15 January 2020
- 5 to 6 February 2020
- 1 to 3 July 2020.

A total of 52 BAM Vegetation Integrity Plots, 65 rapid vegetation assessments and ten box-gum woodland assessments were conducted during the surveys undertaken for this assessment (refer to **Figure 2.1**). Every attempt was made to complete the BAM Vegetation Integrity Plots within the Indicative Development Footprints in the first instance and Development Corridors in the second. However, in some circumstances BAM Vegetation Integrity Plots are situated outside of the Indicative Development Footprints, either in the Development Corridors or wider area (refer to **Figure 2.1**). This occurred where avoidance and minimisation measures have been employed by RPRE, some circumstances where modifications to the Project occurred following surveys of a particular area, and to a lesser extent where additional surveys were not required following consideration of the previous ecological surveys. Floristic and vegetation integrity data was collected in accordance with minimum requirements under the BAM (OEH 2017a).

Table 2.1 presents a summary of the extent of vegetation zones identified within the Development Corridors and Indicative Development Footprints.

Table 2.2 outlines the floristic survey effort relevant to the Indicative Development Footprints. Full clarity around the extent to which BAM Vegetation Integrity Plots were completed within the Indicative Development Footprints, within 50 metres and between 50 and 100 metres from the Indicative Development Footprints is provided in **Table 2.2**. It is important to note that all native vegetation zones have met the plot survey requirement in accordance with BAM (OEH 2017). In fact, the majority of

vegetation zones have had more than the minimum number of BAM Vegetation Integrity Plots completed within them. Umwelt has deliberately used all BAM Vegetation Integrity Plot data in the application of the online BAM Credit Calculator as it captures the full variation of vegetation zones across the Project and it provides a more detailed assessment of the biodiversity values to be impacted by the Project.

In relation to oversampling completed by Umwelt in vegetation zones of biodiversity significance:

- Vegetation Zone 3 required four plots based on the minimum plot requirement of BAM (OEH 2017a); Umwelt used data from seven plots within the BAMCC, presenting a surplus of three plots.
- Vegetation Zone 4 required three plots based on the minimum plot requirement of BAM (OEH 2017a); Umwelt used data from five plots within the BAMCC, presenting a surplus of two plots.
- Vegetation Zone 5 required five plots based on the minimum plot requirement of BAM (OEH 2017a); Umwelt used data from eight plots within the BAMCC, presenting a surplus of three plots.

The total minimum BAM Vegetation Integrity Plot requirement is 37, whilst Umwelt completed 52 throughout extensive field surveys. This presents a surplus of 15 BAM Vegetation Integrity Plots. All of these plots were entered into the BAMCC.

Table 2.1 Summary of Vegetation Zones within the Development Corridors and Indicative Development Footprints

Veg. Zone	Plant Community Type (PCT) *Condition Class*	Area within Development Corridors			Area within Indicative Development Footprints			
		Development Corridor – Wind Farm (ha)	Development Corridor – Permanent Masts (ha)	Total in Development Corridors (ha)	Indicative Development Footprint – Wind Farm (ha)	Indicative Development Footprint – Permanent Masts (ha)	Indicative Development Footprint – External Roads (ha)	Total Indicative Development Footprints (ha)
1	289 Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good Condition*	0.05	0	**0.05**	0.05	0	0.73	**0.78**
2	335 Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good Condition*	14.58	0	**14.58**	5.50	0	0	**5.50**

Veg. Zone	Plant Community Type (PCT) *Condition Class*	Area within Development Corridors			Area within Indicative Development Footprints			
		Development Corridor – Wind Farm (ha)	Development Corridor – Permanent Masts (ha)	Total in Development Corridors (ha)	Indicative Development Footprint – Wind Farm (ha)	Indicative Development Footprint – Permanent Masts (ha)	Indicative Development Footprint – External Roads (ha)	Total Indicative Development Footprints (ha)
3	350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Moderate to Good Condition*	36.33	0	**36.33**	18.75	0	1.33	**20.08**
4	350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Derived Native Grassland*	32.71	0	**32.71**	16.85	0	0.67	**17.52**

Veg. Zone	Plant Community Type (PCT) *Condition Class*	Area within Development Corridors			Area within Indicative Development Footprints			
		Development Corridor – Wind Farm (ha)	Development Corridor – Permanent Masts (ha)	Total in Development Corridors (ha)	Indicative Development Footprint – Wind Farm (ha)	Indicative Development Footprint – Permanent Masts (ha)	Indicative Development Footprint – External Roads (ha)	Total Indicative Development Footprints (ha)
5	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Moderate Good Condition*	217.26	12.40	**229.66**	83.59	0.47	0.75	**84.81**
6	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Derived Native Grassland*	449.75	17.93	**467.68**	169.08	4.76	0.15	**173.99**

Veg. Zone	Plant Community Type (PCT) *Condition Class*	Area within Development Corridors			Area within Indicative Development Footprints			
		Development Corridor – Wind Farm (ha)	Development Corridor – Permanent Masts (ha)	Total in Development Corridors (ha)	Indicative Development Footprint – Wind Farm (ha)	Indicative Development Footprint – Permanent Masts (ha)	Indicative Development Footprint – External Roads (ha)	Total Indicative Development Footprints (ha)
7	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Acacia Shrubland*	21.99	6.68	**28.67**	7.25	1.25	0.03	**8.53**
8	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Sifton Bush Shrubland*	249.13	9.94	**259.07**	82.80	1.12	0.26	**84.18**

Veg. Zone	Plant Community Type (PCT) *Condition Class*	Area within Development Corridors			Area within Indicative Development Footprints			
		Development Corridor – Wind Farm (ha)	Development Corridor – Permanent Masts (ha)	Total in Development Corridors (ha)	Indicative Development Footprint – Wind Farm (ha)	Indicative Development Footprint – Permanent Masts (ha)	Indicative Development Footprint – External Roads (ha)	Total Indicative Development Footprints (ha)
9	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Argyle Apple Forest*	3.79	0	**3.79**	0.61	0	0.01	**0.62**
10	Non-native Vegetation	229.71	4.07	**233.78**	90.23	1.35	13.60	**105.18**
-	Nil (incl. roads, tracks and waterbodies)	20.27	0.96	**21.23**	14.26	0.22	1.24	**15.72**
TOTAL		**1,275.57**	**51.98**	**1,327.55**	**488.97**	**9.17**	**18.77**	**516.91**

Table 2.2 Adequacy of Floristic and Vegetation Integrity Survey in the Indicative Development Footprints

Veg. Zone	Plant Community Type (PCT) *Condition Class*	Area within Indicative Development Footprints				Number of Floristic and Vegetation Integrity Plots				
		Indicative Development Footprint – Wind Farm (ha)	Indicative Development Footprint – Permanent Masts (ha)	Indicative Development Footprint – External Roads (ha)	Total Indicative Development Footprints (ha)	Required[1]	Total Completed	Completed Within (±10m) Indicative Development Footprints	Completed within 50m of Indicative Development Footprints	Completed >50m of Indicative Development Footprints
1	289 Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good Condition*	0.05	0	0.73	**0.78**	1	1	1	-	-
2	335 Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good Condition*	5.50	0	0	**5.50**	3	3	2	-	1

Veg. Zone	Plant Community Type (PCT) *Condition Class*	Area within Indicative Development Footprints				Number of Floristic and Vegetation Integrity Plots				
		Indicative Development Footprint – Wind Farm (ha)	Indicative Development Footprint – Permanent Masts (ha)	Indicative Development Footprint – External Roads (ha)	Total Indicative Development Footprints (ha)	Required[1]	Total Completed	Completed Within (±10m) Indicative Development Footprints	Completed within 50m of Indicative Development Footprints	Completed >50m of Indicative Development Footprints
3	350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Moderate to Good Condition*	18.75	0	1.33	**20.08**	4	7	2	2	3
4	350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Derived Native Grassland*	16.85	0	0.67	**17.52**	3	5	3	-	2

Veg. Zone	Plant Community Type (PCT) *Condition Class*	Area within Indicative Development Footprints				Number of Floristic and Vegetation Integrity Plots				
		Indicative Development Footprint – Wind Farm (ha)	Indicative Development Footprint – Permanent Masts (ha)	Indicative Development Footprint – External Roads (ha)	Total Indicative Development Footprints (ha)	Required[1]	Total Completed	Completed Within (±10m) Indicative Development Footprints	Completed within 50m of Indicative Development Footprints	Completed >50m of Indicative Development Footprints
5	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Moderate Good Condition*	83.59	0.47	0.75	**84.81**	5	8	3	1	4
6	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Derived Native Grassland*	169.08	4.76	0.15	**173.99**	6	10	9	-	1

Veg. Zone	Plant Community Type (PCT) *Condition Class*	Area within Indicative Development Footprints				Number of Floristic and Vegetation Integrity Plots				
		Indicative Development Footprint – Wind Farm (ha)	Indicative Development Footprint – Permanent Masts (ha)	Indicative Development Footprint – External Roads (ha)	Total Indicative Development Footprints (ha)	Required[1]	Total Completed	Completed Within (±10m) Indicative Development Footprints	Completed within 50m of Indicative Development Footprints	Completed >50m of Indicative Development Footprints
7	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Acacia Shrubland*	7.25	1.25	0.03	**8.53**	3	4	3	1	-
8	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Sifton Bush Shrubland*	82.80	1.12	0.26	**84.18**	5	5	2	1	2

Veg. Zone	Plant Community Type (PCT) *Condition Class*	Area within Indicative Development Footprints				Number of Floristic and Vegetation Integrity Plots				
		Indicative Development Footprint – Wind Farm (ha)	Indicative Development Footprint – Permanent Masts (ha)	Indicative Development Footprint – External Roads (ha)	Total Indicative Development Footprints (ha)	Required[1]	Total Completed	Completed Within (±10m) Indicative Development Footprints	Completed within 50m of Indicative Development Footprints	Completed >50m of Indicative Development Footprints
9	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Argyle Apple Forest*	0.61	0	0.01	0.62	1	2	-	1	1
10	Non-native Vegetation	90.23	1.35	13.60	105.18	6	7	4	-	3
-	Nil (incl. roads, tracks and waterbodies)	14.26	0.22	1.24	15.72	NA	NA	NA	NA	NA
Total		**488.97**	**9.17**	**18.77**	**516.91**	**37**	**52**	**29**	**6**	**17**

[1] Calculated against the Indicative Development Footprints

At each floristic and vegetation integrity plot, data was recorded according to Section 5 of the BAM (OEH 2017a). This involved setting out 20 x 50 m, 20 x 20 m and 1 x 1m plots. The location of each plot was recorded using a hand-held GPS with accuracy of ± 5 m. The Map Grid of Australia (MGA) coordinate system was used.

At each plot/transect, roughly 45 to 60 minutes was spent searching for all vascular flora species present within the 20 x 20 m plot. Searches of each 20 x 20 m plot were generally undertaken through parallel transects from one side of the plot to another. Most effort was spent on examining the groundcover, which usually supported well over half of the species present, however the composition of any shrub, mid-storey, canopy and emergent layers were also thoroughly examined.

For each flora species recorded in the plot, the following data was collected in accordance with Table 2 of the BAM (OEH 2017a):

- stratum/layer in which the species occurs
- growth form
- scientific name and common name
- cover
- abundance.

At each vegetation integrity plot the following attributes were recorded in accordance with the BAM (OEH 2017a) to determine the condition of the vegetation zone:

- ***Composition*** - native plant species richness by growth form (within the 20 x 20 m plot)
- ***Structure*** – estimate foliage cover of native and exotic species by growth form (within the 20 x 20 m plot)
- ***Function*** (within the 20 x 50 m plot) including, number of large trees, presence or otherwise of tree stem size classes, presence or otherwise of canopy species regeneration, length of fallen logs, percentage cover for litter (recorded from five 1 x 1 m plots), number of trees with hollows and high threat exotic cover.

2.2.2.1 BAM Vegetation Integrity Plot Location

Following the submission by BCD which refers to the number of BAM Vegetation Integrity Plots that occur outside of the Indicative Development Footprints, further detail is provided below.

Umwelt sampled a larger number of BAM Vegetation Integrity Plots than was required based on the minimum requirement of BAM (OEH 2017a). This was a result of capturing various project design changes since commencing the work in 2017. Many of the design changes were in relation to efforts of avoidance and or minimisation, as is required in BAM. Umwelt used all BAM Vegetation Integrity Plots undertaken for the Project within the online BAM Credit Calculator (BAMCC), despite these presenting a surplus of survey effort.

As discussed further below, many of the BAM Vegetation Integrity Plots are located short distances outside of the Indicative Development Footprints and should therefore actually be considered as within. This would bring down the percentage of plots noted as being situated outside of the Indicative Development Footprints and also the mean distance from the footprints. It is important to note that BAM Vegetation

Integrity Plots were assigned to a particular vegetation zone when the zone has 'considerable homogeneity' and that, based on field inspections, plots would not unduly mis-represent the characteristics of the overall vegetation zone.

Further detail on this is provided below:

- Vegetation Zone 3: Six of the seven plots are identified as occurring outside of Indicative Development Footprints. Three of these six (Plots 31, 6 and DMRP1) however are **located less than 20 metres outside the Indicative Development Footprints**. As this is less than the width of a BAM Vegetation Integrity Plot, these should be deemed within. **The inclusion of these BAM Vegetation Integrity Plots would result in four of the seven plots being within, the minimum plot requirement for Vegetation Zone 3 is just three (OEH 2017).**

- Vegetation Zone 4: Three of the five plots are identified as occurring outside of Indicative Development Footprints. One of these is **less than one metre (0.3 metre) out of the Indicative Development Footprints**. This should be deemed within. **The inclusion of this plot would result in three plots being within, the minimum plot requirement for Vegetation Zone 4 is three (OEH 2017).**

- Vegetation Zone 5: Six of the eight plots are identified as occurring outside of Indicative Development Footprints. Two of these six occur **outside by less than 45 metres** (Plot 8 is 26 metres outside, Plot 42 is 42 metres outside). This distance is less than the length of the BAM 20 x 50m plot. Two of the six occur outside by **less than 150 metres** (Plot 13 is 80 metres outside and Plot 26 is 140 metres outside). These four plots should be deemed within due to proximity, extent of work completed, complex nature of the project and multiple revisions of the project over several years. **The inclusion of the first two plots discussed would result in four plots being within the Indicative Development Footprints. While the inclusion of the four plots discussed would result in six plots being within, the minimum plot requirement for Vegetation Zone 5 is five (OEH 2017).**

Irrespective of the information provided above, Umwelt completed an additional survey within July 2020. This survey was undertaken to capture minor amendments to the Developments Corridors and Indicative Development Footprints (discussed above in **Section 1.2**), in doing so Umwelt completed eight additional BAM Vegetation Integrity Plots within the revised transmission line alignment and proposed permanent met masts. We have considered the location of these eight BAM Vegetation Integrity Plots in the analysis above.

2.2.3 Meandering Transects

Meandering transects were walked across vast areas of the Development Corridors and Indicative Development Footprint – External Roads. Where they were undertaken, they were typically two surveyors who walked in parallel 10 metres apart. Opportunistic sampling of vegetation was undertaken along these transects, particularly searches for threatened and otherwise significant species, endangered populations and TECs. Meandering transects enable floristic sampling across a much larger area than plot-based survey, especially where the number of plots is limited. Records along transects supplemented floristic sampling carried out in plots, however the data collected are in the form of presence records, rather than semi-quantitative cover abundance scores.

Meandering transects provided invaluable information on spatial patterns of vegetation that informed vegetation community mapping of the Development Corridors and Indicative Development Footprint – External Roads.

2.2.4 Digital Aerial Photograph Interpretation

Digital imagery (aerial photographs) of the Development Corridors and Indicative Development Footprints – External Roads was viewed prior to and after vegetation survey to identify spatial patterns in vegetation, land use and landscape features. These informed field survey design and implementation, ecological assessment and vegetation community mapping of the Development Corridors.

Vegetation communities in the Development Corridors and Indicative Development Footprint – External Roads were mapped on-screen overlaying the figures and in Manifold using a ESRI Aerial Imagery Basemap 2020 and DigitalGlobe, Vivid – Australia 01/04/2016 aerial photograph. Mapping was undertaken using the Manifold System 8.0 GIS.

2.2.5 Plant Identification and Nomenclature Standards

All vascular plants recorded or collected within plots and on meandering transects were identified using keys and nomenclature in Harden (1992, 1993, 2000 and 2002). Where known, changes to nomenclature and classification have been incorporated into the results. Updated taxonomy has been derived from PlantNET (Botanic Gardens Trust 2020).

Common names used follow Harden (1992, 1993, 2000 and 2002) where available, and draw on other sources such as local names where these references do not provide a common name.

For herbaceous and graminoid species, such as those belonging to the families Asteraceae, Orchidaceae, Cyperaceae and Poaceae, the allocation of specimens to sub-specific levels was at times affected by the availability of adequate flowering or fruiting material. Where necessary specimens were forwarded to either the National Herbarium of New South Wales or Australian National Herbarium if they were considered to be of potential significance or importance.

2.2.6 Vegetation Mapping

Vegetation mapping was undertaken using best-practice techniques to delineate vegetation communities across the Development Corridors and Indicative Development Footprint – External Roads. The vegetation mapping exercise and product provided in this BDAR is a result of two key components:

- "*updating the baseline mapping of the vegetation*…*within the final disturbance area*" as per Consent Condition 20(a) (SSD 6693), and

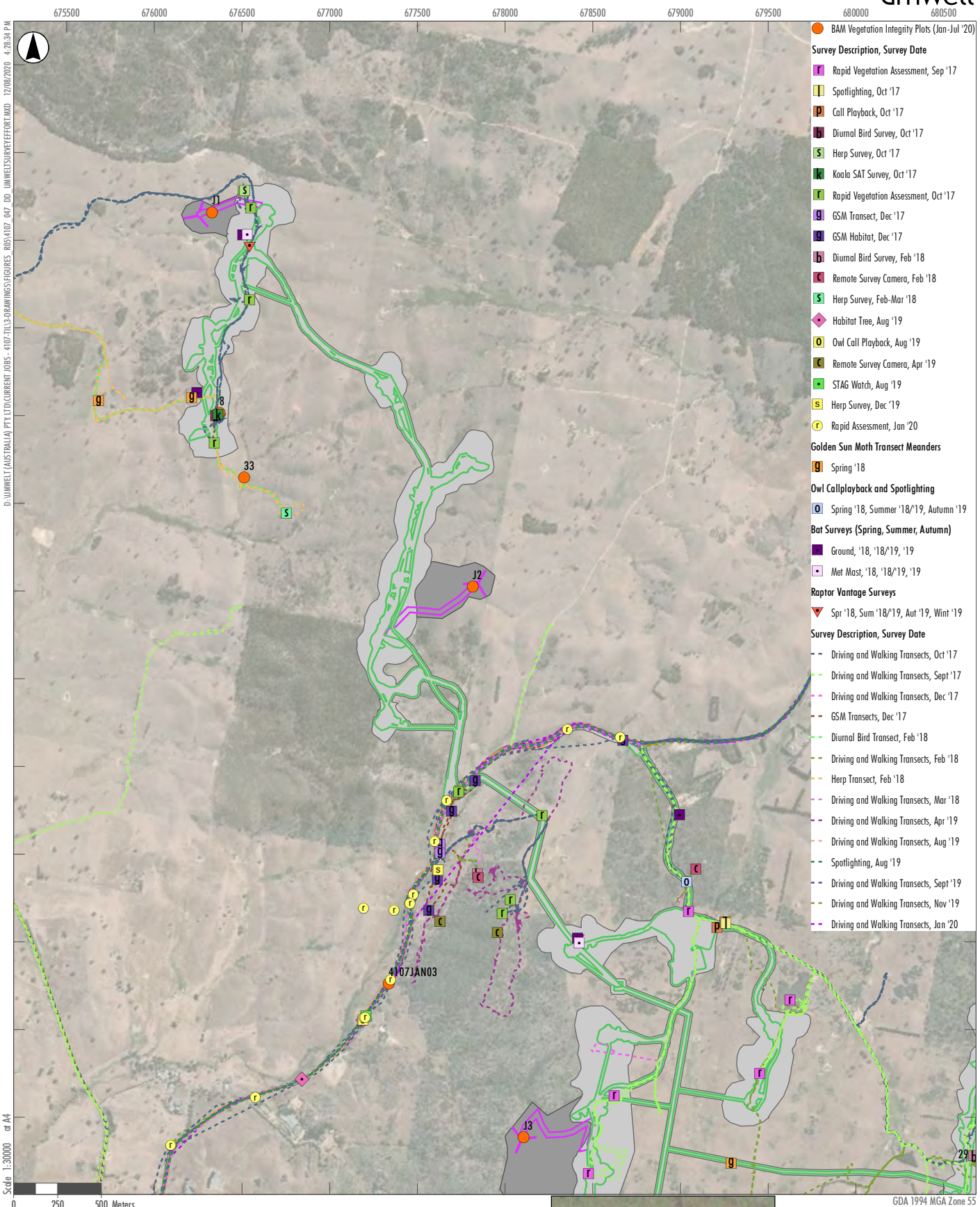
- mapping vegetation within areas of the Development Corridor and Indicative Development Footprint – External Roads that were previously not considered as part of the existing approval.

The baseline mapping of vegetation prepared as part of the approval process which ultimately received both state and federal approval, required considerable amounts of re-working. This was particularly so in relation to the boundaries between vegetation zones, more than the allocation of vegetation communities (i.e. PCTs). Thus, Umwelt's process of updating the baseline mapping of vegetation for the Project initially focussed on tightening boundaries of vegetation zones. Through ongoing surveys since 2017 to 2020, Umwelt have since made further minor amendments to the baseline vegetation mapping. Across the current Development Corridors, Umwelt have not made substantial changes to vegetation communities (i.e. PCTs) unless there was strong evidence to do so.

Vegetation mapping of new and existing components of the Development Corridors and Indicative Development Footprint – External Roads involved the following key steps:

- consideration and analysis of the extensive existing ecological work completed through the existing approval process, particularly:
    - Biodiversity Assessment Rye Park Wind Farm (NGH Environmental 2014)
    - Biodiversity Assessment Addendum – Rye Park Wind Farm (NGH Environmental 2016a)
- preliminary review of digital airborne imagery to explore vegetation distribution patterns as dictated by change in canopy texture, tone and colour, as well as topography
- predicting the distribution of particular vegetation communities based on understanding the distribution of PCTs and their descriptions (BCD 2020c)
- ground-truthing of the vegetation map based on survey effort
- revision of vegetation community floristic delineations based on plot data, and
- revision of the vegetation map based on ground-truthing.

Vegetation communities were delineated through the identification of repeating patterns of plant species assemblages in each of the identified strata.



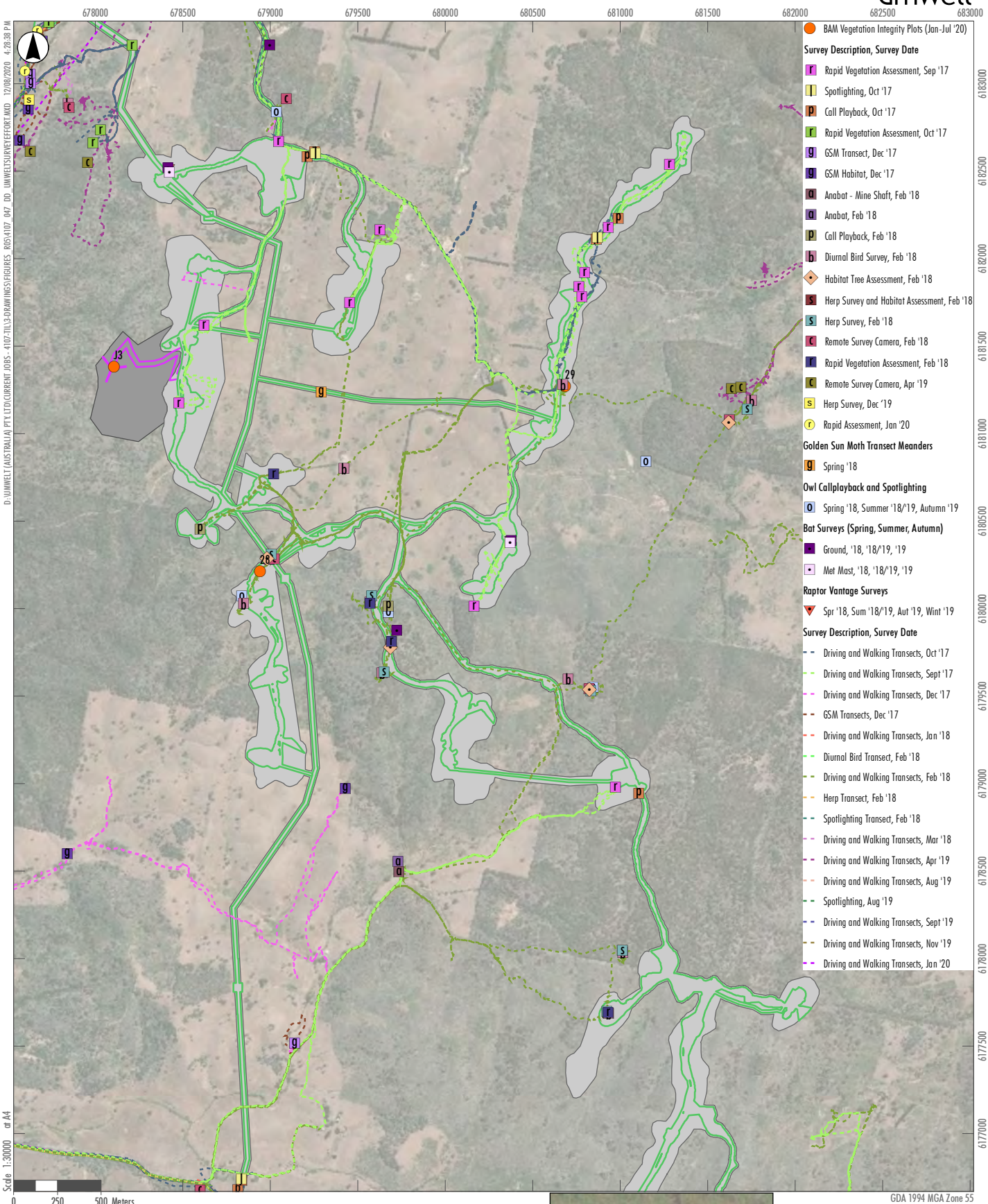
Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads

FIGURE 2.1.a

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



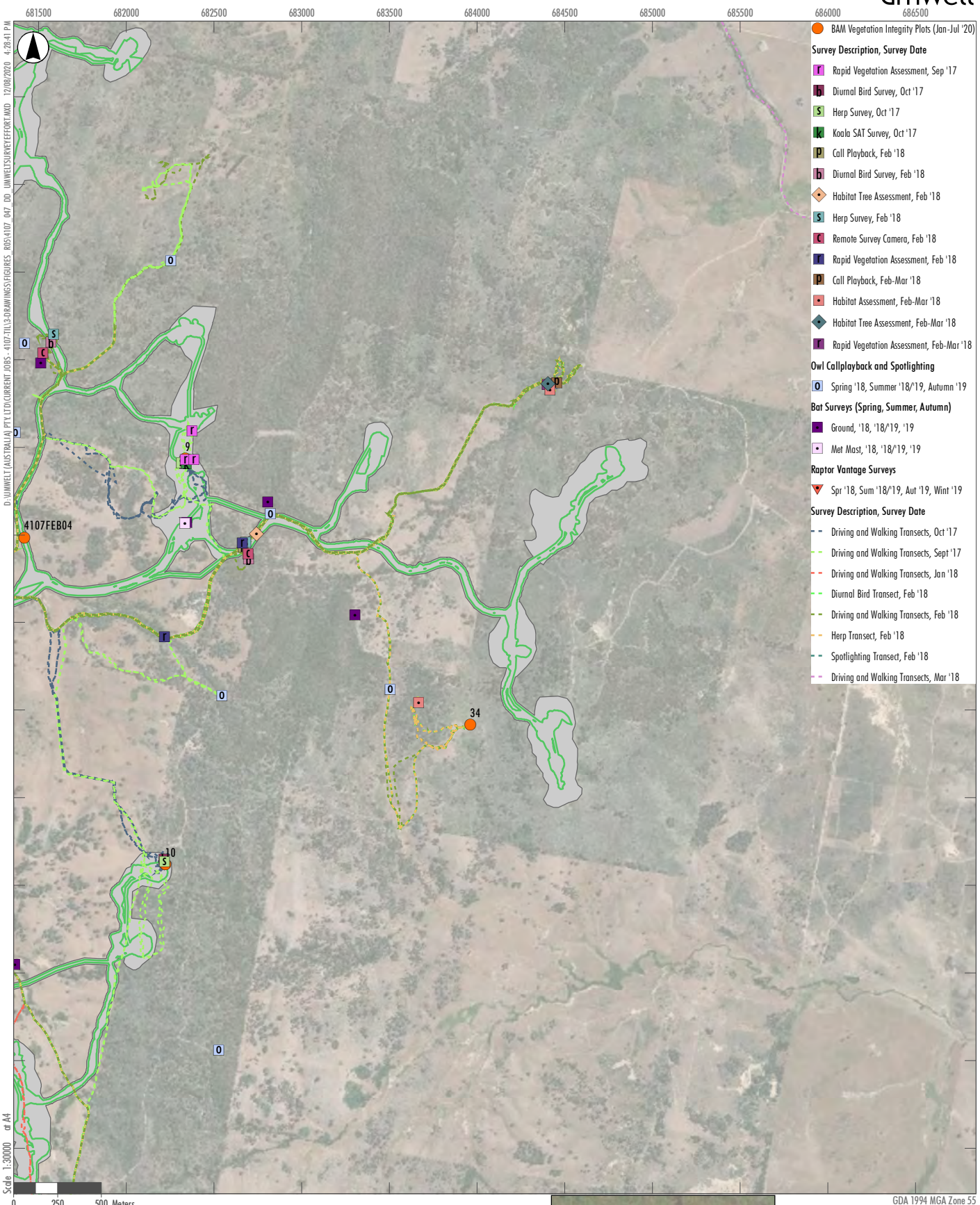
Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads

FIGURE 2.1.b

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

Development Corridor - Wind Farm

Indicative Development Footprint - Wind Farm

FIGURE 2.1.c

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

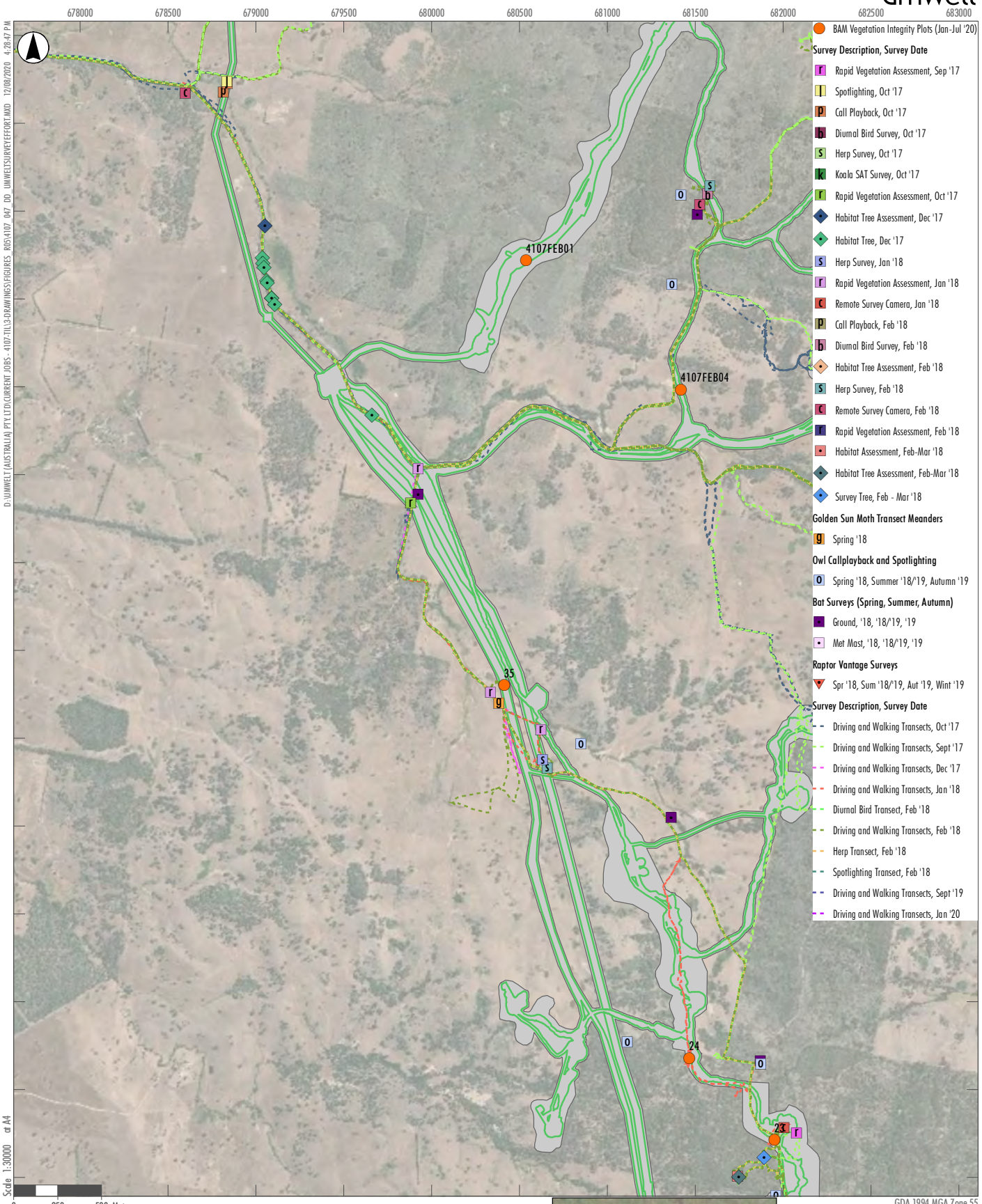
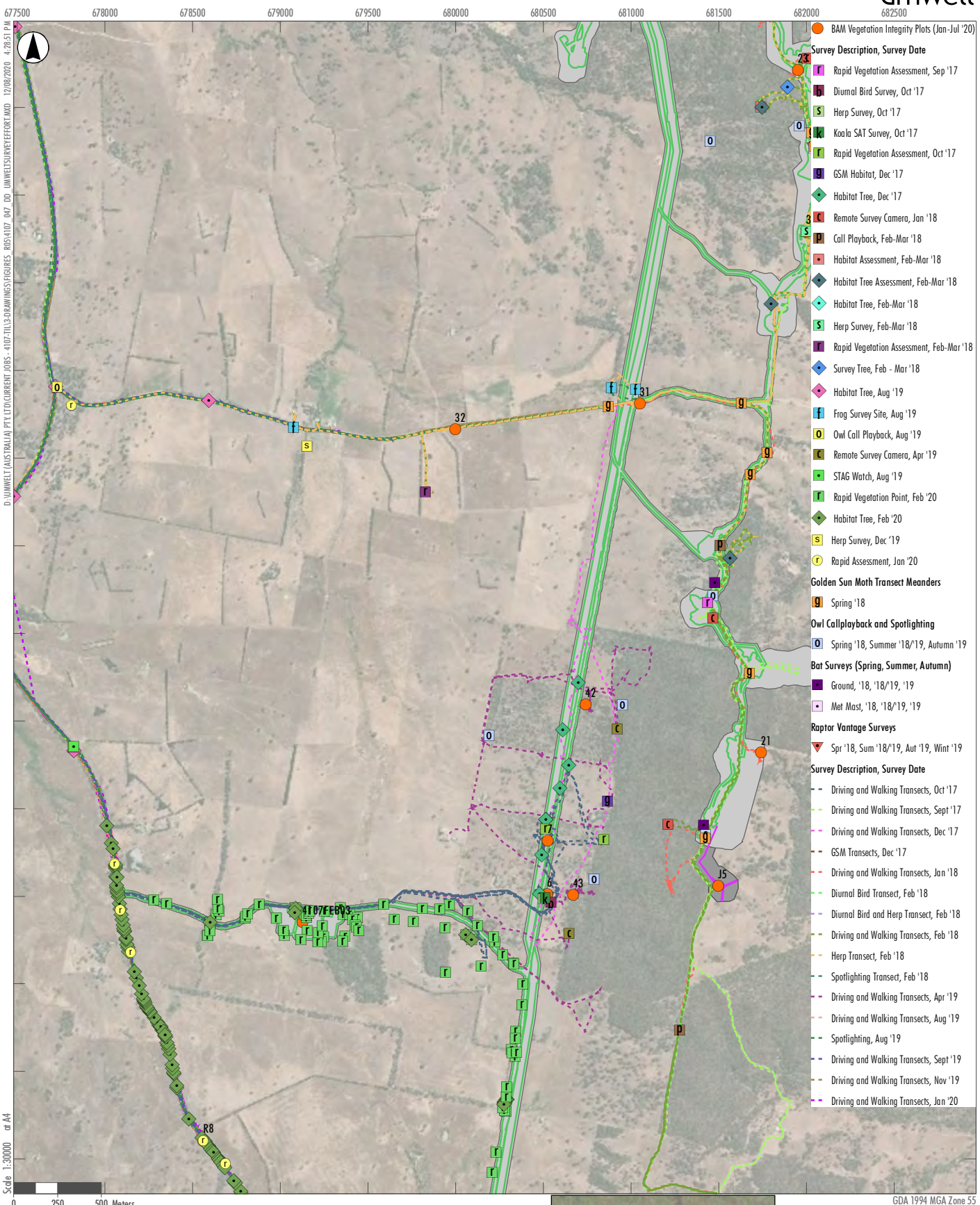


FIGURE 2.1.d

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



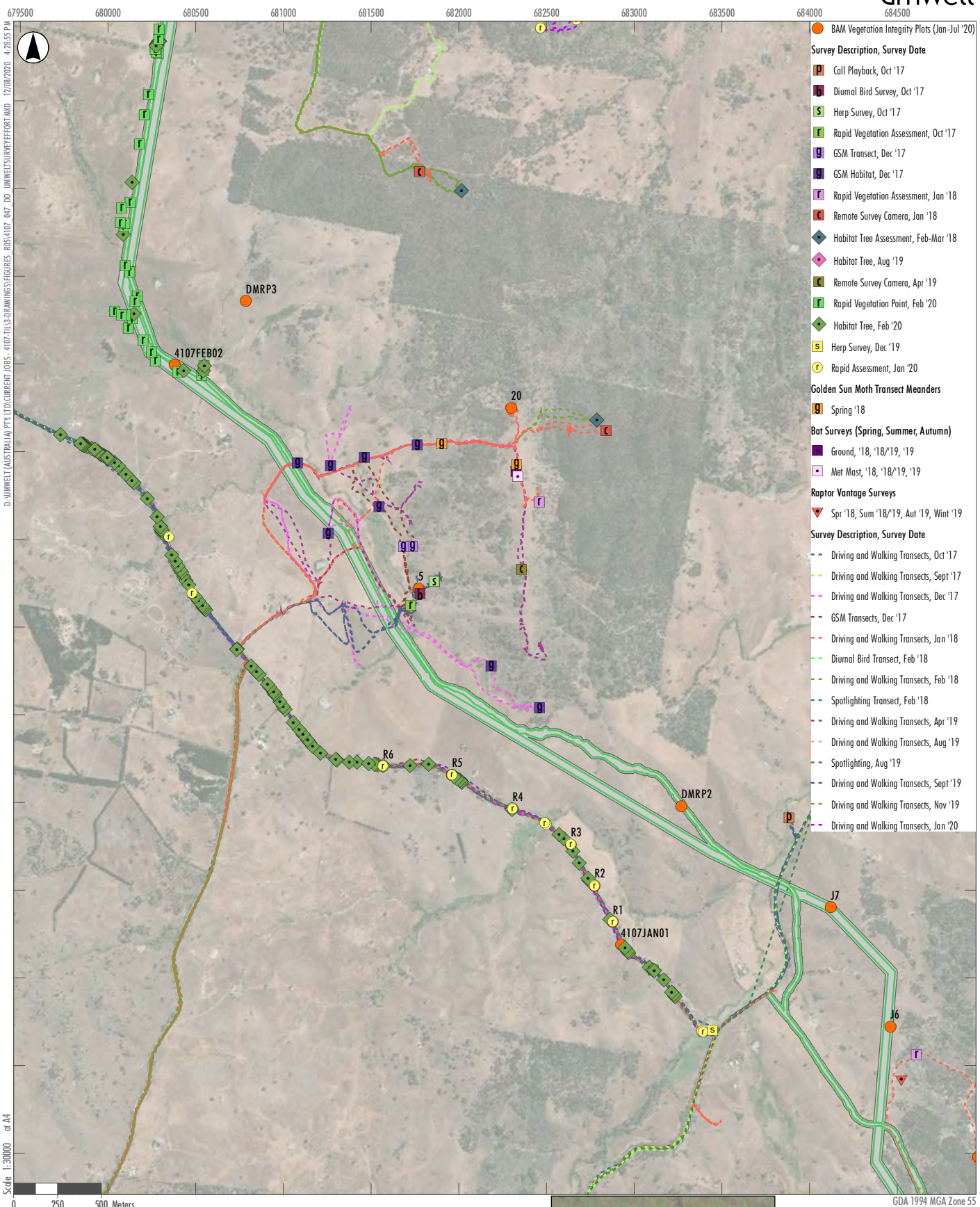
Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads

FIGURE 2.1.e

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

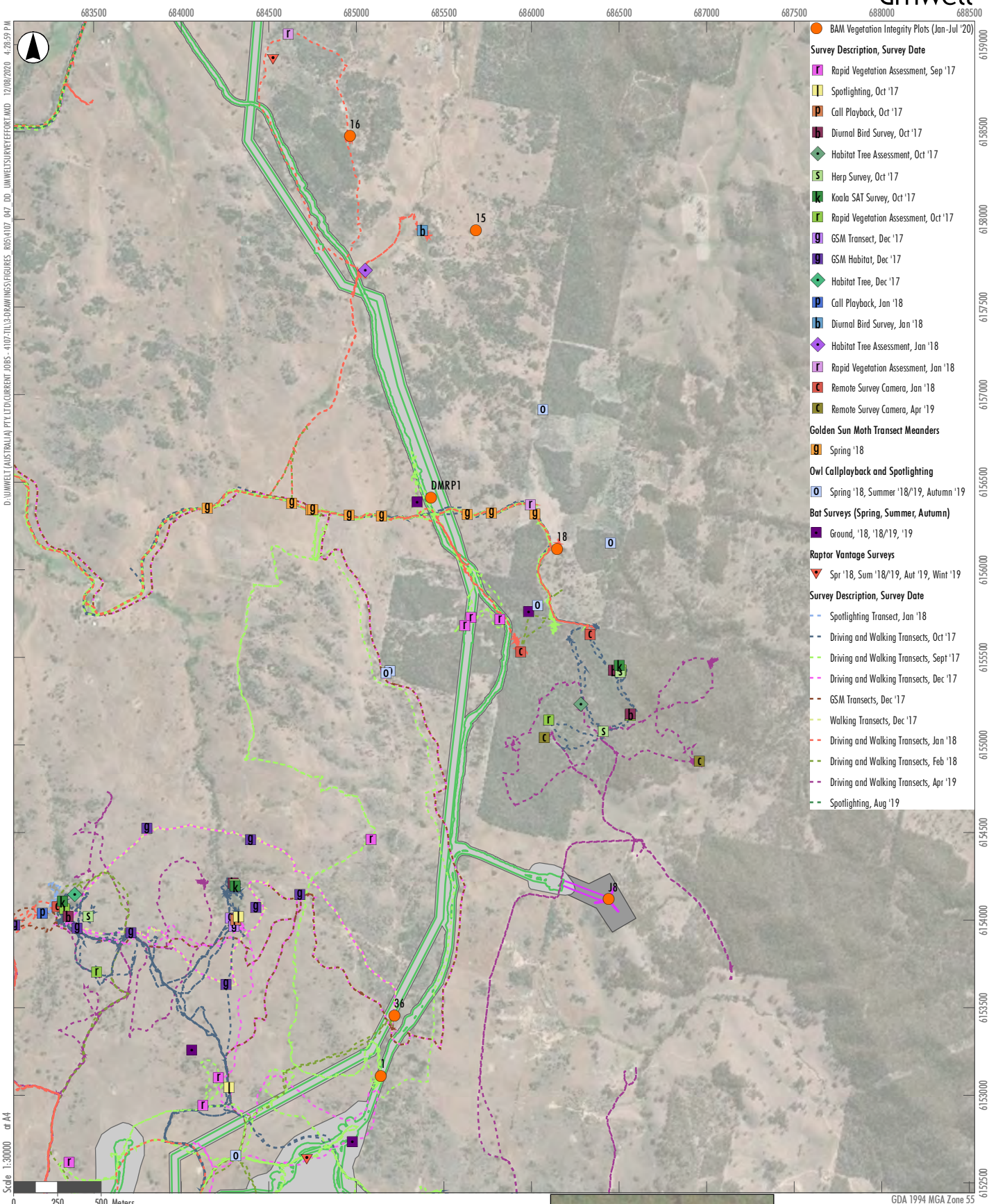
Development Corridor - Wind Farm

Indicative Development Footprint - Wind Farm

FIGURE 2.1.f

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



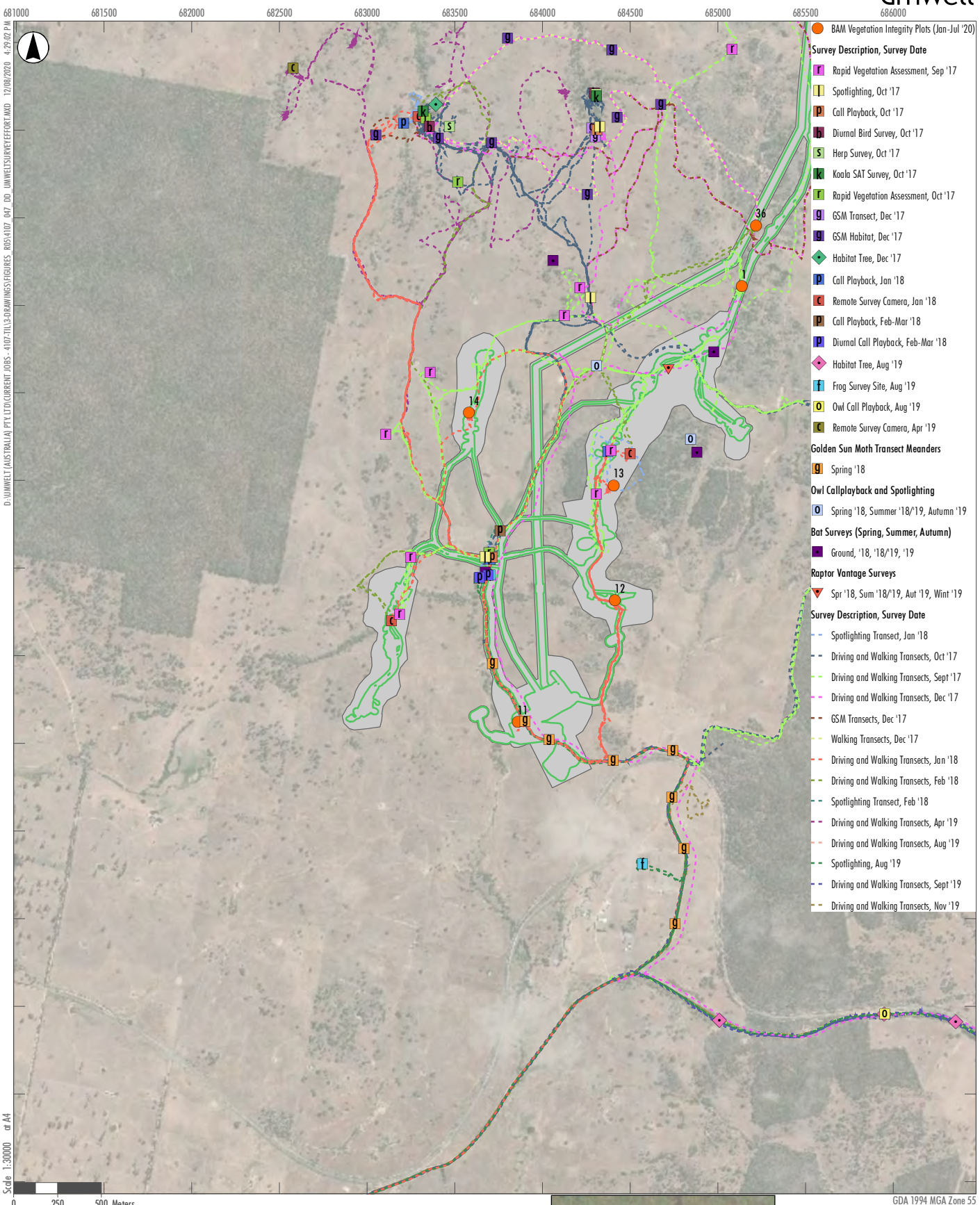
Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts

FIGURE 2.1.g

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts

FIGURE 2.1.h

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

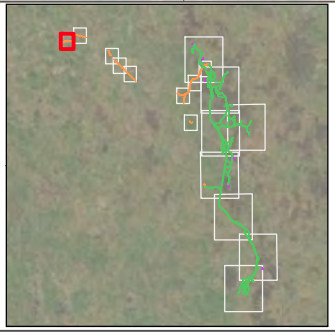
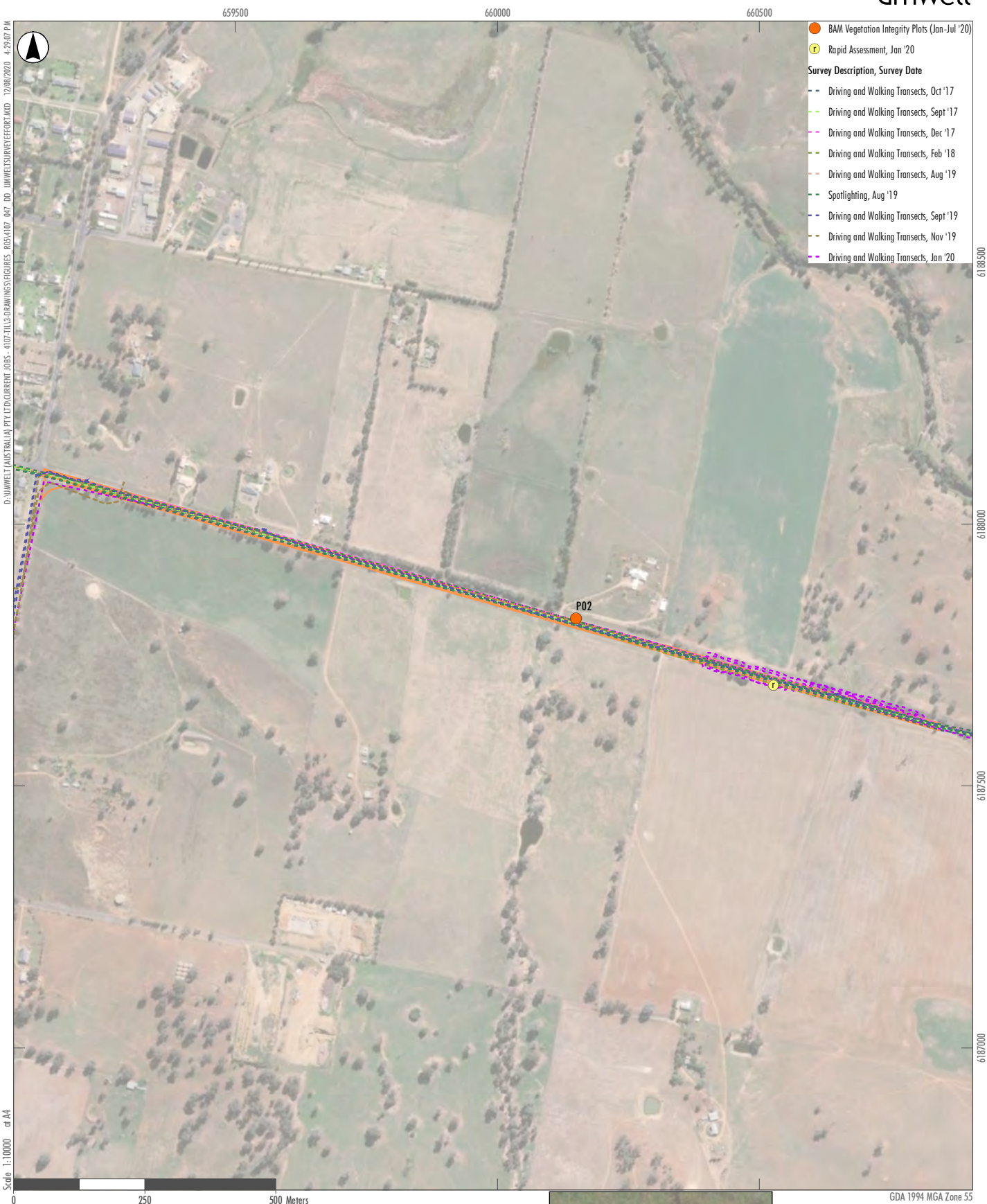


FIGURE 2.1.i

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



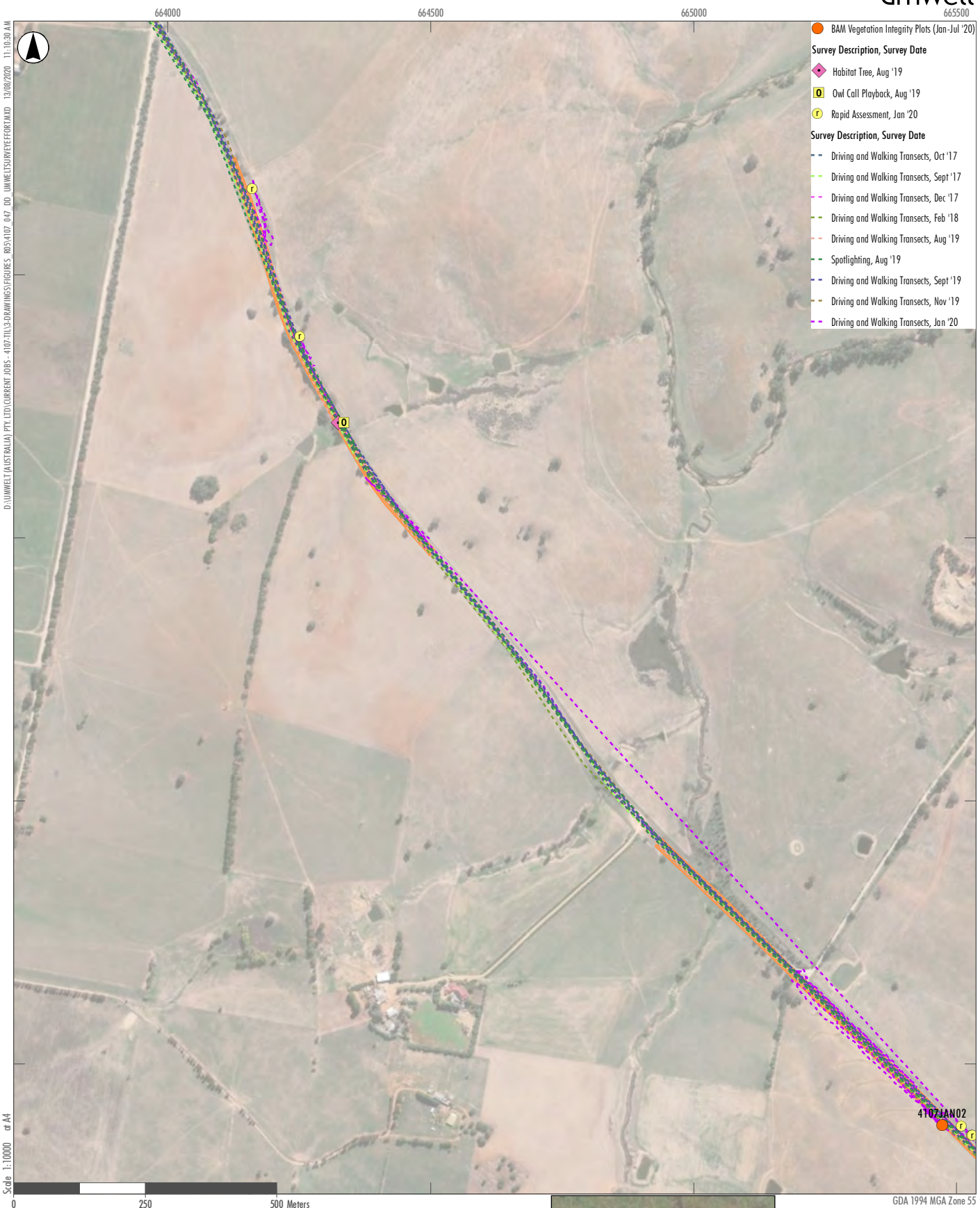
Legend

Indicative Development Footprint - External Roads

FIGURE 2.1.j

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

Indicative Development Footprint - External Roads

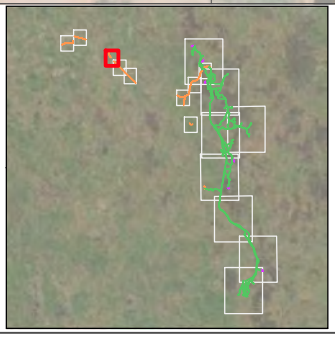
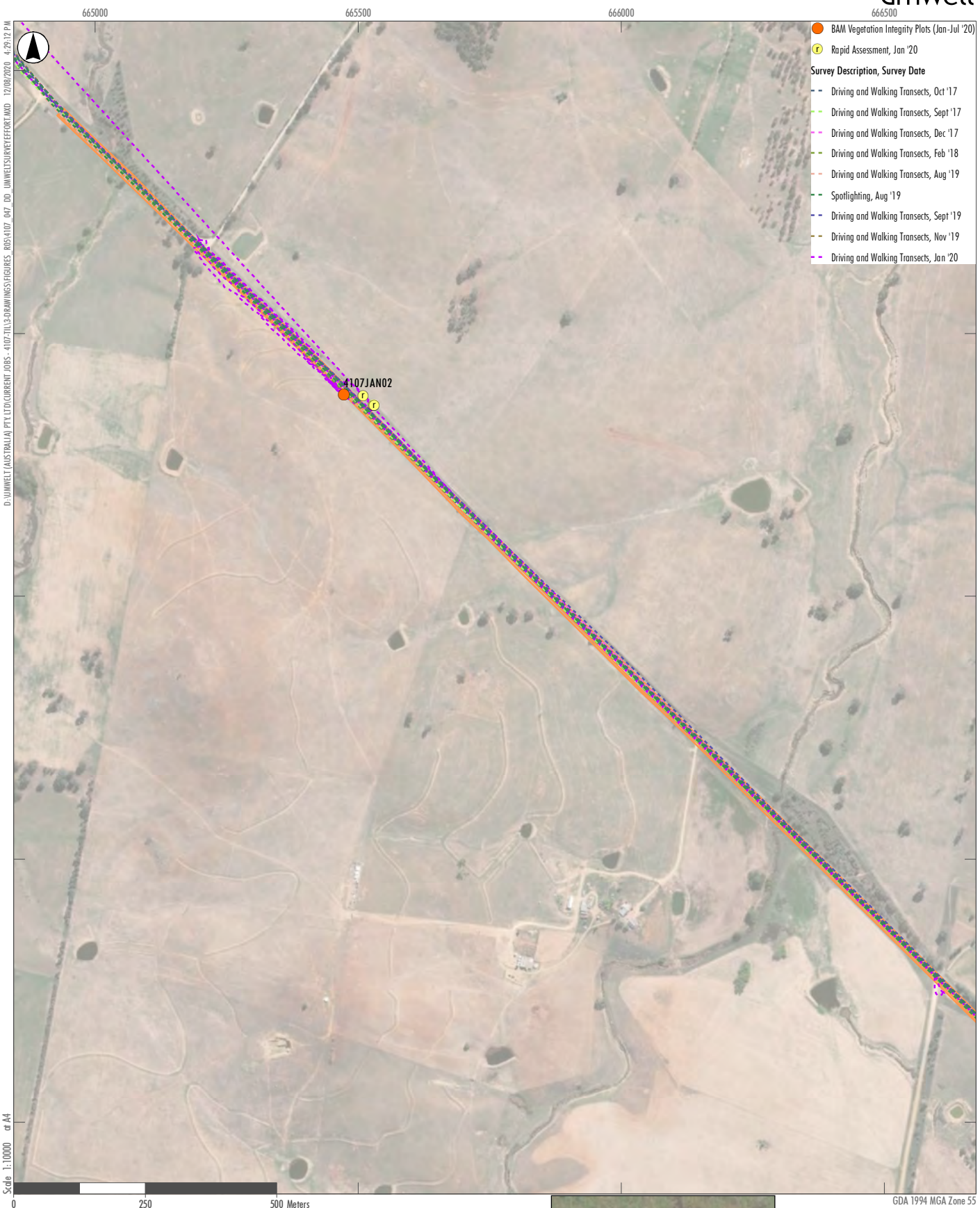


FIGURE 2.1.k

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



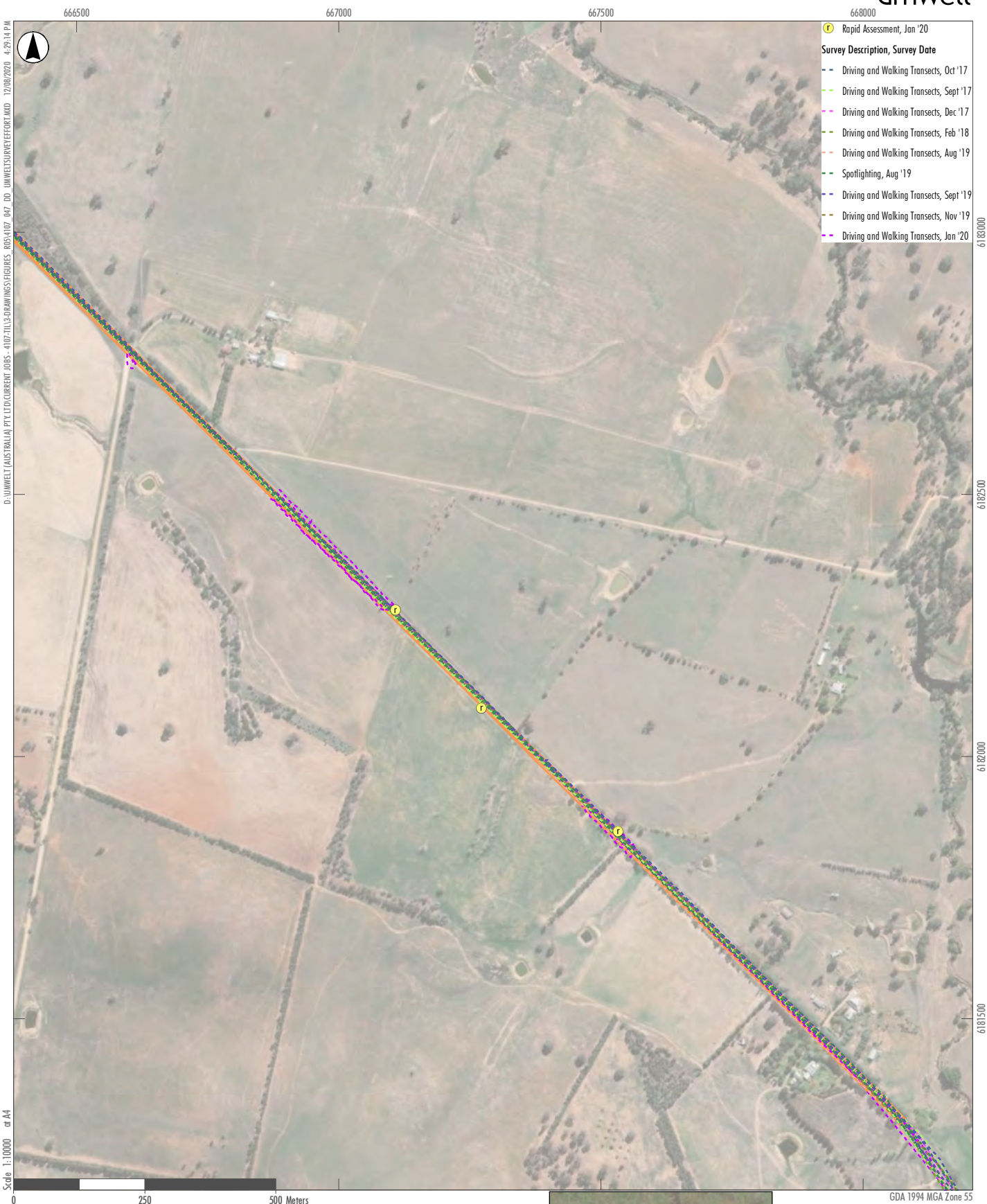
Legend

Indicative Development Footprint - External Roads

FIGURE 2.1.I

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



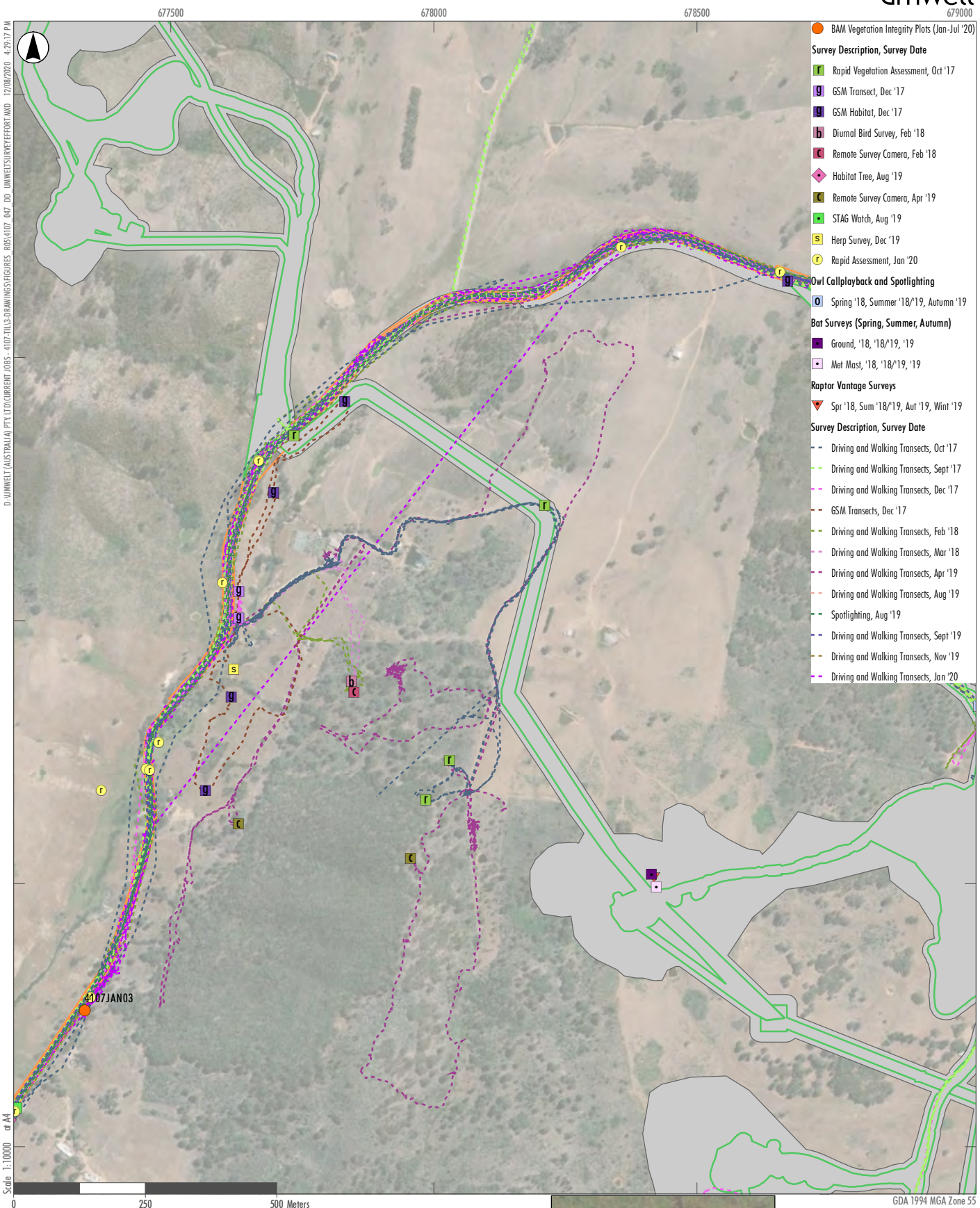
Legend

Indicative Development Footprint - External Roads

FIGURE 2.1.m

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



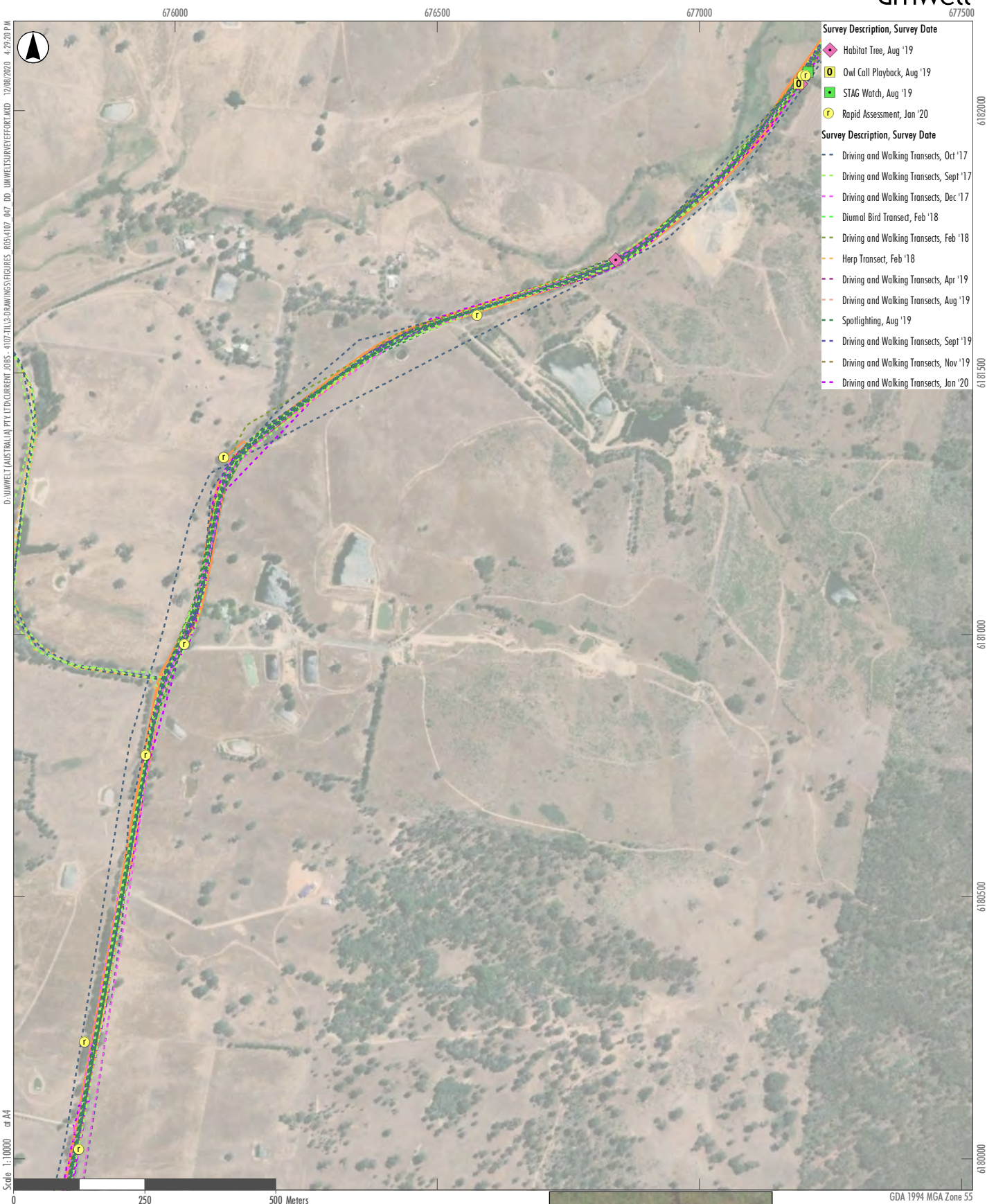
Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - External Roads

FIGURE 2.1.n

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

Indicative Development Footprint - External Roads

FIGURE 2.1.o

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

FIGURE 2.1.p

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

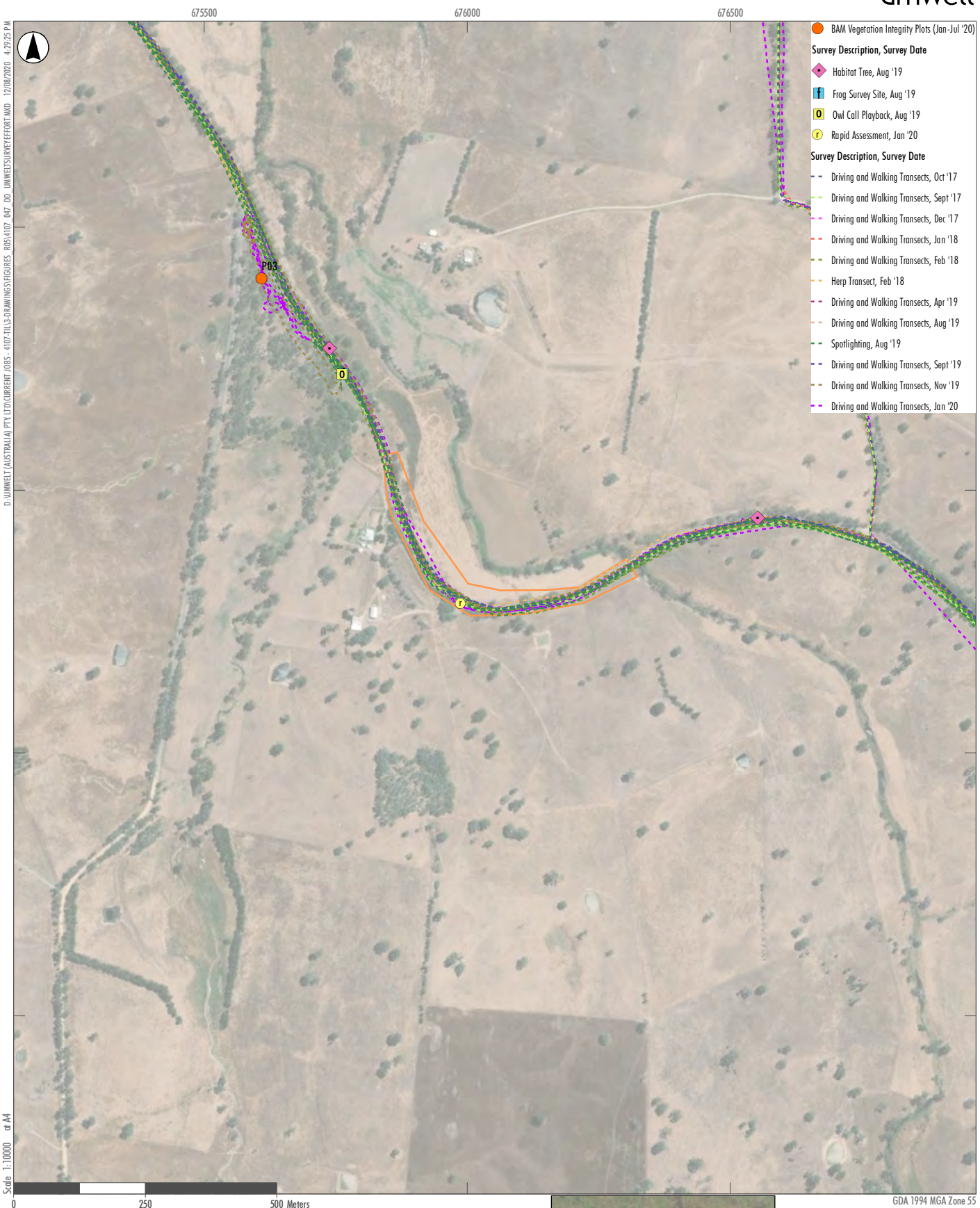


FIGURE 2.1.q

Umwelt Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

2.2.7 Threatened Ecological Community Delineation Techniques

Where vegetation communities mapped within the Development Corridors and Indicative Development Footprint – External Roads had not previously been assessed as part of the existing approval process, Umwelt completed an analysis of TECs listed under the Commonwealth EPBC Act and NSW BC Act and an assessment of similarity with the NSW Threatened Species Scientific Committee Final Determinations and the Commonwealth Threatened Species Scientific Committee Listing and Conservation Advice.

The following approach was used:

- full-floristic plot assessments and meandering surveys to determine floristic composition and structure of each ecological community
- comparison with published species lists, including lists of 'important species' as identified on the listing advice provided by the NSW Threatened Species Scientific Committee and/or Commonwealth Threatened Species Scientific Committee
- comparison with habitat descriptions and distributions for listed TECs
- assessment using guidelines and recovery plans published by the Commonwealth Department of Agriculture, Water and the Environment (DAWE) and the NSW BCD-DPIE
- comparison with other assessments of TECs in the region.

Where vegetation communities were mapped through the existing approval process, the extensive TEC analyses that was completed as part of this process were carefully considered. During the approval process, this included several years of ecological surveys, vegetation community mapping, TEC analysis against the respective determinations and listing/conservation advice, review from regulatory agencies and subsequent revision through the response to submission process. As a result, material changes to the outcomes of the TEC analysis of the existing approval were only completed by Umwelt where there was clear evidence to do so, such as conflicting field data, changes to vegetation community allocation and changes in condition.

2.2.8 Plant Community Type (PCT) Allocation

Each vegetation community described within the Indicative Development Footprints was aligned with an equivalent PCT as detailed in the VIS Classification Database (OEH 2020c). For each vegetation community described in the Indicative Development Footprints, the dominant and characteristic species were entered into the online plant community identification tab and an initial list of PCTs was generated. The profiles for each of the possible PCTs were then interrogated and the most appropriate match assigned based on floristic, structure, soil, landform and distribution details.

Furthermore, the Biodiversity Assessment Addendum (NGH Environmental 2016a) presented a list of Biometric Vegetation Types within the Project. Although a detailed FBA assessment was not completed, a preliminary assessment was undertaken to understand indicative offset requirements. Umwelt initially relied on these Biometric Vegetation Types, however we assessed data from our BAM Vegetation Integrity Plots against PCTs in the VIS Classification Database (BCD 2020c) in accordance with BAM (OEH 2017).

Further detail regarding allocation of PCTs is outlined below in **Table 2.3.**

Table 2.3 PCT Analysis

Vegetation Zone	Assessment
Vegetation Zone 1	Vegetation Zone 1 was aligned with PCT 289 as it supports a number of the species and strata features identified for the PCT as listed on the VIS Classification Database (BCD 2020c). Analysis of plot data for Vegetation Zone 1 found that 19.6 per cent of those species recorded are identified as characteristic of PCT 289 (BCD 2020c). Those recorded characteristic species of PCT 289 make up 47.4 per cent of all species recorded in Vegetation Zone 1. PCT 289 was determined to be the best overall fit in terms of diagnostic species and the community's location in the landscape.
Vegetation Zone 2	Vegetation Zone 2 was aligned with PCT 335 as it supports a number of the species and strata features identified for the PCT as listed on the VIS Classification Database (BCD 2020c). The ground stratum is dominated by tall sedge (*Carex appressa*), a key diagnostic species of PCT 335. Analysis of plot data for Vegetation Zone 2 found that 21.7 per cent of those species recorded are identified as characteristic of PCT 335 (BCD 2020c). Those recorded characteristic species of PCT 335 make up 14.3 per cent of all species recorded in Vegetation Zone 2. PCT 335 was determined to be the best overall fit in terms of diagnostic species and the community's location in the landscape.
Vegetation Zone 3	Vegetation Zone 3 was aligned with PCT 350 as it supports a number of the species and strata features for the PCT as listed on the VIS Classification Database (BCD 2020c). Its canopy is dominated by yellow box (*Eucalyptus melliodora*) and Blakely's red gum (*Eucalyptus blakelyi*), while silver wattle (*Acacia dealbata*) and hoary guinea flower (*Hibbertia obtusifolia*) dominate the shrub layer within the middle stratum. All of these are key diagnostic species of PCT 350. Careful analysis of Vegetation Zone 3 was undertaken against the similarly described PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion. Both PCTs had detailed descriptions of upper, mid and ground strata within the VIS Classification Database (BCD 2020c). Analysis of plot data (Vegetation Zones 3 and 4) found that it had a higher proportion of species characteristic of PCT 350 (52.6 per cent) compared to PCT 277 (46.2 per cent). Furthermore, those recorded characteristic species comprised a higher proportion of all species recorded within the remnant (Vegetation Zone 3) and derived form (Vegetation Zone 4) of this vegetation for PCT 350 (24 per cent) compared with PCT 277 (14.4 per cent) (BCD 2020c). This analysis concluded that PCT 350 was the best overall fit in terms of diagnostic species and the community's location in the landscape.
Vegetation Zone 4	Vegetation Zone 4 was aligned with PCT 350 based on its position in the landscape, consistency in species composition and proximity to the remnant woodland form of the PCT (Vegetation Zone 3).

Vegetation Zone	Assessment
Vegetation Zone 5	Vegetation Zone 5 was aligned with PCT 351 as it supports a number of the species and strata features identified for the PCT as listed on the VIS Classification Database (BCD 2020c). Its canopy is dominated by brittle gum (*Eucalyptus mannifera*), red stringybark (*Eucalyptus macrorhyncha*) and bundy (*Eucalyptus goniocalyx*) and contains six of the seven key diagnostic canopy species listed in for PCT 351. Careful analysis of Vegetation Zone 5 against the similarly aligned PCT 353, Inland Scribbly Gum - Red Stringybark - box - Daviesia latifolia - snow grass open forest on sandy loam soils from acid volcanics in the Boorowa - Young region of the NSW South Western Slopes Bioregion. Analysis of plot data (Vegetation Zones 5 and 6) found that it had a higher proportion of species characteristic of PCT 351 (54.7 per cent) compared to PCT 353 (42.1 per cent) (BCD 2020c). Furthermore, those recorded characteristic species comprised a higher proportion of all species recorded within the remnant (Vegetation Zone 5) and derived form (Vegetation Zone 6) of this vegetation for PCT 351 (28.7 per cent) compared with PCT 353 (7.9 per cent) (BCD 2020c). Analysis showed that PCT 351 was the best overall fit in terms of diagnostic species and the community's location in the landscape.
Vegetation Zone 6	Vegetation Zone 6 was aligned with PCT 351 based on its position in the landscape, consistency in species composition and proximity to the remnant forest form of the PCT (Vegetation Zone 5).
Vegetation Zone 7	Vegetation Zone 7 was aligned with PCT 351 based on its position in the landscape, consistency in species composition and proximity to the remnant forest form of the PCT (Vegetation Zone 5).
Vegetation Zone 8	Vegetation Zone 8 was aligned with PCT 351 based on its position in the landscape, consistency in species composition and proximity to the remnant forest form of the PCT (Vegetation Zone 5).
Vegetation Zone 9	Vegetation Zone 9 was had the best overall fit with PCT 351, despite the canopy characteristics of this Vegetation Zone being seemingly different (dominance of argyle apple [*Eucalyptus cinerea*]) when compared to the remnant Vegetation Zone 5 of PCT 351. Careful analysis of this Vegetation Zone was undertaken against PCT 653 Apple Box - Yellow Box - Argyle Apple dry open forest of the South Eastern Highlands Bioregion and NSW South Western Slopes Bioregion. However, it was determined that the overall composition of the upper, mid and ground stratum species for Vegetation Zone 9 more closely aligned with PCT 351. Analysis of plot data for Vegetation Zone 9 found that it had a higher proportion of species characteristic of PCT 653 (41.7 per cent) compared to PCT 351 (34 per cent) (BCD 2020c). However, those recorded characteristic species comprised a substantially higher proportion of all species recorded within Vegetation Zone 9 for PCT 351 (50 per cent) compared with PCT 653 (13.9 per cent) (BCD 2020c). Furthermore, PCT 653 is described to occur on clay loams in broad river flats or moist alluvial fans which is not consistent with Vegetation Zone 9 (BCD 2020c). The analysis found that PCT 351 was the best overall fit in terms of diagnostic species and the community's location in the landscape.
Vegetation Zone 10	Vegetation Zone 10 was aligned with PCT 351 purely for the purpose of applying the vegetation zone within the BAMCC. PCT 351 was selected as being the most appropriate fit being the dominant PCT throughout the Project and its proximity to Vegetation Zone 10.

2.3 Threatened Species

2.3.1 Literature and Database Review

A review of previous documents and reports relevant to the Project was undertaken. This included ecological reports, previous ecological surveys undertaken for the Project, and relevant ecological database searches. The information obtained was used to inform survey design where required and was also used to assist in the assessment of potentially occurring ecosystem-credit and species-credit species. Relevant documents and resources included:

- BCD Atlas of NSW Wildlife database and mapping tool (BCD 2020a), accessed February 2020
- BCD Threatened Biodiversity Data Collection (BCD 2020b), accessed February 2020
- PlantNET (Botanic Gardens Trust) database search for threatened plants within a 10 km radius search from Rye Park and Yass, accessed February 2020
- DAWE Protected Matters Search Tool (DAWE 2020) for known/predicted EPBC Act-listed species, accessed February 2020.

A preliminary assessment using the TBDC was undertaken which provided a list of species-credit species that might require survey and the suitable survey periods for each species. The results of these database searches, literature review and TBDC review were used to design the appropriate survey requirements for species-credit species.

2.3.2 Ecosystem-credit Species

Ecosystem-credit species are those threatened species that can be predicted by vegetation surrogates and landscape features. Ecosystem-credit species are not required to be specifically targeted during field surveys, however an assessment of the suitability of habitat in the Development Corridors and Indicative Development Footprint – External Roads was undertaken to determine the species presence or otherwise in the vegetation zones identified.

Appendix A outlines the ecosystem credit species predicted by the BAM calculator or identified in the literature review.

2.3.3 Species-credit Species

Targeted and opportunistic surveys and walking transects for species-credit species were undertaken across the Development Corridors and Indicative Development Footprint – External Roads (refer to **Figure 2.1**). **Table 2.4** below outlines the dates, methods and species targeted during the surveys. It includes surveys completed as part of the approvals process for the Project by NGH Environmental (2014 and 2016) and Umwelt. **Figure 2.2** displays the survey effort previously completed by NGH Environmental (2014 and 2016).

Table 2.4 Species Credit Species Survey Methodology and Timing

Survey Date	Method	Species Targeted
Umwelt Surveys		
27 to 29 September 2017	BAM vegetation integrity plots	All species
	Orchid transects and habitat assessments	*Caladenia concolor* *Prasophyllum petilum*
	Meandering transects	*Acacia ausfeldii* *Acacia meiantha* *Ammobium craspedioides* *Anthochaera phrygia* *Burhinus grallarius* *Caladenia concolor* *Eucalyptus alligatrix* subsp. *alligatrix* *Eucalyptus cannonii* *Eucalyptus robertsonii* subsp. *hemisphaerica* *Haliaeetus leucogaster* *Hieraaetus morphnoides* *Lathamus discolor* *Lophoictinia isura* *Petrogale penicillata* *Petroica rodinogaster* *Phascolarctos cinereus* *Polytelis swainsonii* *Prasophyllum petilum* *Senecio garlandii* *Swainsona recta* *Swainsona sericea* *Zieria obcordata*
	Hollow bearing tree surveys Diurnal reptile surveys	*Aprasia parapulchella* *Polytelis swainsonii* *Delma impar*
	Opportunistic observations	All species
16 to 19 October 2017	BAM vegetation integrity plots	All species
	Orchid transects habitat assessments	*Caladenia concolor* *Prasophyllum petilum*
	Meandering transects	*Acacia ausfeldii* *Acacia meiantha* *Ammobium craspedioides* *Anthochaera phrygia* *Burhinus grallarius* *Caladenia concolor* *Callocephalon fimbriatum* *Eucalyptus alligatrix* subsp. *alligatrix* *Eucalyptus cannonii* *Eucalyptus robertsonii* subsp. *hemisphaerica*

Survey Date	Method	Species Targeted
		Euphrasia arguta *Haliaeetus leucogaster* *Hieraaetus morphnoides* *Lophoictinia isura* *Petrogale penicillata* *Phascolarctos cinereus* *Prasophyllum petilum* *Polytelis swainsonii* *Pteropus poliocephalus* *Pultenaea humilis* *Swainsona recta* *Swainsona sericea* *Synemon plana*
	Hollow-bearing tree surveys Diurnal call-playback for regent honeyeater and swift parrot Diurnal bird surveys Koala SAT surveys Diurnal reptile and amphibian surveys Nocturnal call-playback for koala, squirrel glider and Booroolong frog Spotlighting Opportunistic observations	*Anthochaera phrygia* *Aprasia parapulchella* *Burhinus grallarius* *Callocephalon fimbriatum* *Cercartetus nanus* *Delma impar* *Haliaeetus leucogaster* *Hieraaetus morphnoides* *Lathamus discolor* *Litoria booroolongensis* *Litoria raniformis* *Lophoictinia isura* *Ninox connivens* *Petaurus norfolcensis* *Petrogale penicillata* *Petroica rodinogaster* *Phascogale tapoatafa* *Phascolarctos cinereus* *Polytelis swainsonii* *Pteropus poliocephalus*
18 to 21 December 2017	Habitat mapping for superb parrot Targeted golden sun moth surveys	*Polytelis swainsonii* *Synemon plana*
	Meandering transects	*Acacia ausfeldii* *Ammobium craspedioides* *Anthochaera phrygia* *Burhinus grallarius* *Callocephalon fimbriatum* *Cullen parvum* *Eucalyptus alligatrix* subsp. *alligatrix* *Eucalyptus cannonii* *Eucalyptus robertsonii* subsp. *hemisphaerica*

Survey Date	Method	Species Targeted
		Euphrasia arguta *Haliaeetus leucogaster* *Lophoictinia isura* *Petrogale penicillata* *Phascolarctos cinereus* *Prasophyllum petilum* *Pteropus poliocephalus* *Pultenaea humilis* *Senecio garlandii* *Synemon plana*
22 to 25 January 2018	BAM vegetation integrity plots	All species
	Meandering transects	*Acacia ausfeldii* *Anthochaera phrygia* *Burhinus grallarius* *Callocephalon fimbriatum* *Cullen parvum* *Eucalyptus alligatrix* subsp. *alligatrix* *Eucalyptus cannonii* *Eucalyptus robertsonii* subsp. *hemisphaerica* *Euphrasia arguta* *Lathamus discolor* *Lophoictinia isura* *Petrogale penicillata* *Petroica rodinogaster* *Phascolarctos cinereus* *Senecio garlandii*
	Hollow-bearing tree surveys Diurnal bird surveys Diurnal reptile and amphibian surveys Nocturnal call-playback for koala, squirrel glider and Booroolong frog Spotlighting Opportunistic observations	*Anthochaera phrygia* *Burhinus grallarius* *Callocephalon fimbriatum* *Cercartetus nanus* *Litoria aurea* *Litoria booroolongensis* *Litoria raniformis* *Lophoictinia isura* *Petaurus norfolcensis* *Petrogale penicillata* *Petroica rodinogaster* *Phascogale tapoatafa* *Phascolarctos cinereus*
12 to 16, 26 to 28 February and 1 to 2 March 2018	BAM vegetation integrity plots	All species
	Meandering transects	*Acacia ausfeldii* *Anthochaera phrygia* *Burhinus grallarius* *Cullen parvum* *Eucalyptus alligatrix* subsp. *alligatrix*

Survey Date	Method	Species Targeted
		Eucalyptus cannonii *Eucalyptus robertsonii* subsp. *hemisphaerica* *Euphrasia arguta* *Lathamus discolor* *Petrogale penicillata* *Petroica rodinogaster* *Phascolarctos cinereus* *Senecio garlandii*
	Fauna habitat assessment Hollow-bearing tree surveys Micro-bat echolocation recording Diurnal bird surveys Diurnal reptile and amphibian surveys Nocturnal reptile and amphibian surveys Nocturnal call-playback for koala, squirrel glider and frogs Spotlighting Remote Cameras Opportunistic observations	*Anthochaera phrygia* *Burhinus grallarius* *Cercartetus nanus* *Litoria aurea* *Litoria booroolongensis* *Miniopterus orianae oceanensis* *Myotis macropus* *Petaurus norfolcensis* *Petrogale penicillata* *Petroica rodinogaster* *Phascogale tapoatafa* *Phascolarctos cinereus*
1 March 2018	Nocturnal call-playback and spotlighting transects for frogs Nocturnal reptile and amphibian surveys Opportunistic observations	*Litoria aurea* *Litoria booroolongensis* *Litoria raniformis*
22 to 26 October 2018	Targeted superb parrot surveys Bird utilisation surveys Raptor vantage surveys	*Anthochaera phrygia* *Burhinus grallarius* *Callocephalon fimbriatum* *Haliaeetus leucogaster* *Lathamus discolor* *Lophoictinia isura* *Petroica rodinogaster* *Polytelis swainsonii*
29 to 31 October 2018	Targeted superb parrot surveys Bird utilisation surveys	*Anthochaera phrygia* *Burhinus grallarius* *Callocephalon fimbriatum* *Haliaeetus leucogaster* *Lathamus discolor* *Lophoictinia isura* *Petroica rodinogaster* *Polytelis swainsonii*
5 to 9 November 2018	Targeted superb parrot surveys Bird utilisation surveys Raptor vantage surveys Micro-bat echolocation recording	*Anthochaera phrygia* *Burhinus grallarius* *Chalinolobus dwyeri* *Callocephalon fimbriatum*

Survey Date	Method	Species Targeted
		Haliaeetus leucogaster *Lathamus discolor* *Lophoictinia isura* *Miniopterus orianae oceanensis* *Myotis macropus* *Petroica rodinogaster* *Polytelis swainsonii*
12 to 16 November 2018	Micro-bat echolocation recording Nocturnal call-playback and spotlighting for forest owls Raptor vantage surveys Golden sun moth meanders	*Chalinolobus dwyeri* *Callocephalon fimbriatum* *Haliaeetus leucogaster* *Lophoictinia isura* *Miniopterus orianae oceanensis* *Myotis macropus* *Ninox connivens* *Synemon plana*
19 to 23 November 2018	Micro-bat echolocation recording Nocturnal call-playback and spotlighting for forest owls Raptor vantage surveys Golden sun moth meanders	*Chalinolobus dwyeri* *Callocephalon fimbriatum* *Haliaeetus leucogaster* *Lophoictinia isura* *Miniopterus orianae oceanensis* *Myotis macropus* *Ninox connivens* *Synemon plana*
28 to 30 November 2018	Micro-bat echolocation recording Nocturnal call-playback and spotlighting for forest owls Raptor vantage surveys	*Callocephalon fimbriatum* *Chalinolobus dwyeri* *Haliaeetus leucogaster* *Lophoictinia isura* *Miniopterus orianae oceanensis* *Myotis macropus* *Ninox strenua* *Ninox connivens*
22 January 2019	Micro-bat echolocation recording	*Chalinolobus dwyeri* *Miniopterus orianae oceanensis* *Myotis macropus*
29 to 31 January and 1 to 13 February 2019	Targeted superb parrot surveys Bird utilisation surveys Raptor vantage surveys Micro-bat echolocation recording	*Anthochaera phrygia* *Burhinus grallarius* *Chalinolobus dwyeri* *Callocephalon fimbriatum* *Lathamus discolor* *Lophoictinia isura* *Miniopterus orianae oceanensis* *Myotis macropus* *Polytelis swainsonii*

Survey Date	Method	Species Targeted
13 to 15 February 2019	Nocturnal call-playback and spotlighting for forest owls	*Ninox strenua* *Ninox connivens* *Tyto novaehollandiae*
8 March 2019	Micro-bat echolocation recording	*Chalinolobus dwyeri* *Myotis macropus* *Miniopterus orianae oceanensis*
25 March 2019	Micro-bat echolocation recording	*Chalinolobus dwyeri* *Myotis macropus* *Miniopterus orianae oceanensis*
1 to 17 April 2019	Targeted superb parrot surveys Bird utilisation surveys Raptor vantage surveys Micro-bat echolocation recording Nocturnal call-playback and spotlighting for forest owls	*Polytelis swainsonii* *Ninox strenua* *Ninox connivens* *Tyto novaehollandiae*
3 and 4 April 2019	BAM vegetation integrity plots Opportunistic observations	All species
	Remote survey cameras	*Cercartetus nanus* *Petaurus norfolcensis* *Phascogale tapoatafa*
	Meandering transects	*Anthochaera phrygia* *Burhinus grallarius* *Eucalyptus alligatrix* subsp. *alligatrix* *Eucalyptus cannonii* *Eucalyptus robertsonii* subsp. *hemisphaerica* *Lathamus discolor* *Petroica rodinogaster* *Phascolarctos cinereus* *Senecio garlandii*
1 to 8 July 2019	Targeted superb parrot surveys Bird utilisation surveys Raptor vantage surveys Nocturnal call-playback and spotlighting for forest owls Raptor vantage surveys	*Haliaeetus leucogaster* *Lathamus discolor* *Ninox strenua* *Ninox connivens* *Tyto novaehollandiae* *Polytelis swainsonii*
19 to 23 August 2019	Nocturnal call-playback and spotlighting for forest owls Nocturnal call-playback and spotlighting for Sloane's froglet	*Ninox strenua* *Ninox connivens* *Tyto novaehollandiae* *Crinia sloanei*
23 to 25 September 2019	Meandering transects	*Acacia ausfeldii* *Acacia meiantha* *Ammobium craspedioides* *Anthochaera phrygia* *Burhinus grallarius*

Survey Date	Method	Species Targeted
		Caladenia concolor *Eucalyptus alligatrix* subsp. *alligatrix* *Eucalyptus cannonii* *Eucalyptus robertsonii* subsp. *hemisphaerica* Haliaeetus leucogaster *Hieraaetus morphnoides* *Lathamus discolor* *Lophoictinia isura* *Petroica rodinogaster* *Polytelis swainsonii* *Prasophyllum petilum* *Senecio garlandii* *Swainsona recta* *Swainsona sericea* *Zieria obcordata*
11 to 15 November 2019	BAM vegetation integrity plots	All species
	Meandering transects, including herp habitat	*Ammobium craspedioides* *Anthochaera phrygia* *Aprasia parapulchella* *Burhinus grallarius* *Callocephalon fimbriatum* *Delma impar* *Eucalyptus alligatrix* subsp. *alligatrix* *Eucalyptus cannonii* *Eucalyptus robertsonii* subsp. *hemisphaerica* *Euphrasia arguta* *Haliaeetus leucogaster* *Lathamus discolor* *Lophoictinia isura* *Petroica rodinogaster* *Polytelis swainsonii* *Prasophyllum petilum* *Pultenaea humilis* *Senecio garlandii* *Swainsona recta* *Swainsona sericea* *Synemon plana*
17 to 18 December 2019	Meandering transects Nocturnal call-playback and spotlighting for several frog species	*Anthochaera phrygia* *Burhinus grallarius* *Callocephalon fimbriatum* *Cullen parvum* *Delma impar* *Eucalyptus alligatrix* subsp. *alligatrix* *Eucalyptus cannonii* *Eucalyptus robertsonii* subsp. *hemisphaerica* *Euphrasia arguta*

Survey Date	Method	Species Targeted
		Haliaeetus leucogaster *Lathamus discolor* *Litoria aurea* *Litoria booroolongensis* *Litoria castanea* *Litoria raniformis* *Lophoictinia isura* *Petroica rodinogaster* *Polytelis swainsonii* *Prasophyllum petilum* *Pultenaea humilis* *Senecio garlandii* *Swainsona recta* *Swainsona sericea* *Synemon plana*
19 December 2019	Meandering transects	*Synemon plana*
13 to 15 January 2020	BAM vegetation integrity plots	All species
	Micro-bat echolocation recording Meandering transects	*Anthochaera phrygia* *Burhinus grallarius* *Callocephalon fimbriatum* *Chalinolobus dwyeri* *Cullen parvum* *Eucalyptus alligatrix* subsp. *alligatrix* *Eucalyptus cannonii* *Eucalyptus robertsonii* subsp. *hemisphaerica* *Euphrasia arguta* *Haliaeetus leucogaster* *Lathamus discolor* *Lophoictinia isura* *Miniopterus orianae oceanensis* *Myotis macropus* *Petroica rodinogaster* *Prasophyllum petilum* *Pultenaea humilis* *Senecio garlandii*
21 January 2020	Nocturnal call-playback and spotlighting for several frog species	*Litoria aurea* *Litoria booroolongensis* *Litoria castanea* *Litoria raniformis*
5 and 6 February 2020	BAM vegetation integrity plots	All species
1 to 3 July 2020	BAM vegetation integrity plots GSM Habitat Assessment Transects	All species

Survey Date	Method	Species Targeted
NGH Surveys		
26 to 27 October 2011	Reconnaissance survey	NA
31 October to 4 November 2011	0.04 hectare standard quadrats (20 x 20 metre) / Random meanders within relatively homogenous vegetation of up to 30 minutes in duration and covering up to 1 hectare (59 sites)	*Ammobium craspedioides* *Eucalyptus robertsonii* subsp. *hemisphaerica* *Prasophyllum petilum* *Caladenia concolor* *Swainsona recta* *Swainsona sericea* *Synemon plana* *Acacia ausfeldii* *Euphrasia arguta* *Acacia meiantha*
	Inspection points (128 points)	
	Targeted searches of walked transects approximately 10 metres apart	
	Habitat assessments (54, 100 x 100 metres quadrats)	NA
	Hollow-bearing tree surveys (35, 100 x 100 metres quadrats)	*Polytelis swainsonii* *Lathamus discolor* *Ninox strenua* *Ninox connivens* *Petaurus norfolcensis*
	Bird utilisation survey (18 surveys)	NA
	Reptile active searches, including rolling of rocks, logs and branches (11 surveys)	*Delma impar* *Aprasia parapulchella*
	Microbat Anabat surveys (9 nights)	*Falsistrellus tasmaniensis* *Miniopterus orianae oceanensis* *Scoteanax rueppellii* *Saccolaimus flaviventris*
	Nocturnal surveys, including evening listening and stag watches, call playback, spotlighting (foot-based and vehicle-based) (8 surveys)	*Ninox strenua* *Ninox connivens* *Petaurus norfolcensis*
10 to 14 April 2012	Habitat Assessments (20, 100 x 100 metres quadrats)	
	Hollow-bearing tree surveys (2, 100 x 100 metres quadrats)	*Polytelis swainsonii* *Lathamus discolor* *Ninox strenua* *Ninox connivens* *Petaurus norfolcensis*
	Bird utilisation survey (6 surveys)	NA
	Microbat Anabat surveys (6 nights)	*Falsistrellus tasmaniensis* *Miniopterus orianae oceanensis* *Scoteanax rueppellii* *Saccolaimus flaviventris*

Survey Date	Method	Species Targeted
	Nocturnal surveys, including evening listening and stag watches, call playback, spotlighting (foot-based and vehicle-based) (18 surveys)	*Ninox strenua* *Ninox connivens* *Petaurus norfolcensis*
	Cage-trapping and targeted nocturnal surveys for squirrel glider (2 trap sites, comprising 8 traps over four nights and 8 traps over three nights)	*Petaurus norfolcensis* *Phascogale tapoatafa*
November 2012	Targeted surveys for golden sun moth during the known flying time (10 sites)	*Synemon plana*
8 to 12 July 2013	Targeted point-count surveys for swift parrot and mapping of habitat features (10 search areas, 11 surveys)	*Lathamus discolor*
	Bird utilisation survey	NA
July 2013	Installation of 10 artificial tile grids (50 tiles each), targeting striped legless lizard	*Delma impar*
4 to 6 November 2013	Targeted surveys for Yass daisy and hoary sunray (walked transects approximately 10 metres apart)	*Ammobium craspedioides* *Leucochrysum albicans* var. *tricolor* *Ammobium craspedioides* *Eucalyptus robertsonii* subsp. *hemisphaerica* *Prasophyllum petilum* *Caladenia concolor* *Swainsona recta* *Swainsona sericea* *Synemon plana* *Acacia ausfeldii* *Euphrasia arguta* *Acacia meiantha*
4 to 9 November 2013	Targeted surveys for superb parrot to assess flight paths and local use of the site during the breeding season (25 transects and 3 days of flight path mapping by 8 people)	*Polytelis swainsonii*
	General bird surveys, Anabat surveys and nocturnal surveys	*Burhinus grallarius* *Chalinolobus dwyeri* *Lophoictinia isura* *Polytelis swainsonii* *Miniopterus orianae oceanensis* *Myotis macropus* *Anthochaera phrygia* *Callocephalon fimbriatum*

Survey Date	Method	Species Targeted
		Haliaeetus leucogaster
	Targeted surveys for koala including RapSAT searches to determine potential presence of the species (7 grids, totalling 33 plots)	*Phascolarctos cinereus*
	Bird utilisation survey (8 surveys)	*Lophoictinia isura* *Polytelis swainsonii* *Anthochaera phrygia* *Callocephalon fimbriatum* *Haliaeetus leucogaster*
	Microbat Anabat surveys (7 nights)	*Falsistrellus tasmaniensis* *Miniopterus orianae oceanensis* *Scoteanax rueppellii* *Saccolaimus flaviventris*
	Targeted nocturnal surveys (4 sights)	*Petaurus norfolcensis*
	Targeted funnel trap surveys for striped legless lizard (2 sites, comprising 24 traps over 4 nights)	*Delma impar*
	Targeted nocturnal call playback and spotlighting for threatened large forest owls (4 surveys)	*Ninox strenua* *Ninox connivens*
	Hollow-bearing tree surveys (7 search areas, hollows mapped within 100 metres of infrastructure in moderate-good condition vegetation)	*Polytelis swainsonii* *Lathamus discolor* *Ninox strenua* *Ninox connivens* *Petaurus norfolcensis*
November to December 2013	Weekly surveys of the 10 artificial tile grids to determine presence of striped legless lizard	*Delma impar*
18 to 20, 23 and 27 November, 3 and 8 December 2013	Targeted surveys for golden sun moth during the known flying time	*Synemon plana*
12 to 15 March 2014	Habitat assessments (transects and quadrats) for striped legless lizard and golden sun moth	*Delma impar* *Synemon plana*
7 to 9 October 2014	Targeted surveys for crimson spider orchid	*Caladenia concolor*
17 to 22 June 2015	0.04 hectare standard quadrats (20 x 20 metre) / random meanders within relatively homogenous vegetation of up to 30 minutes in duration and covering up to 1 hectare	*Eucalyptus robertsonii* subsp. *hemisphaerica*
	Habitat assessments	NA

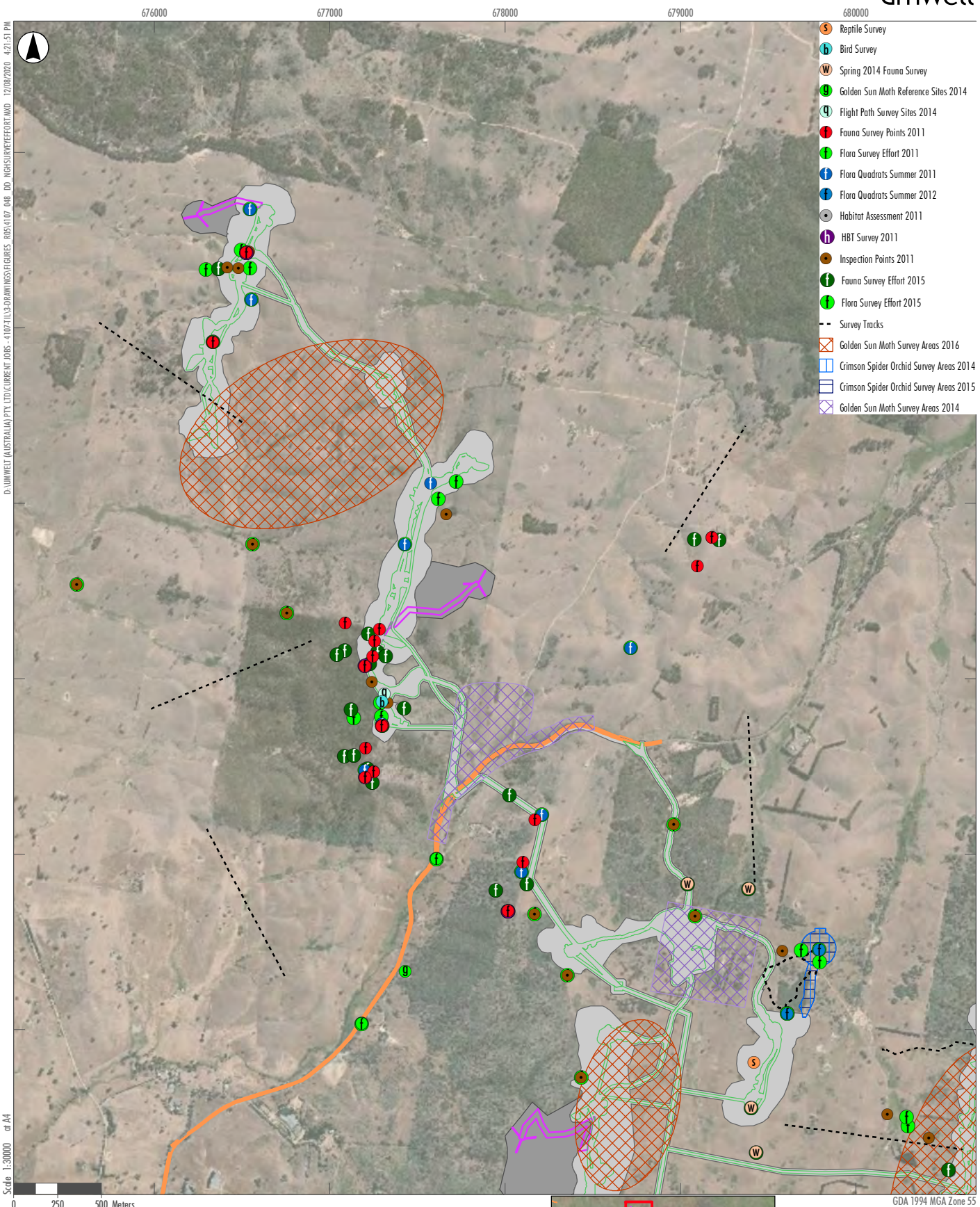
Survey Date	Method	Species Targeted
	Targeted hollow-bearing tree survey and assessment	*Polytelis swainsonii* *Lathamus discolor* *Ninox strenua* *Ninox connivens* *Petaurus norfolcensis*
28 September 2016	Targeted surveys for crimson spider orchid	*Caladenia concolor*

Species-credit surveys considered the following survey guidelines:

- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* – Working Draft (DEC 2004)
- *NSW Guide to Surveying Threatened Plants* (OEH 2016)
- *Threatened species survey and assessment guidelines: field survey methods for fauna – Amphibians* (DECC 2009)
- *Draft Survey Guidelines for Australia's Threatened Orchids* (DoE 2013).

Appendix B outlines the species-credit species predicted by the BAM calculator or identified in the literature review and the targeted survey effort undertaken in accordance with BAM survey requirements.

Appendix B also notes where species-credit species were not considered to require further survey in accordance with Section 6.4 (Step 3) of the BAM (OEH 2017a).



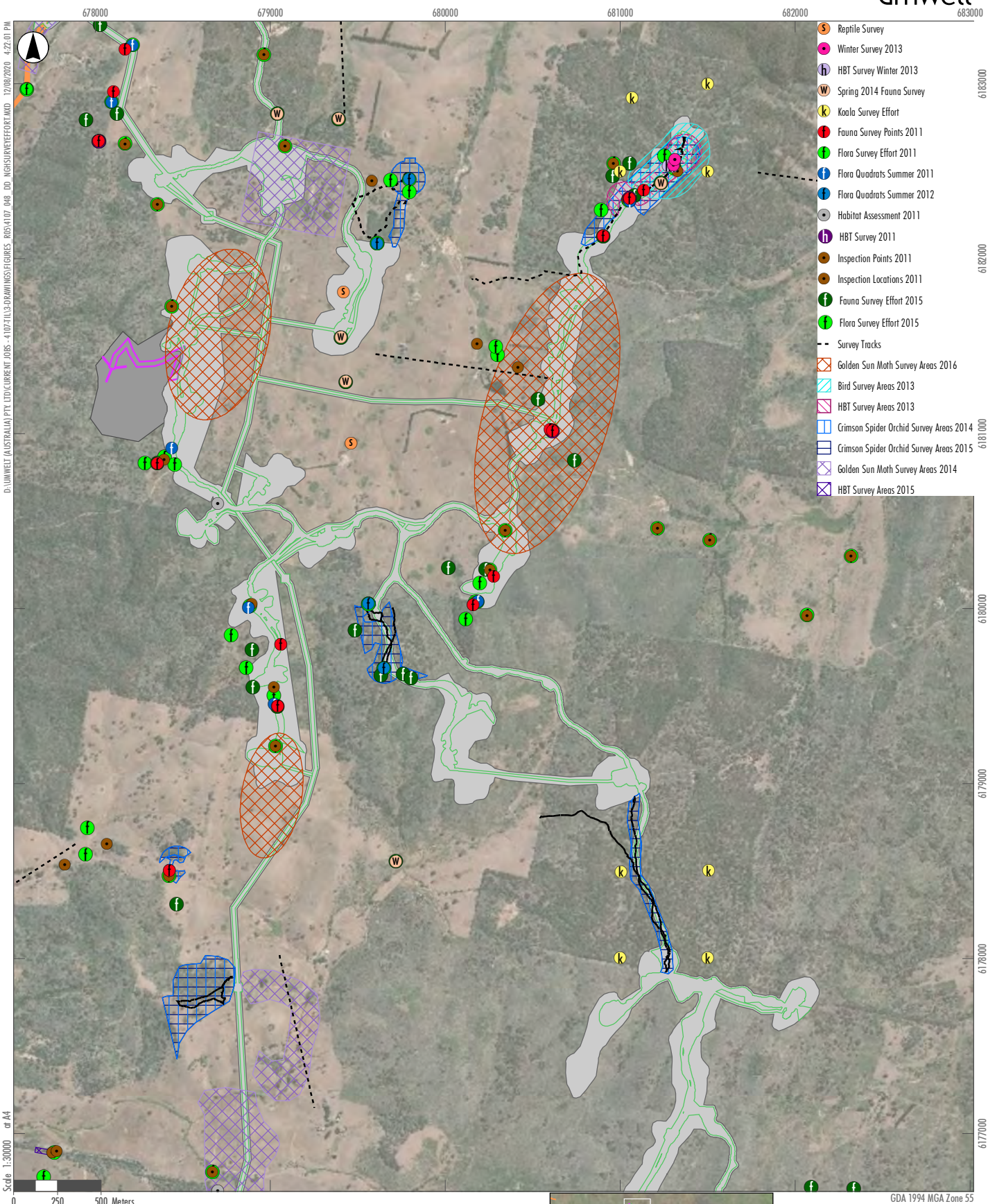
Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads

FIGURE 2.2.a

NGH Environmental Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NGH Environmental (2018); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads

FIGURE 2.2.b

NGH Environmental Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NGH Environmental (2018); Rye Park Renewable Energy Pty Ltd (2020)

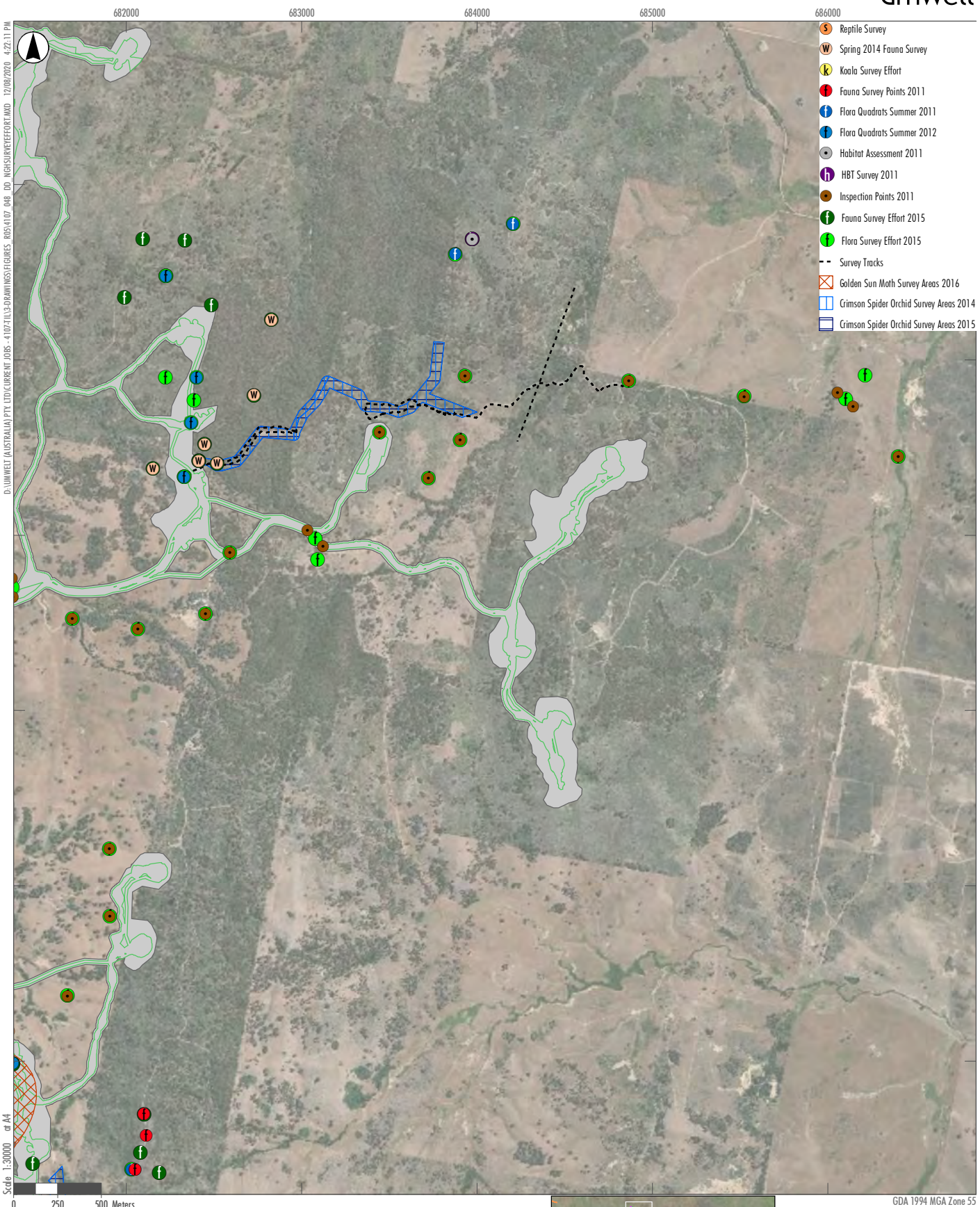
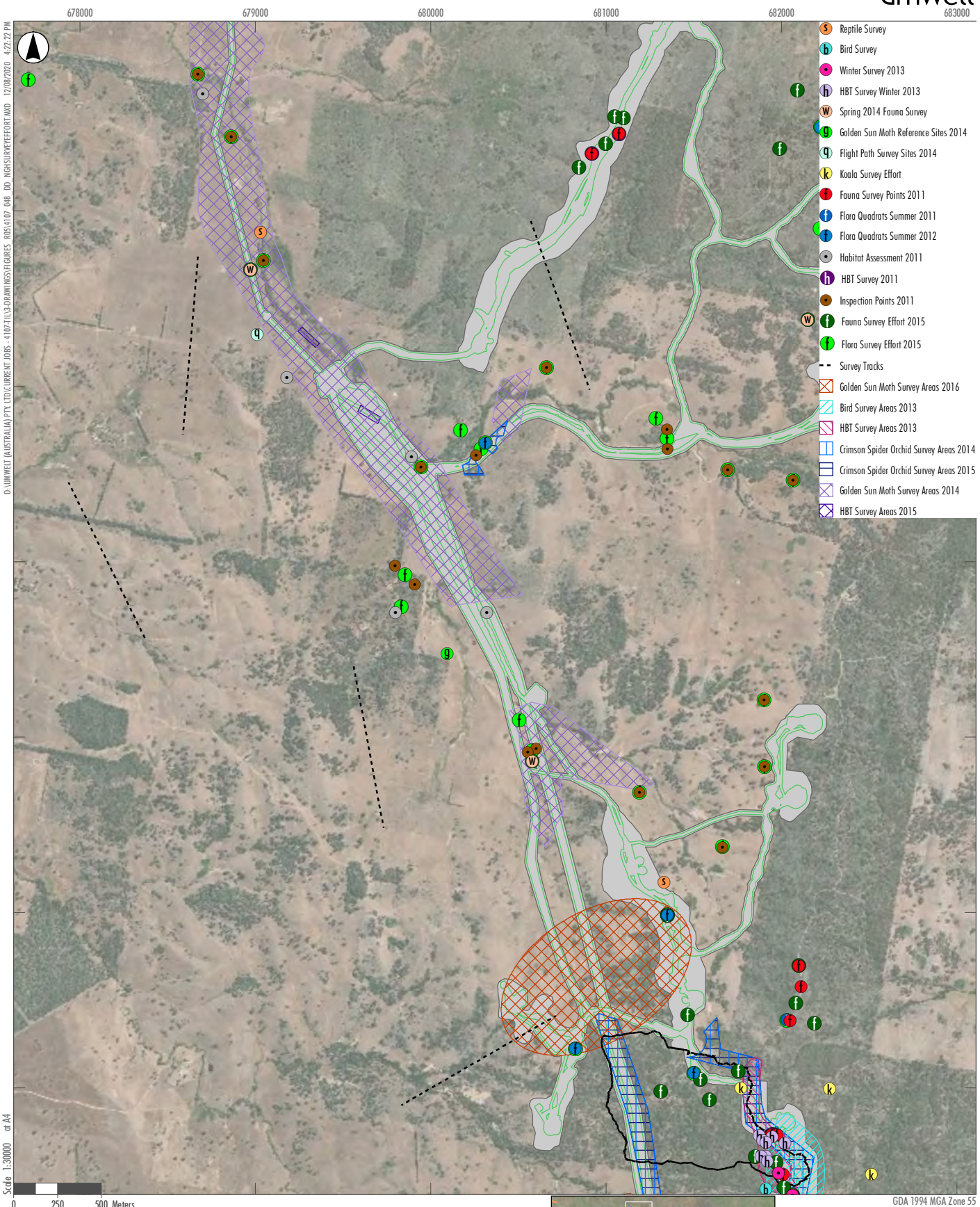


FIGURE 2.2.c

NGH Environmental Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NGH Environmental (2018); Rye Park Renewable Energy Pty Ltd (2020)



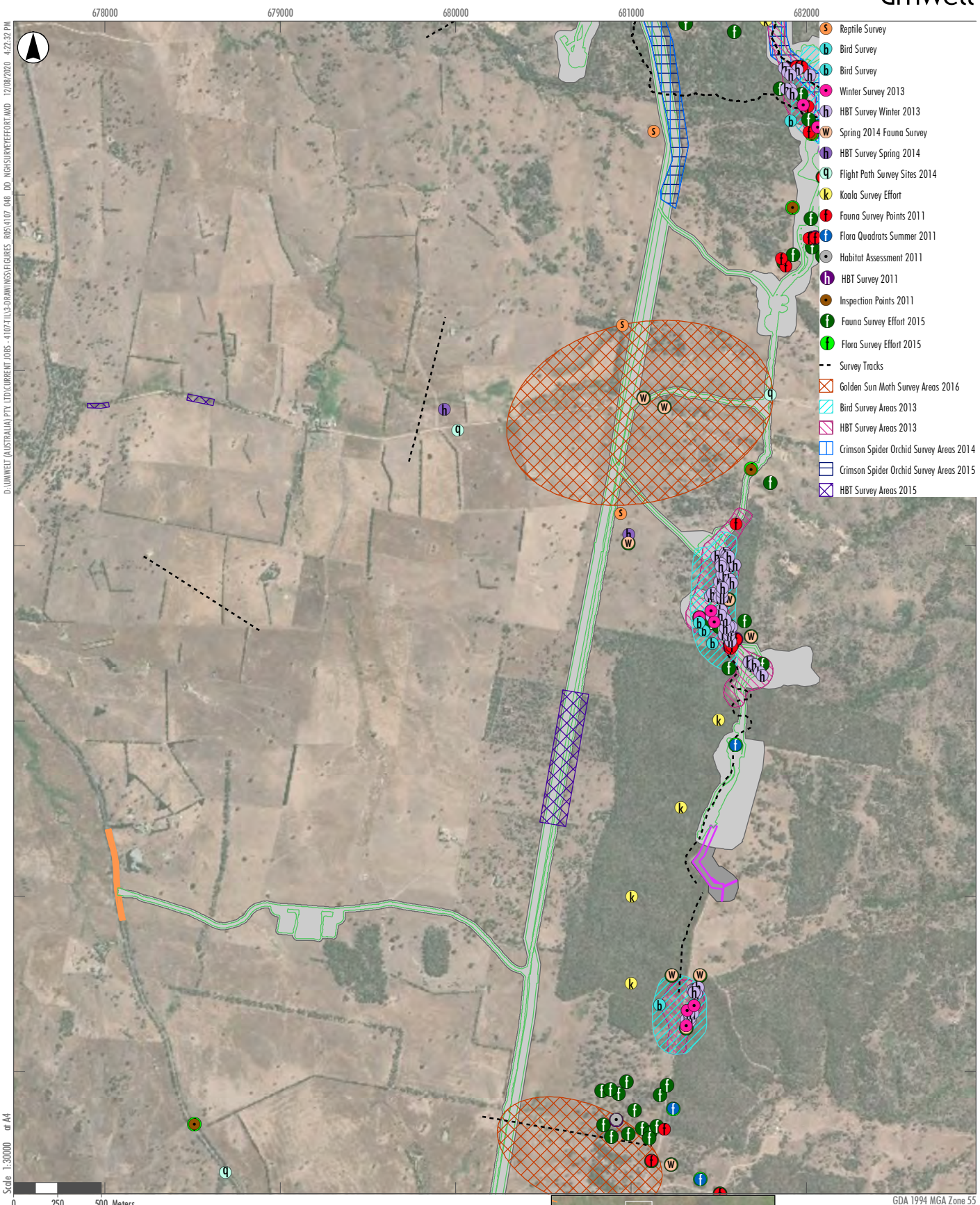
Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm

FIGURE 2.2.d

NGH Environmental Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NGH Environmental (2018); Rye Park Renewable Energy Pty Ltd (2020)



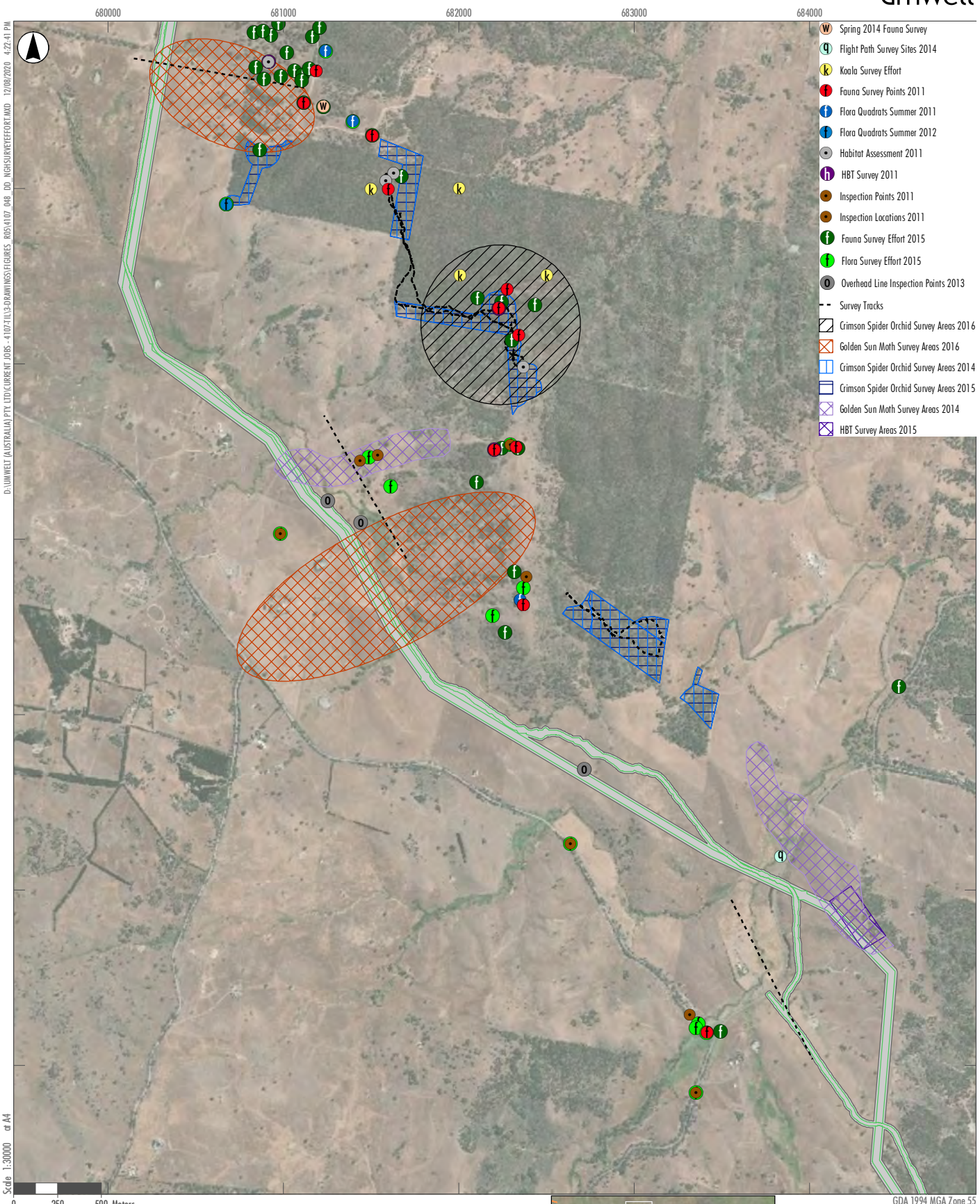
Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads

FIGURE 2.2.e

NGH Environmental Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NGH Environmental (2018); Rye Park Renewable Energy Pty Ltd (2020)



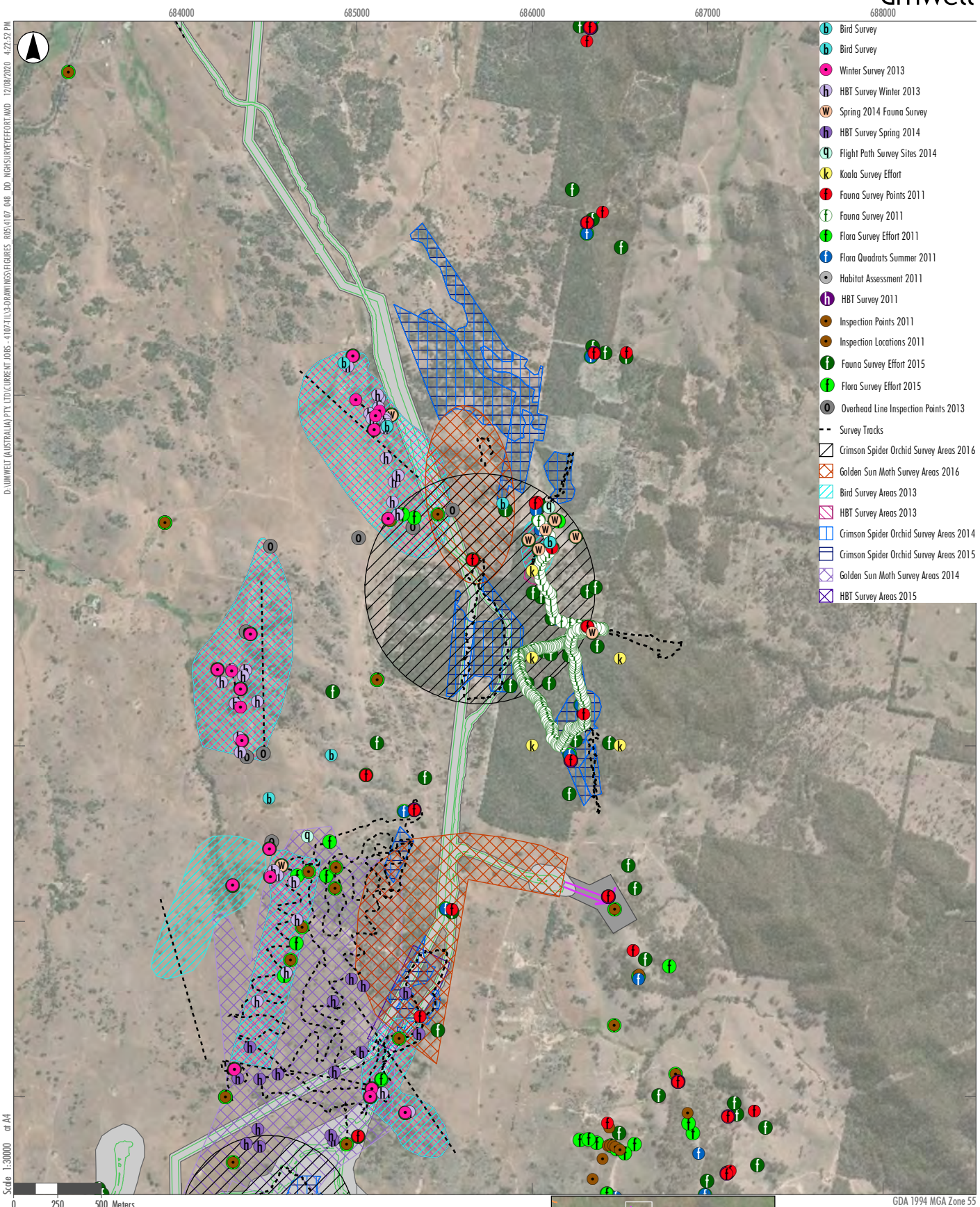
Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm

FIGURE 2.2.f

NGH Environmental Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NGH Environmental (2018); Rye Park Renewable Energy Pty Ltd (2020)



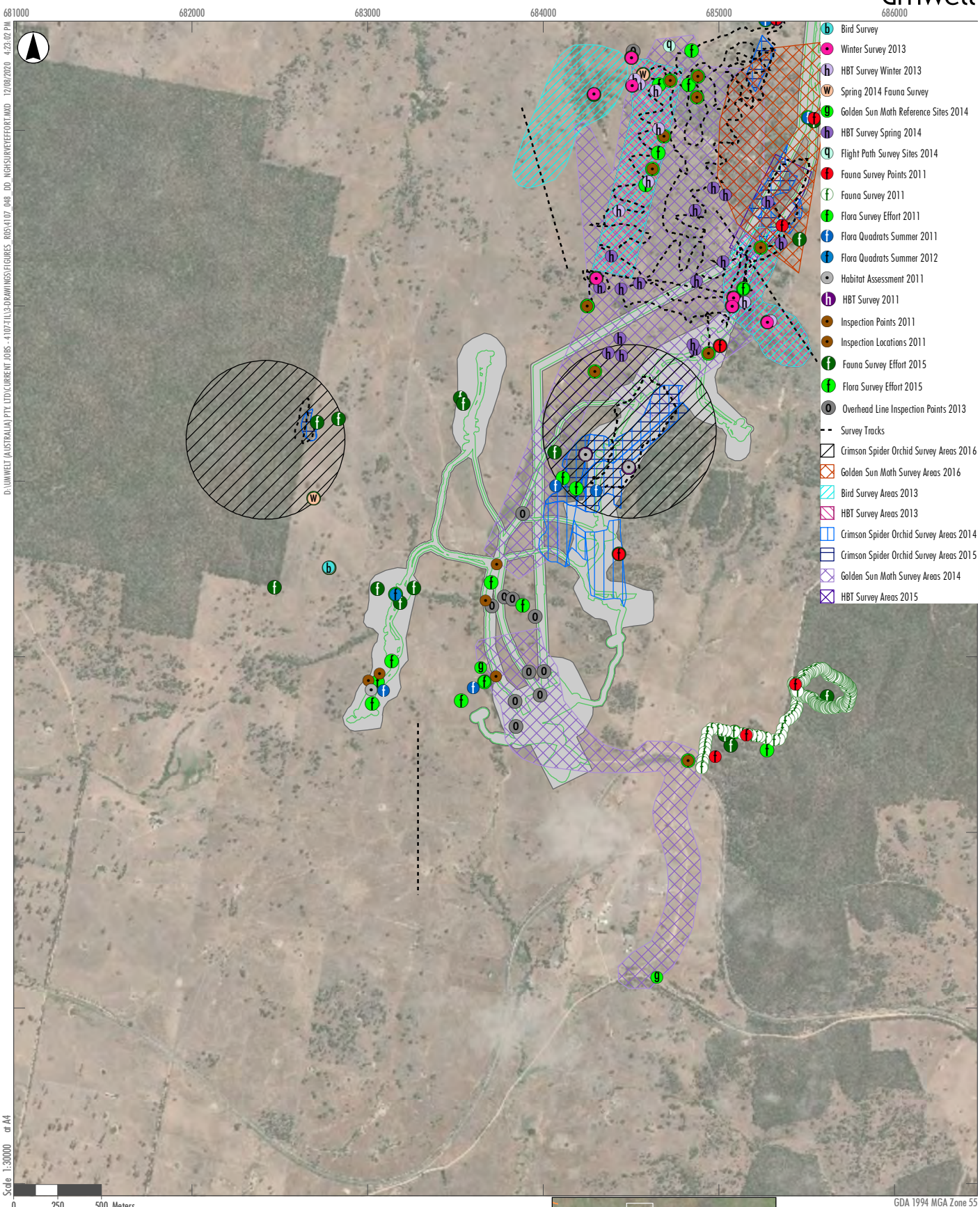
Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts

FIGURE 2.2.g

NGH Environmental Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NGH Environmental (2018); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts

FIGURE 2.2.h

NGH Environmental Survey Effort

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NGH Environmental (2018); Rye Park Renewable Energy Pty Ltd (2020)

2.3.4 Weather Conditions and Limitations

Table 2.5 below outlines the weather conditions for the surveys, derived from the Bureau of Meteorology (2020). Temperature data for dates prior to June 2018 are derived from the Yass Rural Fire Service weather station (070358), and post-June 2018 from Burrinjuck Dam (073007). Rainfall data are derived from the weather station in Rye Park (Glenflesk) (070361) (BOM 2020). **Table 2.6** presents the weather information for previous NGH Environmental surveys as described in the Biodiversity Assessment (2014) and Biodiversity Assessment Addendum (2016).

Table 2.5 Weather Conditions for Umwelt Surveys

Date	Daily Data			Monthly Data		
	Min-Max Temp. (°C)	Rainfall (mm)	Relative Humidity (%)	Min-Max Temp (mean °C)	Rainfall (total mm)	Relative Humidity (mean %)
27 September 2017	0.2-26.5	0	NR	3.8-17.9	20.0	NR
28 September 2017	12.5-20.9	6.6	NR			
29 September 2017	7.0-NR	1.2	NR			
16 October 2017	4.4-26.2	0	NR	5.3-24.8	56.8	NR
17 October 2017	6.5-28.2	0	NR			
18 October 2017	5.0-28.2	0	NR			
19 October 2017	5.0-28.2	0	NR			
18 December 2017	15.7-33.3	0	NR	13.8-30.7	153.2	NR
19 December 2017	19.7-36.1	0	NR			
20 December 2017	24.0-27.1	0	NR			
21 December 2017	11.1-28.5	5.6	NR			
22 January 2018	13.4-38.4	0	NR	12.6-33.4	50.6	NR
23 January 2018	13.4-38.4	0	NR			
24 January 2018	13.4-38.4	0	NR			
25 January 2018	13.4-35.1	3.4	NR			
12 February 2018	9.0-29.3	0	NR	10.9-30.8	83.0	NR
13 February 2018	15.9-32.1	0	NR			
14 February 2018	12.0-32.5	0	NR			
15 February 2018	6.0-30.2	0	NR			
16 February 2018	11.4-34.4	0	NR			
26 February 2018	11.7-22.0	63.0	NR			
27 February 2018	10.2-31.7	1.6	NR			
28 February 2018	NR-31.7	0	NR			
1 March 2018	9.7-29.8	0	NR	10.2-28.1	3.0	NR
2 March 2018	12.5-32.0	0	NR			
22 October 2018	7.4-24.6	0	NR	9.8-23.9	18.8	NR

Date	Daily Data			Monthly Data		
	Min-Max Temp. (°C)	Rainfall (mm)	Relative Humidity (%)	Min-Max Temp (mean °C)	Rainfall (total mm)	Relative Humidity (mean %)
23 October 2018	7.5-29.1	0	NR			
24 October 2018	9.5-23.7	0	NR			
25 October 2018	12.1-25.3	0	NR			
26 October 2018	7.9-26.2	0	NR			
29 October 2018	9.1-27.1	0	NR			
30 October 2018	9.0-27.0	0	NR			
31 October 2018	8.5-31.5	0	NR			
5 November 2018	11.9-25.4	0	NR	11.3-26.4	89.4	NR
6 November 2018	16.3-26.5	3.2	NR			
7 November 2018	15.2-17.8	17.4	NR			
8 November 2018	7.0-18.4	18.2	NR			
12 November 2018	NR-30.5	0	NR			
13 November 2018	14.6-30.8	0	NR			
14 November 2018	17.0-22.5	0	NR			
15 November 2018	14.5-26.5	9.2	NR			
16 November 2018	12.2-28.6	0	NR			
19 November 2018	12.5-NR	0	NR			
20 November 2018	NR-30.5	0	NR			
21 November 2018	13.0-22.0	0	NR			
22 November 2018	8.1-15.3	1.4	NR			
23 November 2018	7.4-13.4	12.8	NR			
28 November 2018	13.3-19.1	6.2	NR			
29 November 2018	8.7-24.9	11.6	NR			
30 November 2018	12.6-NR	0	NR			
29 January 2019	19.0-36.0	0.6	88	19.5-36.3	65.5	72
30 January 2019	20.0-38.6	0	87			
31 January 2019	NR-34.3	0	45			
1 February 2019	16.7-26.8	0	71	15.6-31.2	26.4	72
2 February 2019	16.2-30.2	0	77			
3 February 2019	18.7-37.6	2.0	89			
4 February 2019	18.9-36.8	0	95			
5 February 2019	20.2-31.1	4.4	69			
6 February 2019	19.8-33.7	8.0	71			
7 February 2019	20.3-32.5	0	81			

Date	Daily Data			Monthly Data		
	Min-Max Temp. (°C)	Rainfall (mm)	Relative Humidity (%)	Min-Max Temp (mean °C)	Rainfall (total mm)	Relative Humidity (mean %)
8 February 2019	20.5-31.3	0.8	86			
9 February 2019	17.1-23.8	8.2	83			
10 February 2019	8.7-25.4	0	82			
11 February 2019	9.3-28.6	0	68			
12 February 2019	12.3-32.6	0	72			
13 February 2019	11.4-24.6	0	52			
14 February 2019	9.4-30.0	0	75			
15 February 2019	11.4-33.3	0	68			
1 March 2019	18.0-33.4	0.8	85	14.2-27.1	93.4	79
8 March 2019	10.3-30.0	0	85			
25 March 2019	16.8-18.3	8.0	85			
1 April 2019	5.6-22.0	0	84	10.1-23.7	2.0	80
2 April 2019	7.5-24.0	0	83			
3 April 2019	11.0-25.8	0	94			
4 April 2019	11.4-24.0	0	60			
5 April 2019	16.0-25.0	0	75			
6 April 2019	13.0-26.0	0	94			
7 April 2019	9.0-25.0	0	82			
8 April 2019	9.5-26.0	0	72			
9 April 2019	13.0-20.0	1.6	57			
10 April 2019	5.0-19.2	0	80			
11 April 2019	6.4-22.6	0	75			
12 April 2019	11.5-25.3	0	81			
13 April 2019	7.8-24.6	0	85			
14 April 2019	10.3-24.8	0	65			
15 April 2019	14.0-23.8	0.4	73			
16 April 2019	11.3-24.4	0	75			
17 April 2019	11.1-25.6	0	76			
1 July 2019	0.0-11.0	0	100	3.5-13.4	18.6	88
2 July 2019	0.5-13.1	0	96			
3 July 2019	0.7-15.3	0	99			
4 July 2019	2.7-14.7	0	87			
5 July 2019	4.5-17.2	0	79			
6 July 2019	6.2-16.6	0	78			

Date	Daily Data			Monthly Data		
	Min-Max Temp. (°C)	Rainfall (mm)	Relative Humidity (%)	Min-Max Temp (mean °C)	Rainfall (total mm)	Relative Humidity (mean %)
7 July 2019	3.6-14.0	0	96			
8 July 2019	5.5-13.0	2.4	100			
19 August 2019	3.9-8.5	2.4	87	1.8-13.7	33.2	88
20 August 2019	4.0-9.8	0.8	84			
21 August 2019	4.4-13.6	0.6	75			
22 August 2019	8.7-14.0	0	75			
23 August 2019	-1.0-14.8	0	83			
23 September 2019	4.1-12.8	0	85	4.5-18.7	37.6	77
24 September 2019	1.3-16.8	0.6	85			
25 September 2019	2.1-21.0	0	84			
11 November 2019	7.2-25.7	0	83	11.1-27.0	20.4	62
12 November 2019	8.3-26.2	0	65			
13 November 2019	7.4-19.5	0	52			
14 November 2019	7.4-24.2	0	52			
15 November 2019	9.6-25.6	0	53			
17 December 2019	15.0-34.8	0	67	15.1-33.3	8.4	60
18 December 2019	17.2-38.9	0	60			
19 December 2019	17.8-41.2	0	55			
13 January 2020	15.0-30.0	0	58	17.3-34.2	60.9	67
14 January 2020	16.5-NR	0	69			
15 January 2020	NR	NR	NR			
21 January 2020	15.4-28.8	5.4 (46.2 the night before)	78			
5 February 2020	14.7-34.5	0	18.2	16.6-30.3	NR	72
6 February 2020	16.0-26.4	0	NR			
1 July 2020	16.0	0	NR	NR	NR	NR
2 July 2020	14.5	1.8	NR	NR	NR	NR
3 July 202	11.5	0.1	NR	NR	NR	NR

NR = No record

Table 2.6 Weather Conditions for NGH Environmental Surveys

Date	Temperature During Surveys (°C)	Cloud (%)	Wind	Rain (mm)
26 October 2011	18.3	NR	NR	7.4
27 October 2011	22.2	NR	NR	0
31 October 2011	24.1	NR	NR	0
1 November 2011	23.6	NR	NR	0
2 November 2011	22.3	NR	NR	0
3 November 2011	23.0	NR	NR	0
4 November 2011	26.6	NR	NR	0
5 November 2011	18 to 26	Nil	Nil	0
10 April 2012	17.5	NR	NR	0.4
11 April 2012	20.0	NR	NR	0
12 April 2012	NR	NR	NR	0
13 April 2012	23.5	NR	NR	0
14 April 2012	16.5	NR	NR	0
8 July 2013	13.8	NR	NR	0
9 July 2013	3 to 6 in the mornings and 11 to 15 in the afternoons	30	Gentle Breeze	0
10 July 2013		80	Gentle Breeze	0
11 July 2013		100	Mild Breeze	0
12 July 2013		20	Calm	0
4 November 2013	-0.5 to 21	30	Light Wind	0
5 November 2013	1 to 23.5	20	Light Wind	0
6 November 2013	1 to 28	10	Light Wind	0
7 November 2013	5 to 31.5	30	Moderate Wind	0
8 November 2013	10 to 25	80	Moderate Wind	0
9 November 2013	6 to 24	100	Strong Wind	0
15 November 2013	18 to 25	30	Nil	0
18 November 2013	18 to 22	50	Moderate Wind	0
19 November 2013	12 to 27	30	Calm to Slight Breeze	0
20 November 2013	26 to 32	20	Calm	0
22 November 2013	14 to 24	80	Moderate Wind	0
23 November 2013	21 to 24	Nil	Nil	2
27 November 2013	12 to 27	10	Calm to Slight Breeze	4
3 December 2013	20 to 32	10	Calm to Moderate Wind	0
6 December 2013	7.5 to 15	50	Moderate to Strong Wind	0
8 December 2013	25 to 25	0	Calm	0

Date	Temperature During Surveys (°C)	Cloud (%)	Wind	Rain (mm)
10 December 2013	13 to 20	40	Moderate Wind	0
13 December 2013	18 to 26	10	Moderate Wind	0
17 December 2013	18 to 22	Nil	Slight Breeze	0
12 March 2014	27.5	NR	NR	0.8
13 March 2014	25.7	NR	NR	5.4
14 March 2014	29.4	NR	NR	9.0
15 March 2014	26.6	NR	NR	0.6
7 October 2014	NR	NR	NR	8.0
8 October 2014	NR	NR	NR	1.4
9 October 2014	22	NR	NR	0
17 June 2015	14.3	NR	NR	4.6
18 June 2015	11.8	NR	NR	9.0
19 June 2015	14.1	NR	NR	26.6
20 June 2015	11.6	NR	NR	0
21 June 2015	11.9	NR	NR	0
22 June 2015	10.5	NR	NR	0
28 September 2016	20	NR	NR	0

NR = No record

Sourced from the Biodiversity Assessment (NGH Environmental 2014), Biodiversity Assessment Addendum (NGH Environmental 2016a) and BOM (2020).

3 Results

3.1 Landscape Value

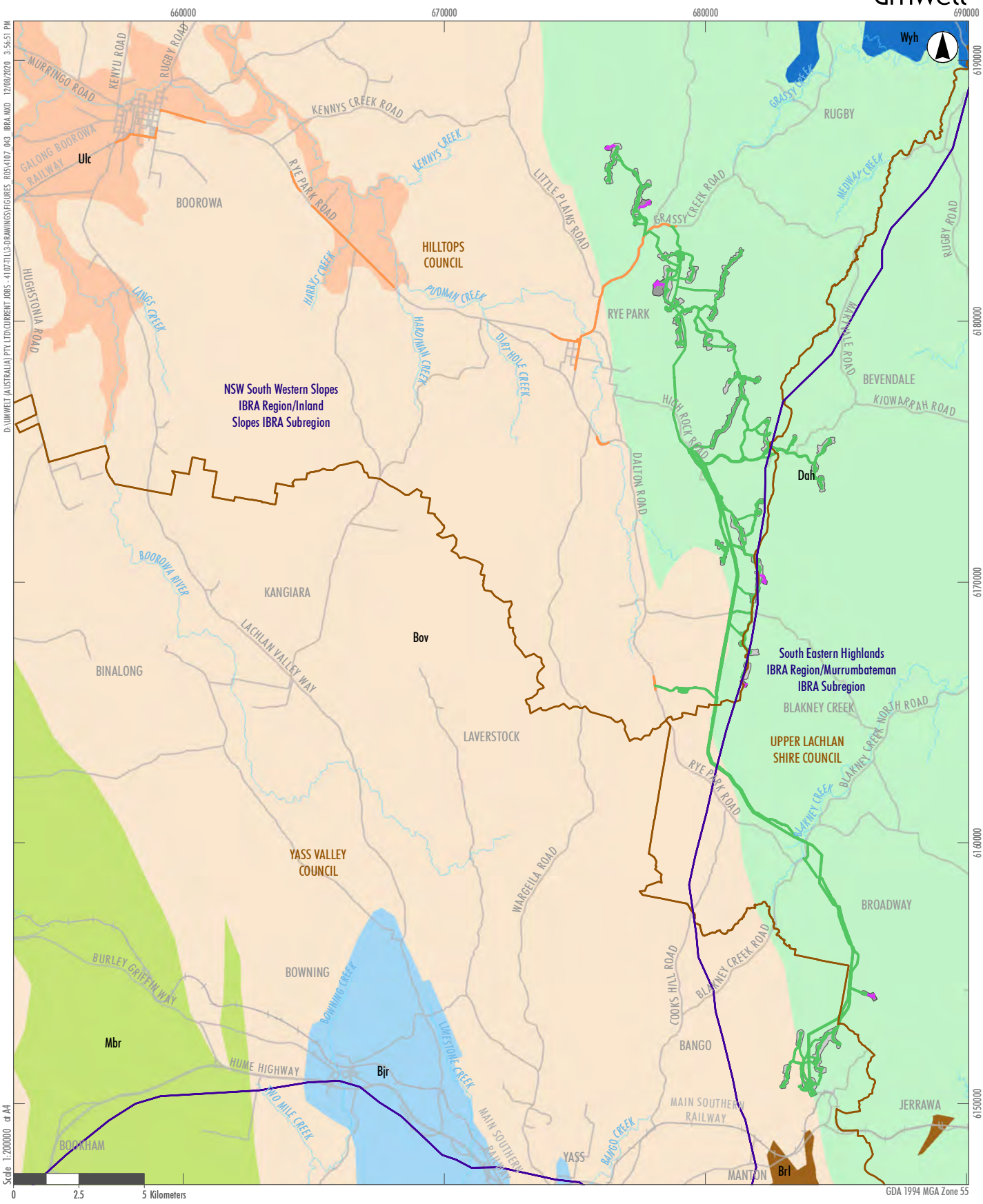
The 500 m buffer area of the Indicative Development Footprints contains a range of landscape features. These landscape features are shown in **Figure 3.1** to **3.2** and outlined in relation to the Indicative Development Footprints in **Table 3.1** below.

Table 3.1 Landscape Features in the Indicative Development Footprints

Landscape Features		Broadly Consistent with Approved Project
IBRA Bioregions	NSW – South Western Slopes South Eastern Highlands	✓
IBRA Subregions (Bioregions)	Inland Slopes (NSW – South Western Slopes) Murrumbateman (South Eastern Highlands)	✓
Mitchell Landscapes	Dalton Hills (Dominant) Boorowa Volcanics (Sub-dominant) Upper Lachlan Channels and Floodplains (Minor)	✓
Rivers, Streams, Estuaries[1]	Barlows Creek (3rd Stream Order) Blakney Creek (1st and 4th Stream Order) Browns Creek (2nd Stream Order) Dry Creek (3rd Stream Order) Flakney Creek (1st and 2nd Stream Order) Grassy Creek (2nd Stream Order) Harrys Creek (4th Stream Order) Lagoon Creek (2nd, 3rd, 4th and 5th Stream Order) Pipeclay Creek (2nd Stream Order) Pudman Creek (5th and 6th Stream Order) Reedy Gully (2nd Stream Order) Ryans Creek (2nd and 3rd Stream Order) Spring Creek (3rd and 4th Stream Order) Urumwalla Creek (2nd and 4th Stream Order)	✓
Wetlands (within, adjacent to and downstream)	Nil	✓
Native Vegetation Covers	500 metre buffer comprises 11,086 hectares (7,867 hectares in SWS IBRA Region and 3,219 hectares in SEH IBRA Region) (**Figure 3.2**) **SWS IBRA Region** 3,716 hectares of native vegetation was mapped in the 500m buffer area (47 per cent) **SHE IBRA Region** 1,734 hectares of native vegetation was mapped in the 500m buffer area (54 per cent)	✓

Landscape Features		Broadly Consistent with Approved Project
Areas of Geological Significance or Soil Hazard Features	None identified	✓
Areas of Outstanding Biodiversity Value	None identified	✓
Cleared Areas	118.78 hectares within the Indicative Development Footprints (including both the Indicative Development Footprint – Wind Farm, Indicative Development Footprint – Permanent Met Masts and the Indicative Development Footprint – External Roads). This comprises 103.18 hectares of Non-native Vegetation and 15.60 hectares of roads, tracks and waterbodies.	✓
Connectivity Features	Broad habitat connectivity corridors have been identified and are presented in **Figure 3.2.** Not identified as an important flyway for migratory species. As part of the BBAMP survey work completed by Umwelt, the migration period of the large bent-wing bat was surveyed (as requested by BCD), to determine the usage of the species when migrating north from their maternity cave at Wee Jasper, NSW. The results of the BBAMP survey confirms that the site is not being used as a migration route by this species.	✓

[1] Strahler, A. N., (1952)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Local Government Area
- IBRA Region/Subregion Area
- Watercourses

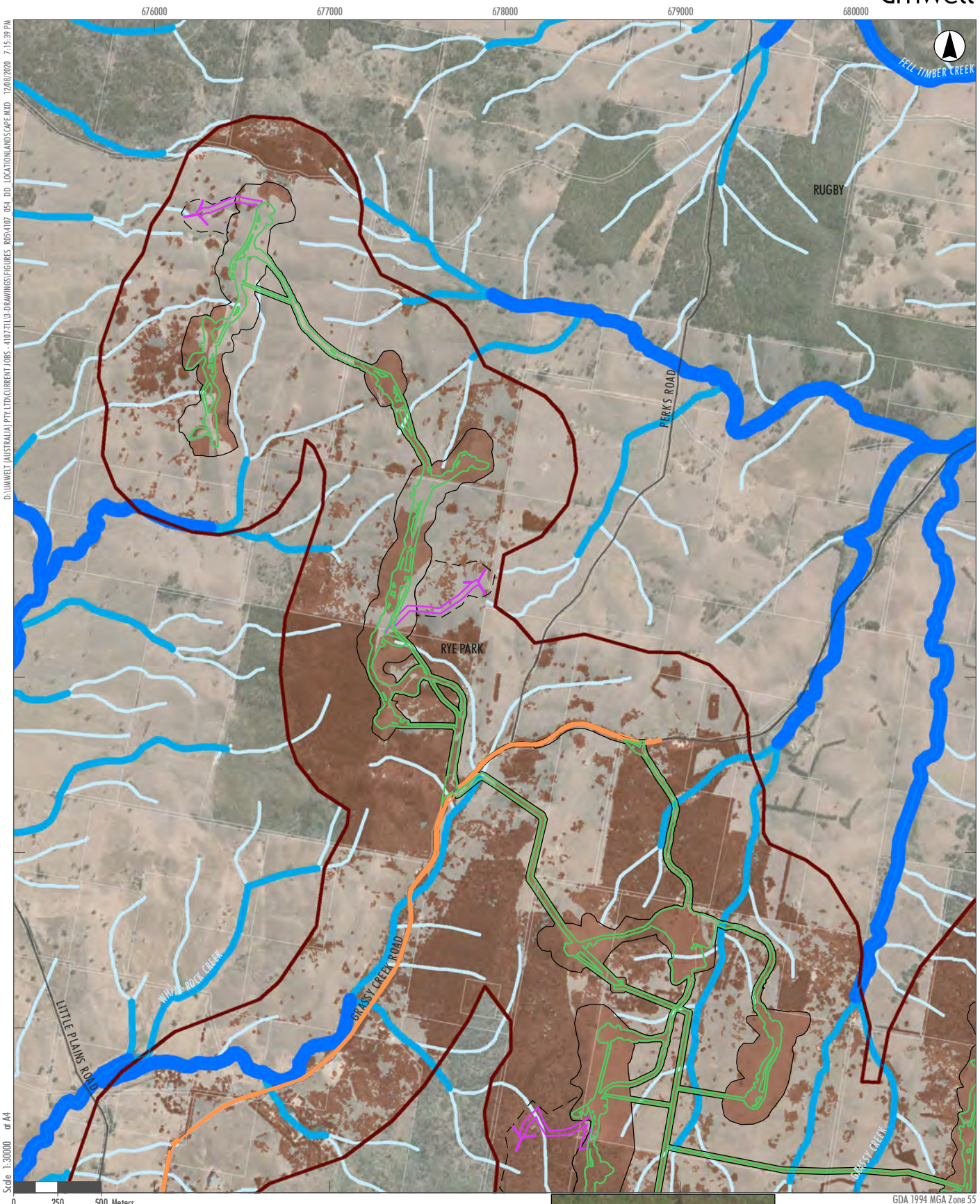
Mitchell Landscapes

- Boorowa Volcanics (Bov)
- Breadalbane Swamps and Lagoons (Brl)
- Burrinjuck Ridges (Bjr)
- Crookwell Basalts and Sands (Ckw)
- Dalton Hills (Dah)
- Gunning Hills (Ghg)
- Marilba Range
- Upper Lachlan Channels and Floodplains (Ulc)
- Wyangla Hills (Wyh)

FIGURE 3.1

Location Map IBRA Regions/Subregions and Local Government Areas

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Australian Government Department of the Environment (2012); OEH (2008); NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Native Vegetation
- 500m Development Footprint Buffer
- Property Boundaries
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)

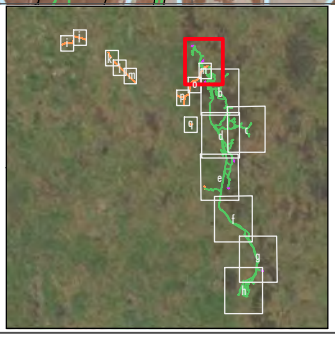
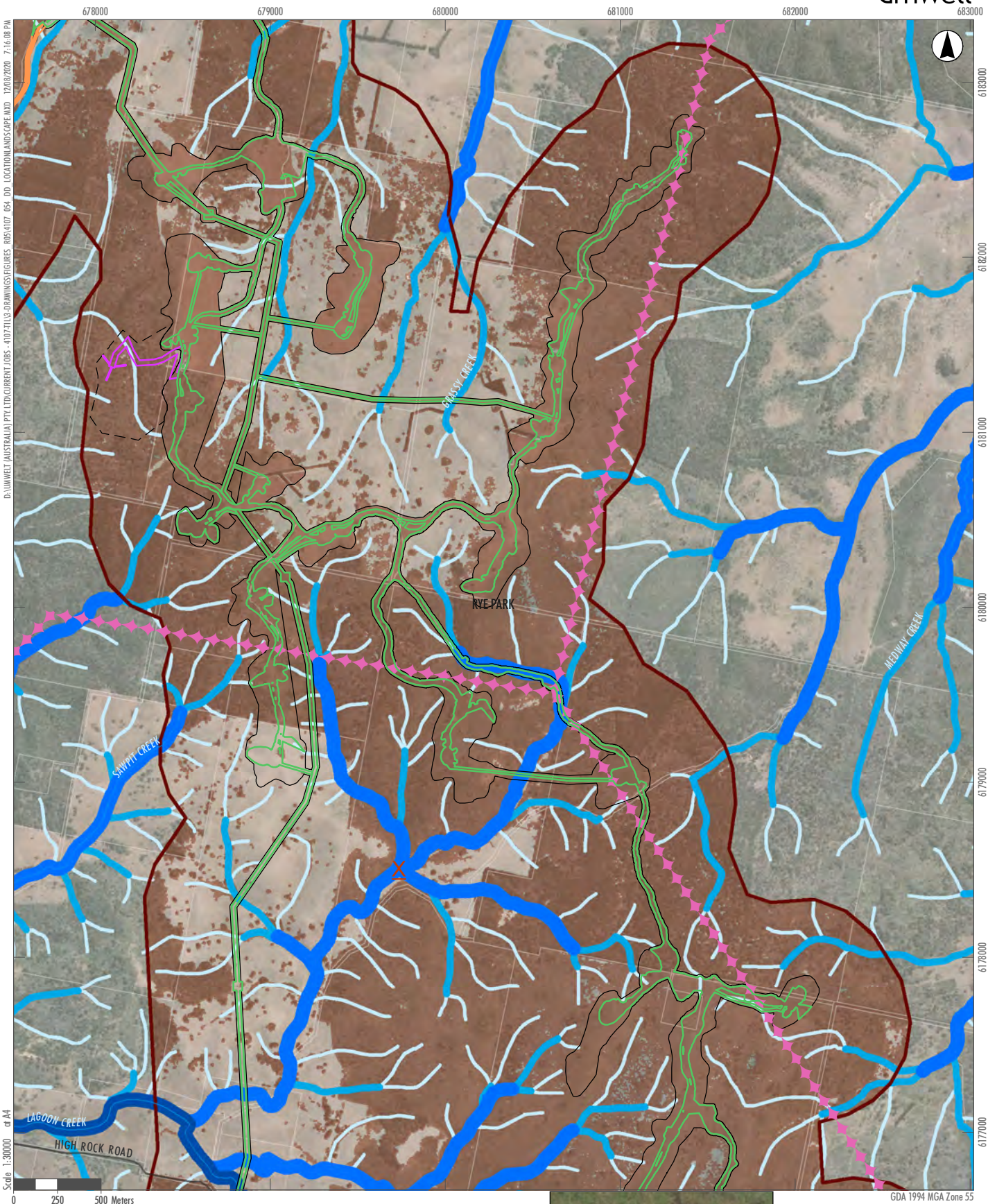


FIGURE 3.2.a

Location Map Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Scale 1:30000 at A4

Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Native Vegetation
- 500m Development Footprint Buffer
- Indicative Habitat Corridors
- Property Boundaries
- Watercourses
- Historic Mine Shaft

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)
- 50m Riparian Corridor (Stream Orders 5, 6)

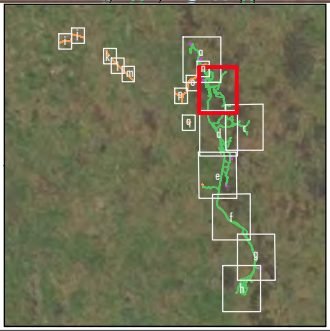
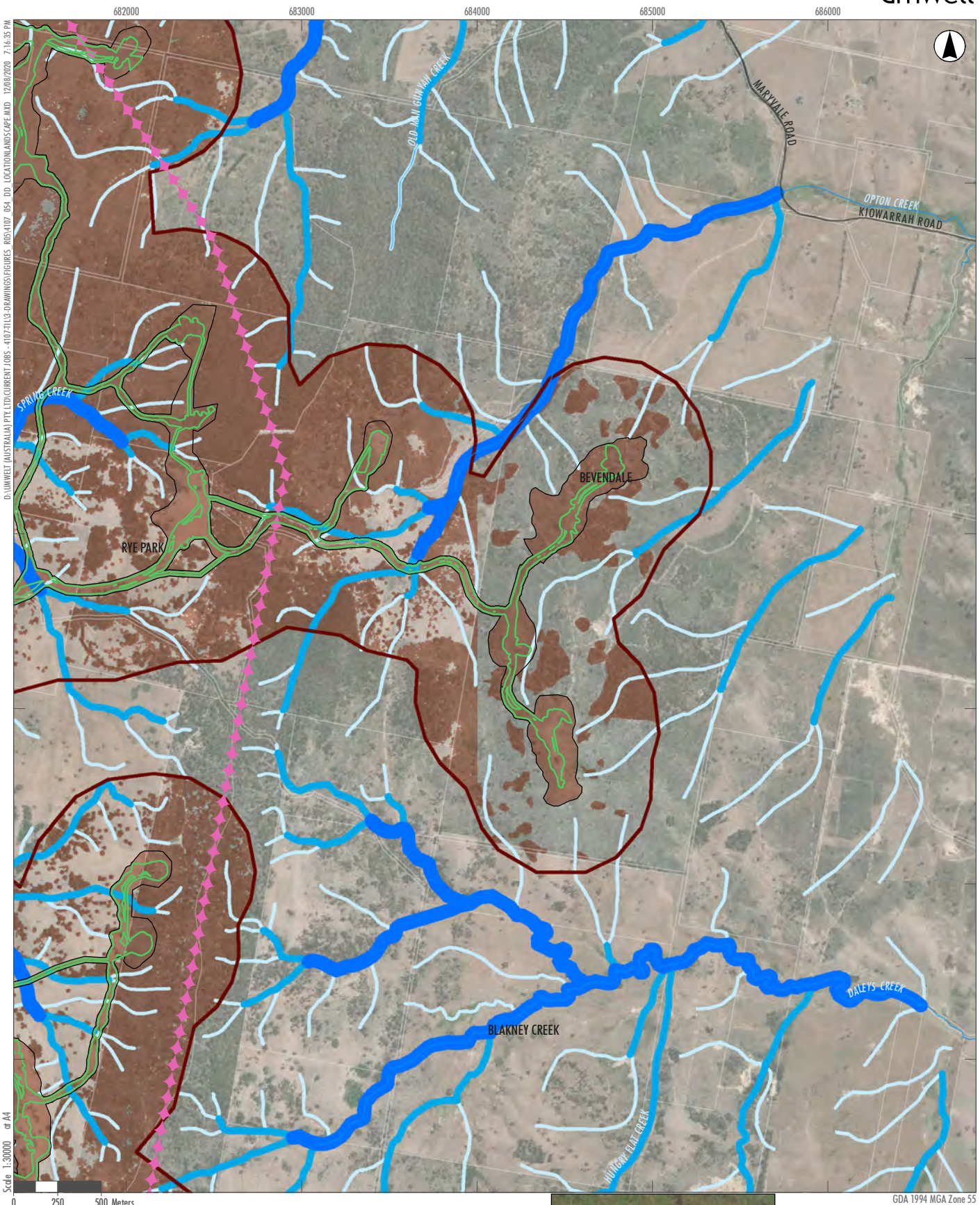


FIGURE 3.2.b

Location Map Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm
- Native Vegetation
- 500m Development Footprint Buffer
- Indicative Habitat Corridors
- Property Boundaries
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)

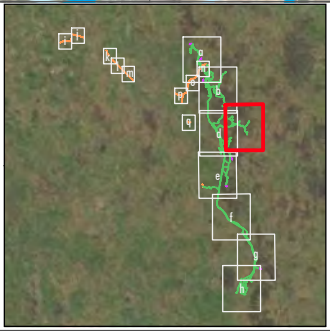
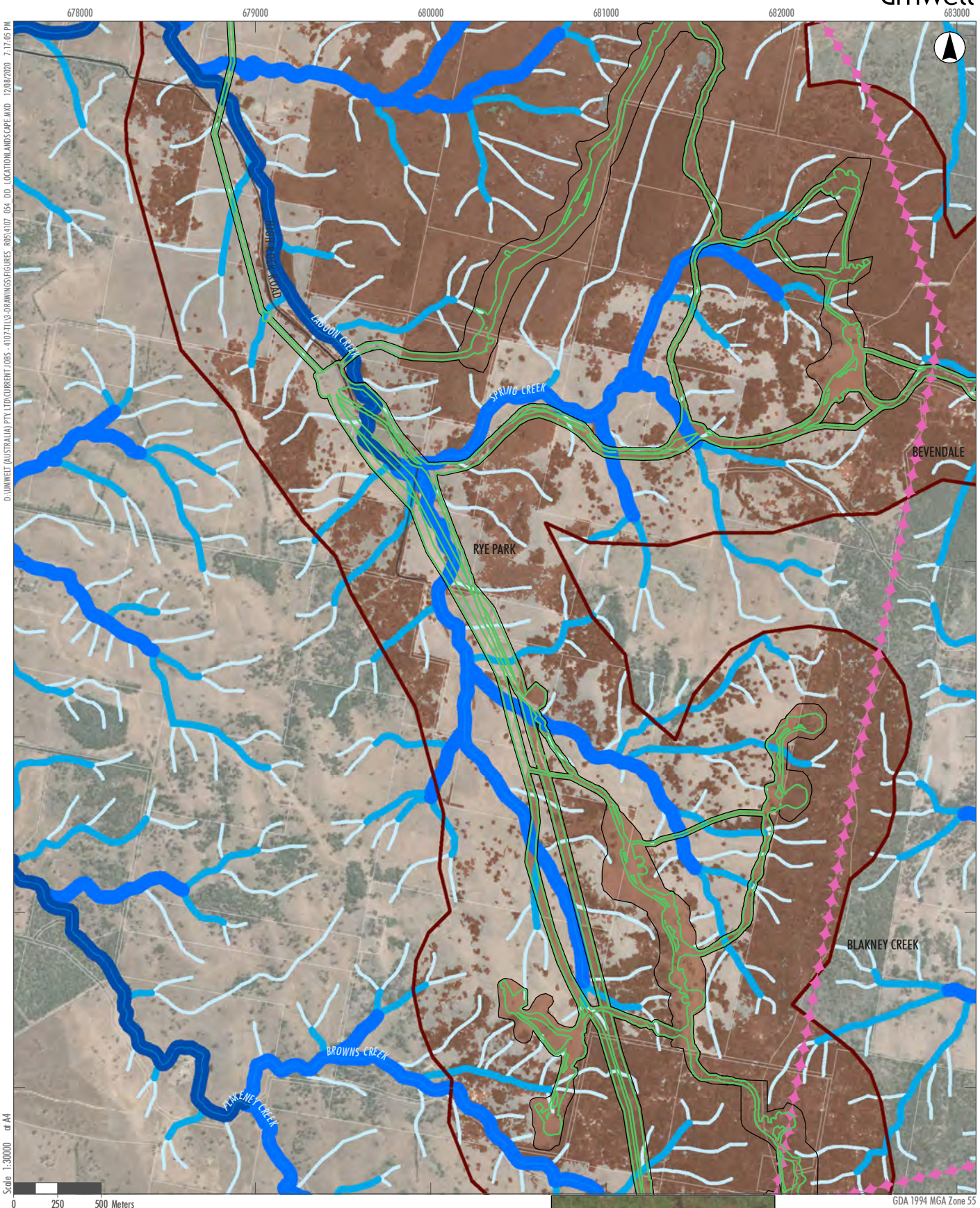


FIGURE 3.2.c

Location Map Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm
- Native Vegetation
- 500m Development Footprint Buffer
- Indicative Habitat Corridors
- Property Boundaries
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)
- 50m Riparian Corridor (Stream Orders 5, 6)

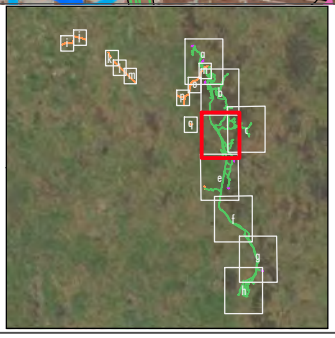
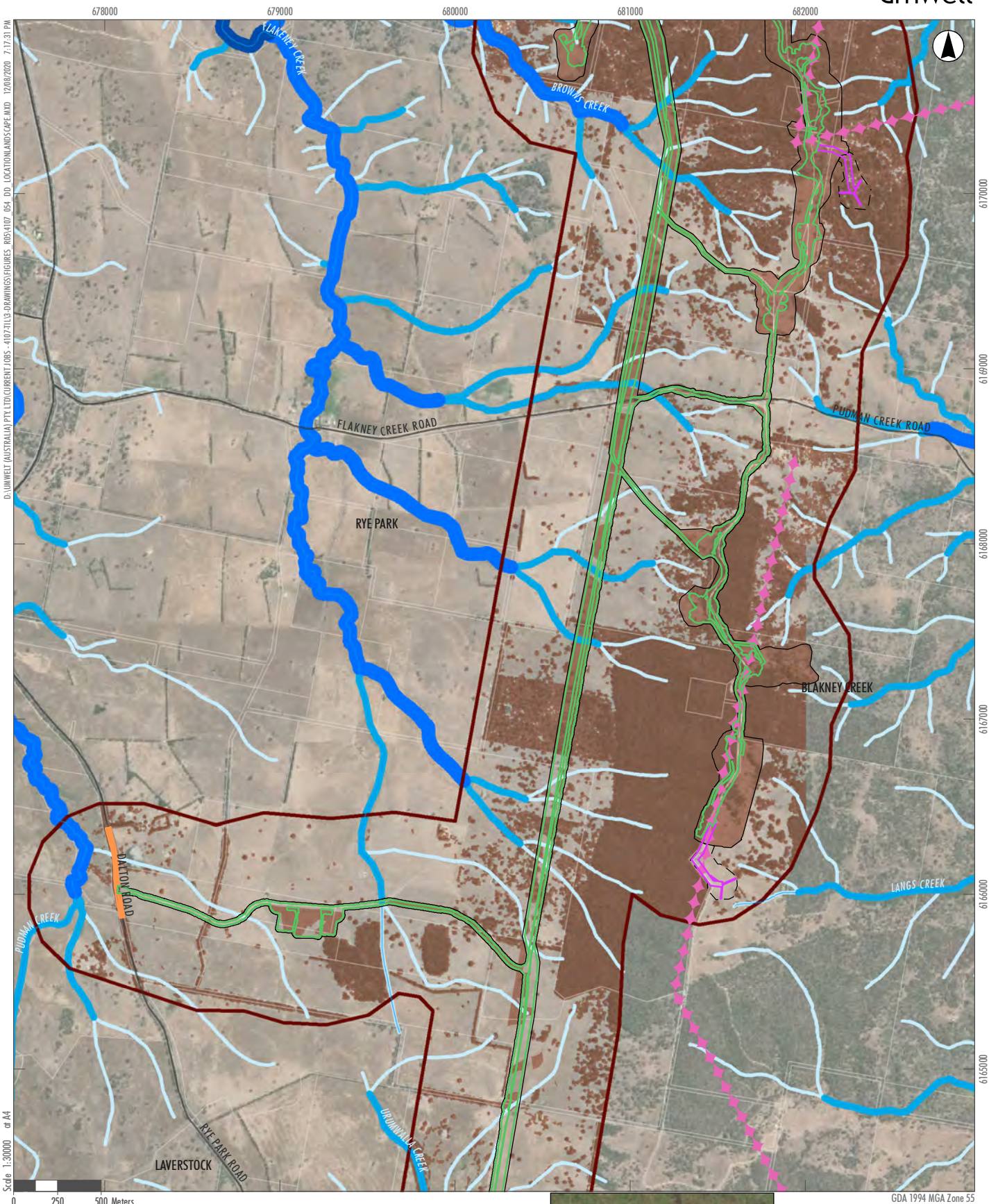


FIGURE 3.2.d

Location Map Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Native Vegetation
- 500m Development Footprint Buffer
- Indicative Habitat Corridors
- Property Boundaries
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)
- 50m Riparian Corridor (Stream Orders 5, 6)

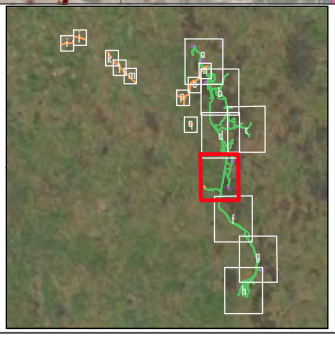
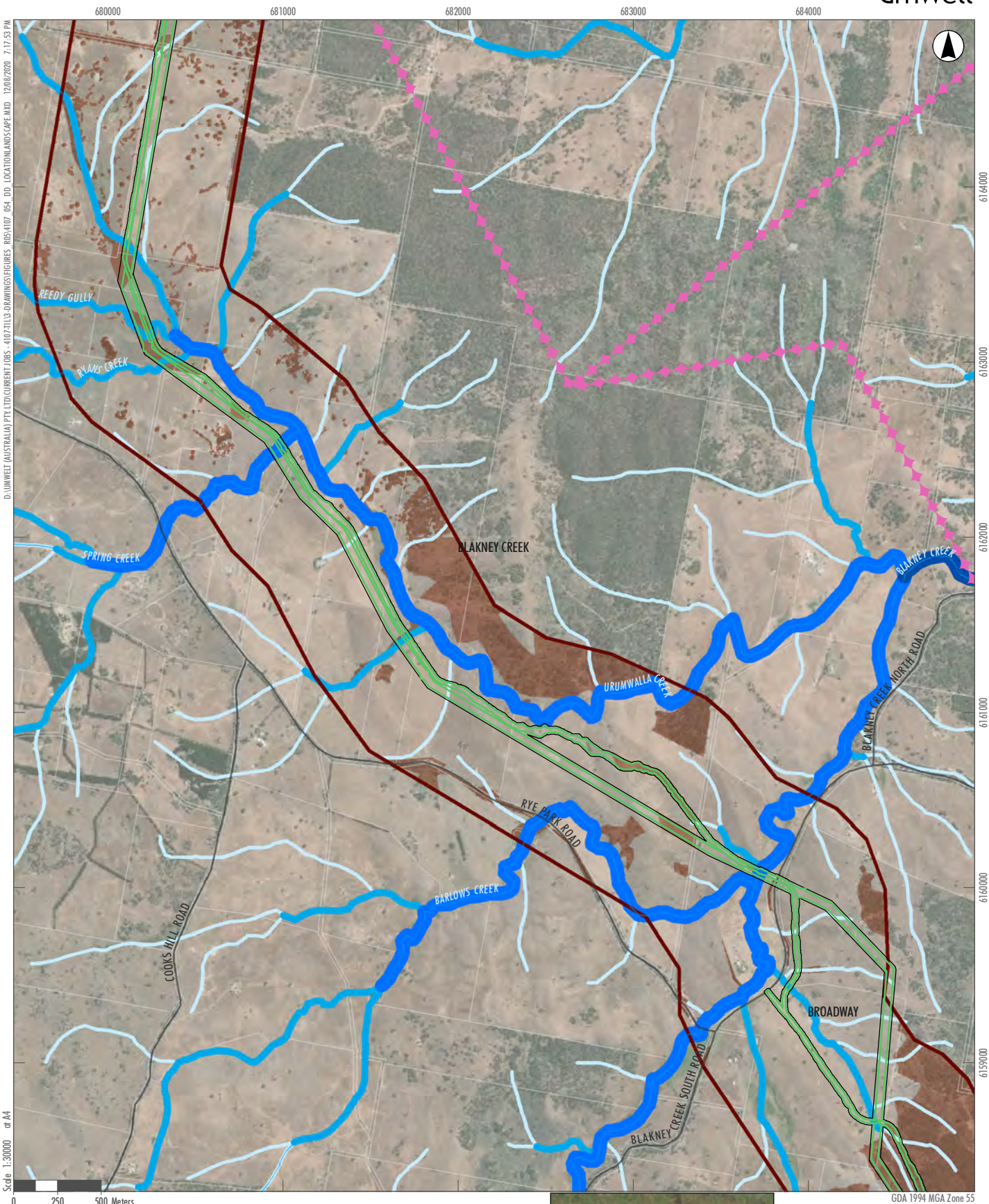


FIGURE 3.2.e

Location Map
Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



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Scale 1:30000 at A4

Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm
- Native Vegetation
- 500m Development Footprint Buffer
- Indicative Habitat Corridors
- Property Boundaries
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)
- 50m Riparian Corridor (Stream Orders 5, 6)

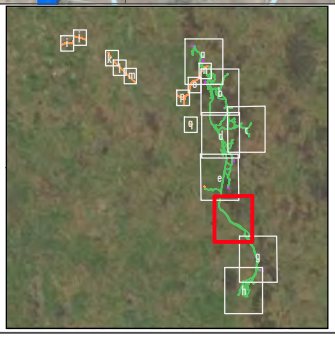
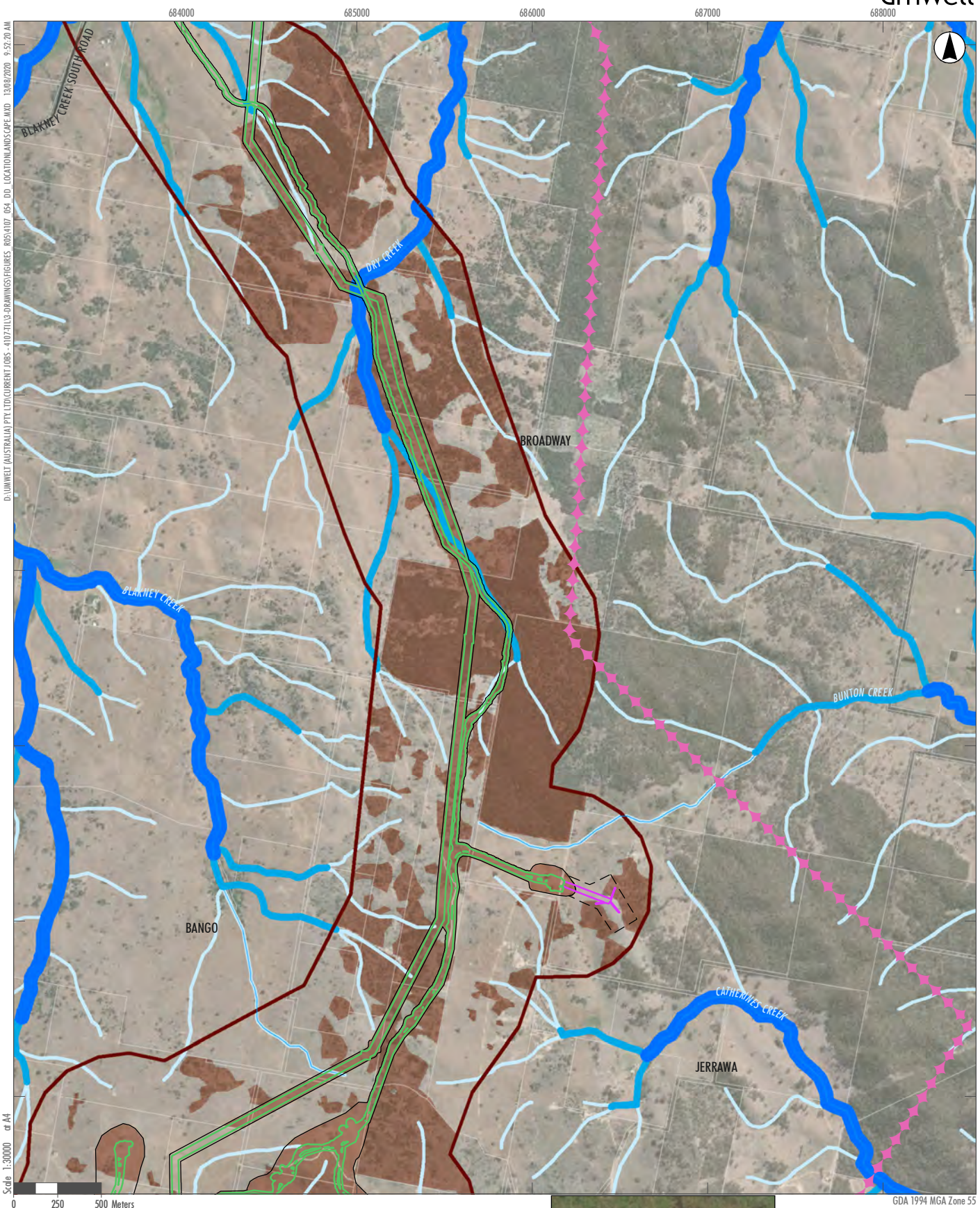


FIGURE 3.2.f

Location Map
Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



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Scale 1:30000 at A4

Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Native Vegetation
- 500m Development Footprint Buffer
- Indicative Habitat Corridors
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)

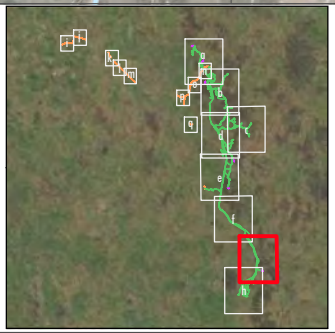
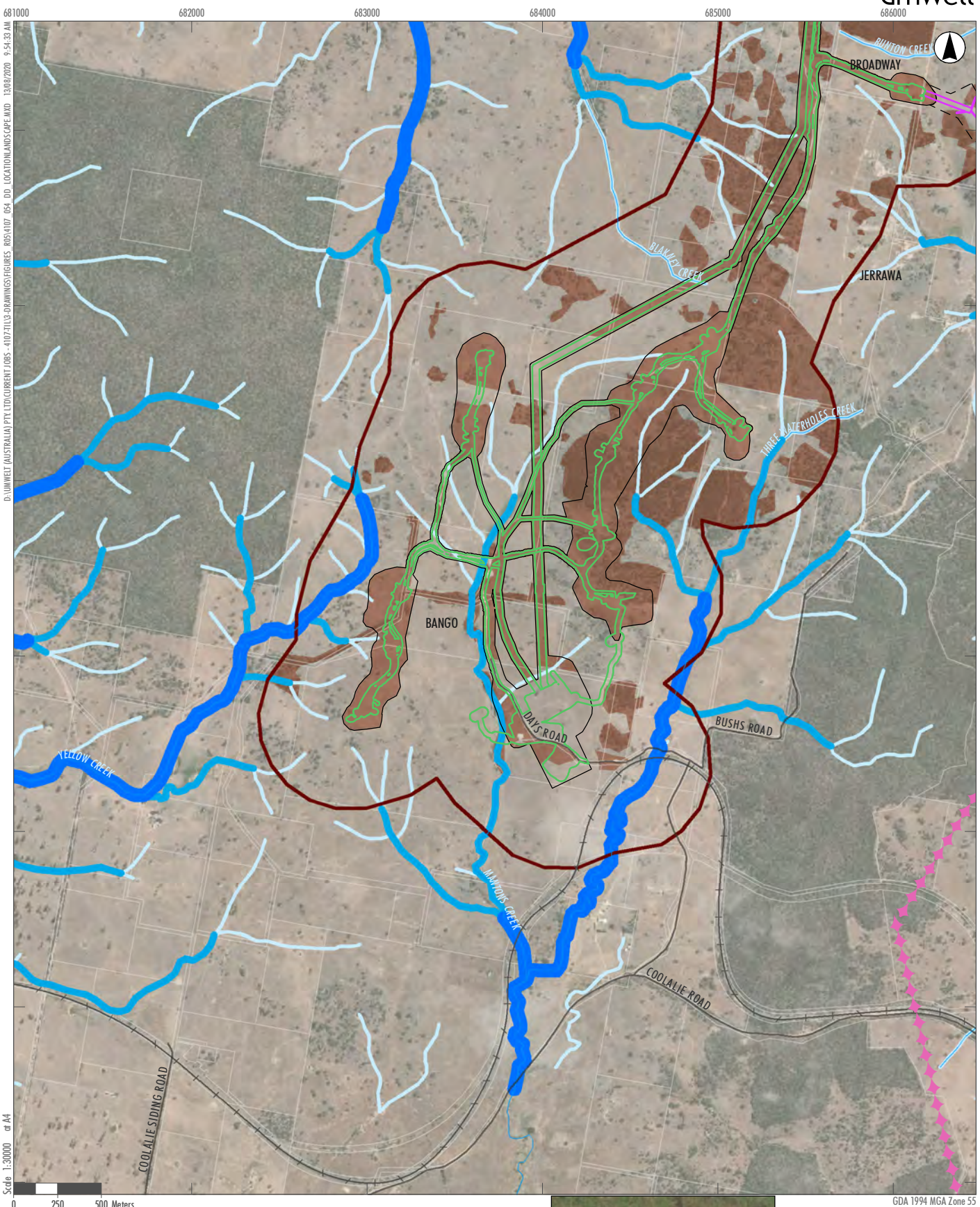


FIGURE 3.2.g

Location Map
Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Scale 1:30000 at A4

Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Native Vegetation
- 500m Development Footprint Buffer
- Indicative Habitat Corridors
- Railways
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)

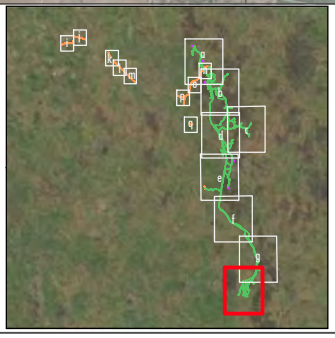


FIGURE 3.2.h

Location Map
Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads
- Native Vegetation
- 500m Development Footprint Buffer
- Property Boundaries
- Railways
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)
- 50m Riparian Corridor (Stream Orders 5, 6)

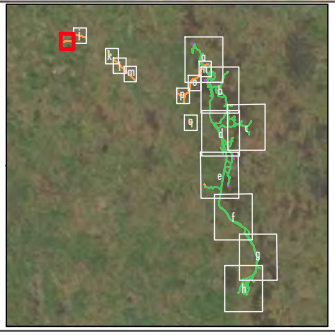


FIGURE 3.2.i

Location Map
Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads
- Native Vegetation
- 500m Development Footprint Buffer
- Property Boundaries
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 50m Riparian Corridor (Stream Orders 5, 6)

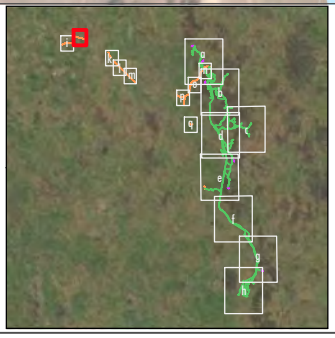


FIGURE 3.2.j

Location Map Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads
- Native Vegetation
- 500m Development Footprint Buffer
- Property Boundaries
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)
- 50m Riparian Corridor (Stream Orders 5, 6)

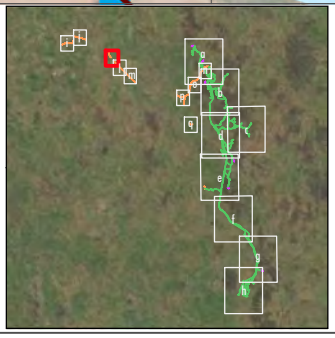


FIGURE 3.2.k

Location Map Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads
- Native Vegetation
- 500m Development Footprint Buffer
- Property Boundaries
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)

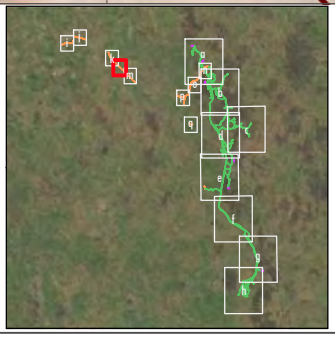


FIGURE 3.2.1

Location Map Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads
- Native Vegetation
- 500m Development Footprint Buffer
- Property Boundaries
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)
- 50m Riparian Corridor (Stream Orders 5, 6)

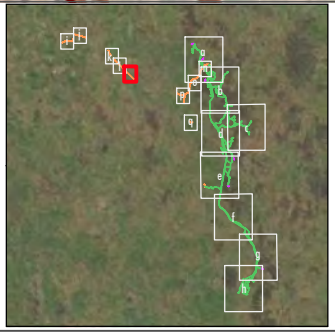


FIGURE 3.2.m

Location Map
Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - External Roads
- Native Vegetation
- 500m Development Footprint Buffer
- Property Boundaries

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)

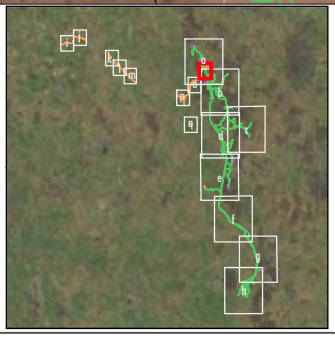


FIGURE 3.2.n

Location Map Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads
- Native Vegetation
- 500m Development Footprint Buffer
- Property Boundaries
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)

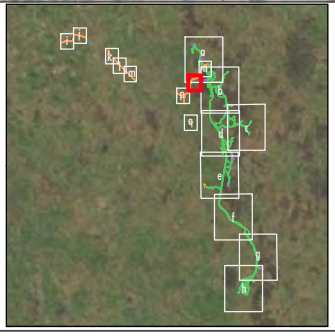


FIGURE 3.2.o

Location Map Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

Scale 1:10000 at A4

Legend

- Indicative Development Footprint - External Roads
- Native Vegetation
- 500m Development Footprint Buffer
- Property Boundaries
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)
- 50m Riparian Corridor (Stream Orders 5, 6)

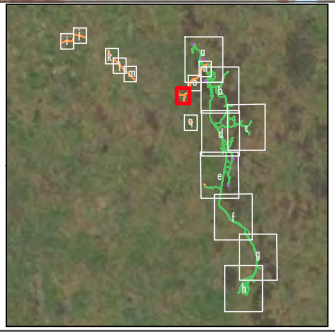


FIGURE 3.2.p

Location Map Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads
- Native Vegetation
- 500m Development Footprint Buffer
- Property Boundaries
- Watercourses

Riparian Buffers (Strahler Stream Order)

- 10m Riparian Corridor (Stream Orders 0, 1)
- 20m Riparian Corridor (Stream Orders 2, 3)
- 40m Riparian Corridor (Stream Orders 3, 4)
- 50m Riparian Corridor (Stream Orders 5, 6)

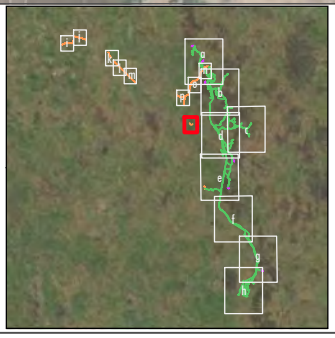


FIGURE 3.2.q

Location Map Landscape Features

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

3.2 Native Vegetation within the Indicative Development Footprints

3.2.1 Plant Community Types and Vegetation Zones

Surveys of the Indicative Development Footprints identified four PCTs across ten condition classes being (refer to **Figure 3.3**):

- PCT 289 Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
    - Moderate to Good
- PCT 335 Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion
    - Moderate to Good
- PCT 350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
    - Moderate to Good
    - Derived Native Grassland
- PCT 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
    - Moderate to Good
    - Derived Native Grassland
    - Acacia Shrubland
    - Sifton Bush Shrubland
    - Argyle Apple Forest
    - Non-native Vegetation

A summary of the extent of each of the vegetation zones recorded within the Development Corridors, Indicative Development Footprints is provided with a comparison against the previous vegetation mapping (NGH Environmental 2016a) in **Table 3.2**.

A description of each vegetation zones is provided below and flora and fauna species lists are included in **Appendix C**.

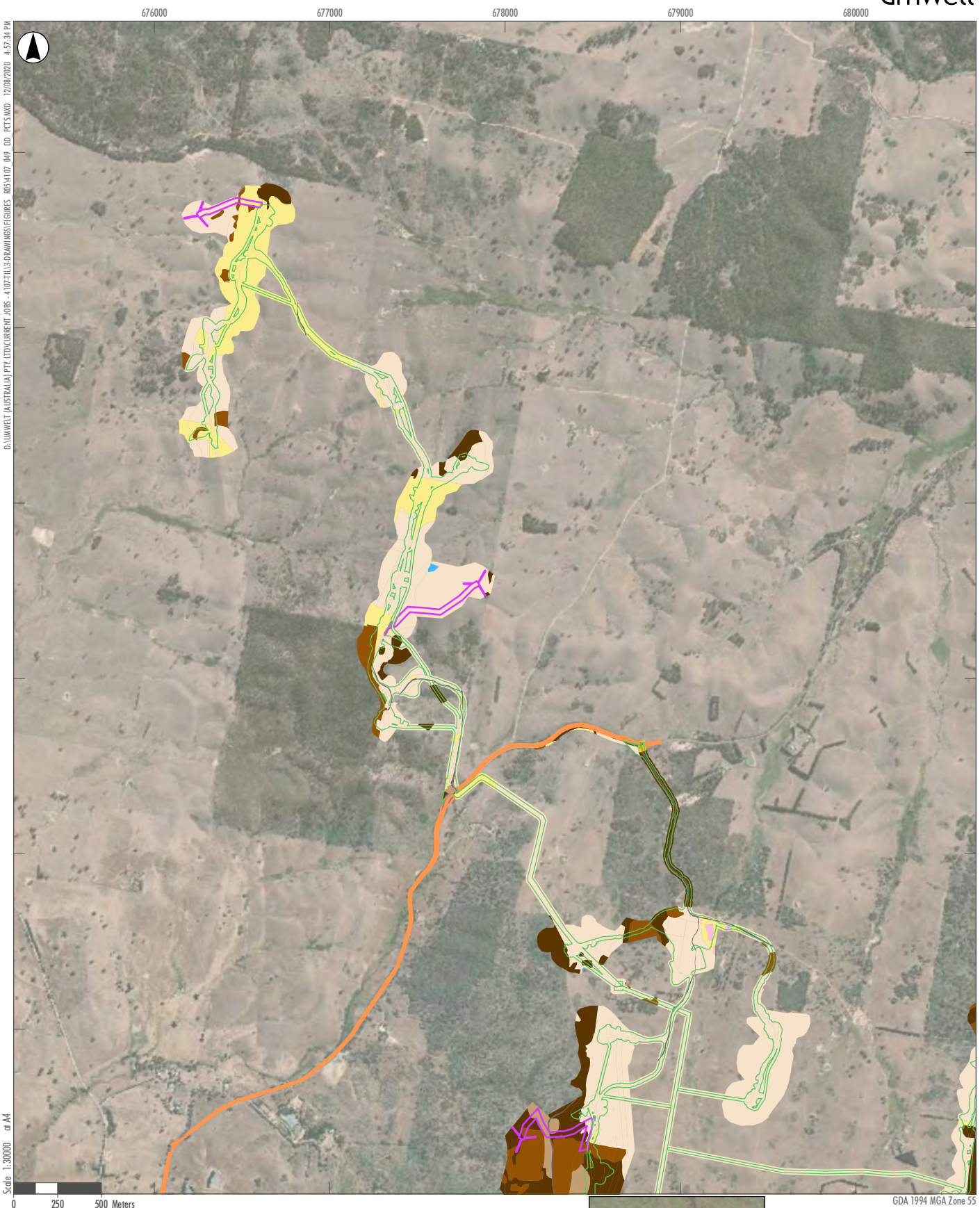
Table 3.2 Summary of Vegetation Zones in Development Corridors and Indicative Development Footprints

Current PCT and Condition	Previous Vegetation Mapping[1]	Area in Development Corridor – Wind Farm (ha)	Area in Development Corridor – Permanent Met Masts (ha)	Total Area in Development Corridors (ha)	Area in Indicative Development Footprint – Wind Farm (ha)	Area in Indicative Development Footprint – Permanent Met Masts (ha)	Area in Indicative Development Footprint – External Road (ha)	Total Area in Indicative Development Footprints (ha)
289 Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good Condition*	-	0.05	0	**0.05**	0.05	0	0.73	**0.78**
335 Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good Condition*	-	14.58	0	**14.58**	5.50	0	0	**5.50**
350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Moderate to Good Condition*	24.9	36.33	0	**36.33**	18.75	0	1.33	**20.08**

Current PCT and Condition	Previous Vegetation Mapping[1]	Area in Development Corridor – Wind Farm (ha)	Area in Development Corridor – Permanent Met Masts (ha)	Total Area in Development Corridors (ha)	Area in Indicative Development Footprint – Wind Farm (ha)	Area in Indicative Development Footprint – Permanent Met Masts (ha)	Area in Indicative Development Footprint – External Road (ha)	Total Area in Indicative Development Footprints (ha)
350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Derived Native Grassland*	25.3	32.71	0	**32.71**	16.85	0	0.67	**17.52**
351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Moderate Good Condition*	87.7	217.26	12.40	**229.66**	83.59	0.47	0.75	**84.81**
351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Derived Native Grassland*	71.6	449.75	17.93	**467.68**	169.08	4.76	0.15	**173.99**
351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Acacia Shrubland*	1.3	21.99	6.68	**28.67**	7.25	1.25	0.03	**8.53**

Current PCT and Condition	Previous Vegetation Mapping[1]	Area in Development Corridor – Wind Farm (ha)	Area in Development Corridor – Permanent Met Masts (ha)	Total Area in Development Corridors (ha)	Area in Indicative Development Footprint – Wind Farm (ha)	Area in Indicative Development Footprint – Permanent Met Masts (ha)	Area in Indicative Development Footprint – External Road (ha)	Total Area in Indicative Development Footprints (ha)
351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Sifton Bush Shrubland*	29.6	249.13	9.94	**259.07**	82.80	1.12	0.26	**84.18**
351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Argyle Apple Forest*	0.4	3.79	0	**3.79**	0.61	0	0.01	**0.62**
Non-native Vegetation	15.8	229.71	4.07	**233.78**	90.23	1.35	13.60	**105.18**
Nil (incl. roads, tracks and waterbodies)	-	20.27	0.96	**21.23**	14.26	0.22	1.24	**15.72**
Totals	**256.8**	**1,275.57**	**51.98**	**1,327.55**	**488.97**	**9.17**	**18.77**	**516.91**

[1] Biodiversity Assessment Addendum (NGH Environmental 2016a)



Legend

- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

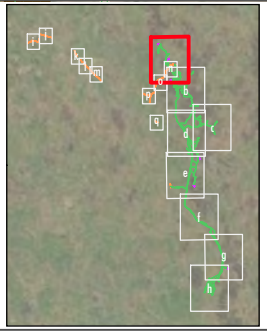
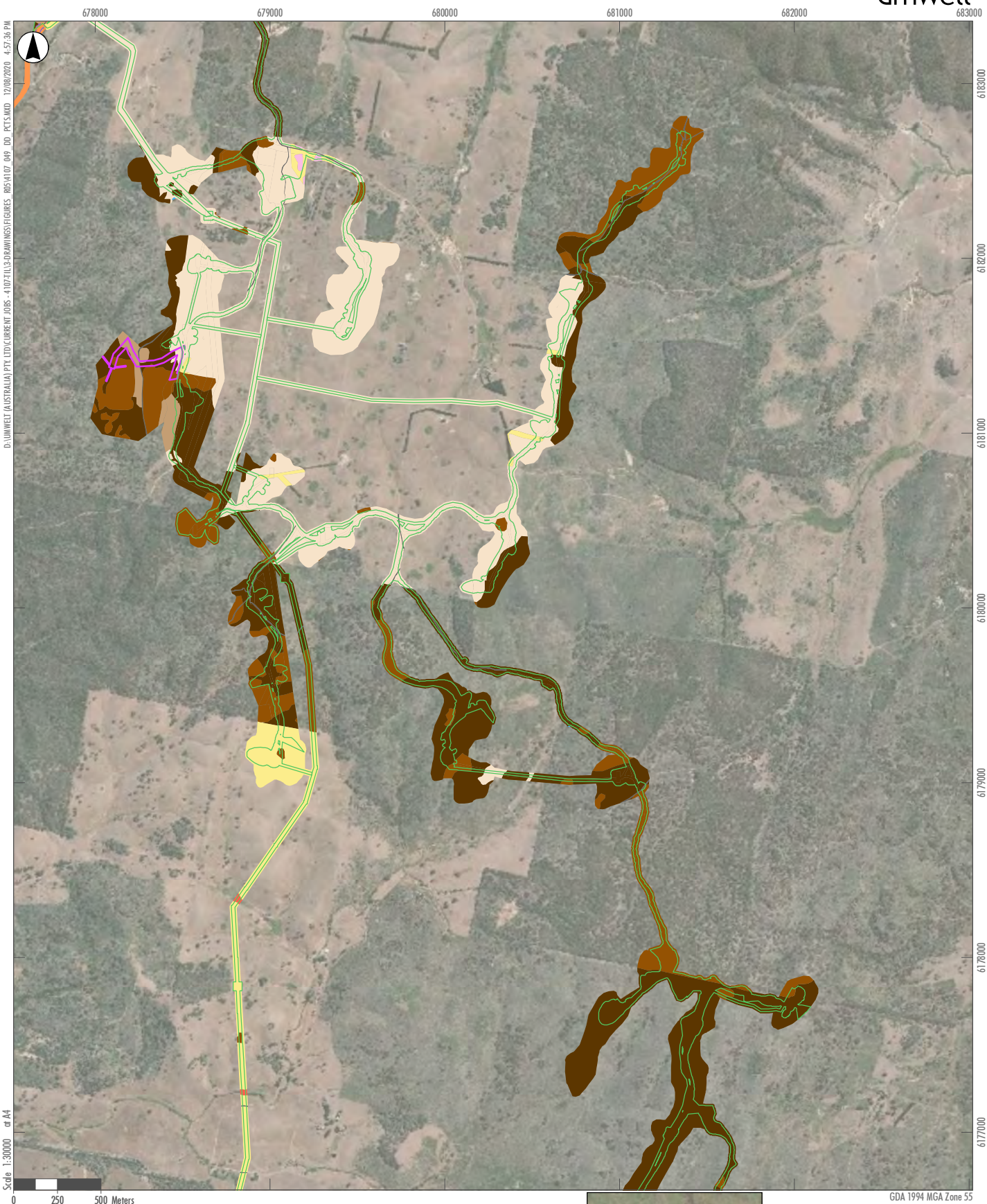


FIGURE 3.3.a

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

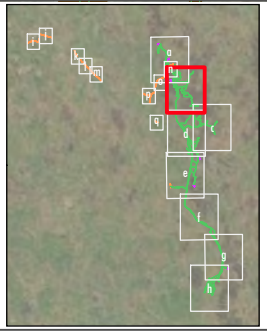
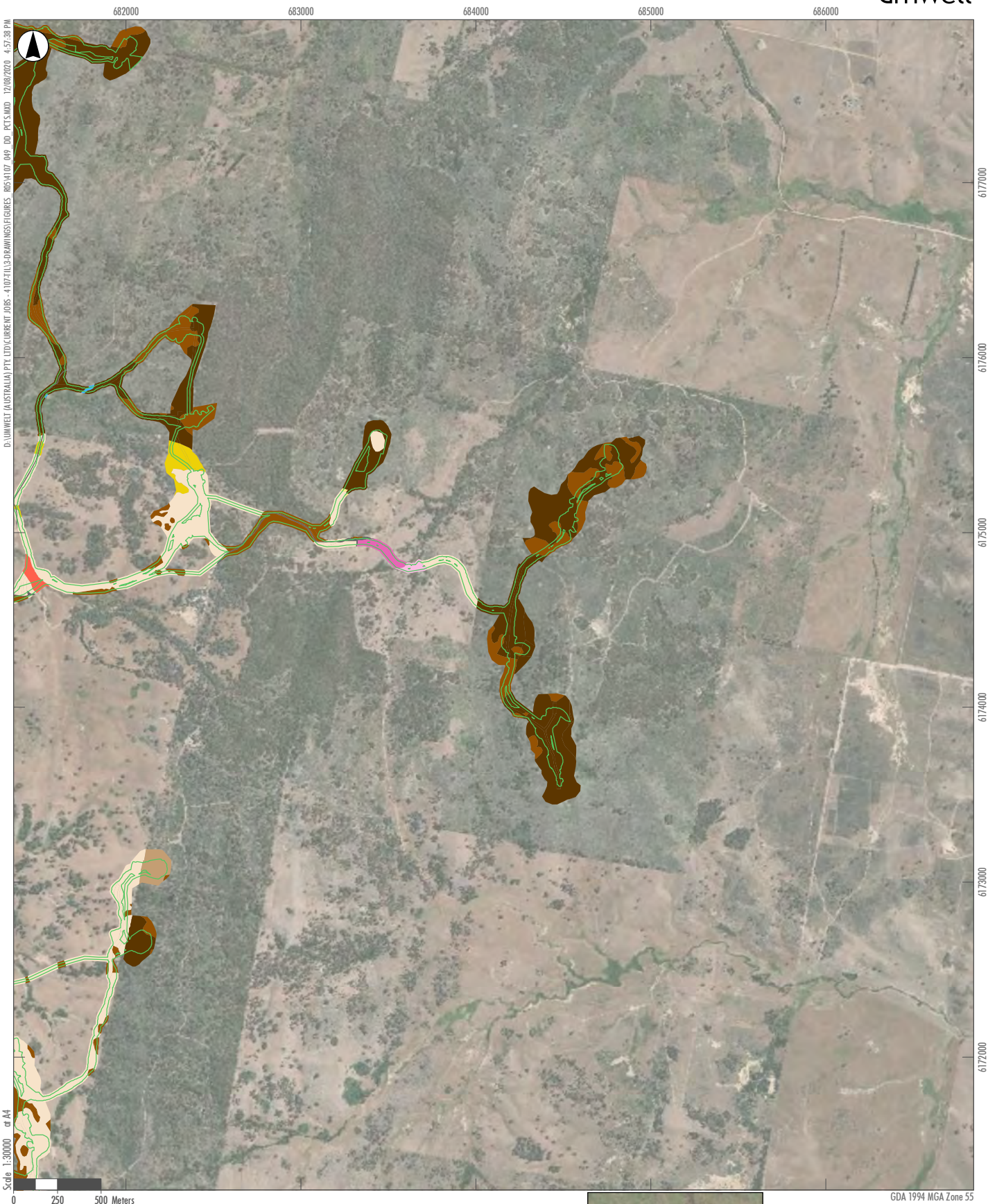


FIGURE 3.3.b

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprint - Wind Farm

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

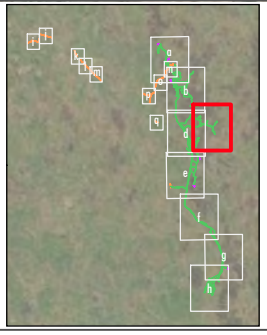
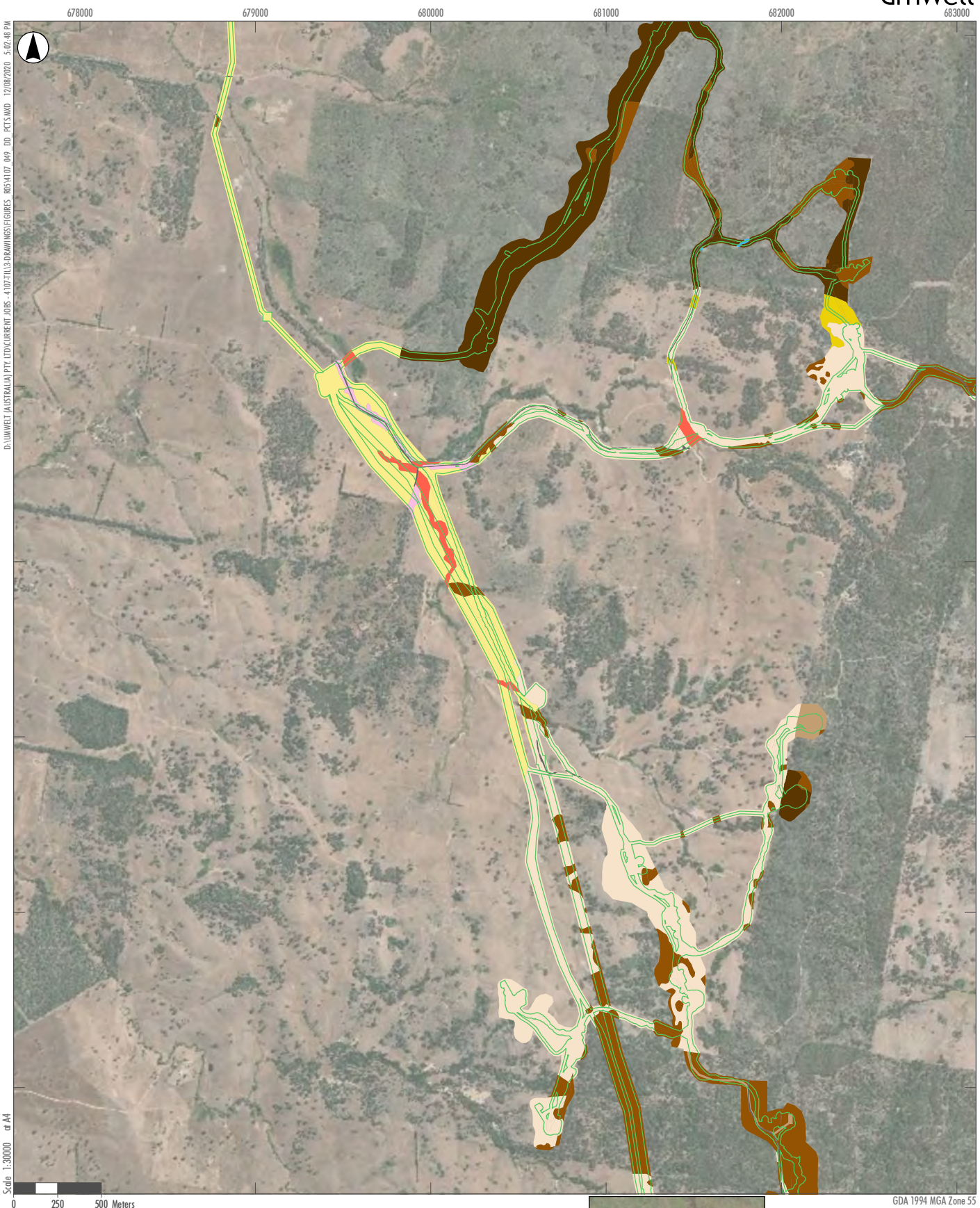


FIGURE 3.3.c

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprint - Wind Farm

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

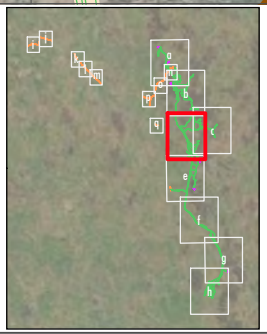
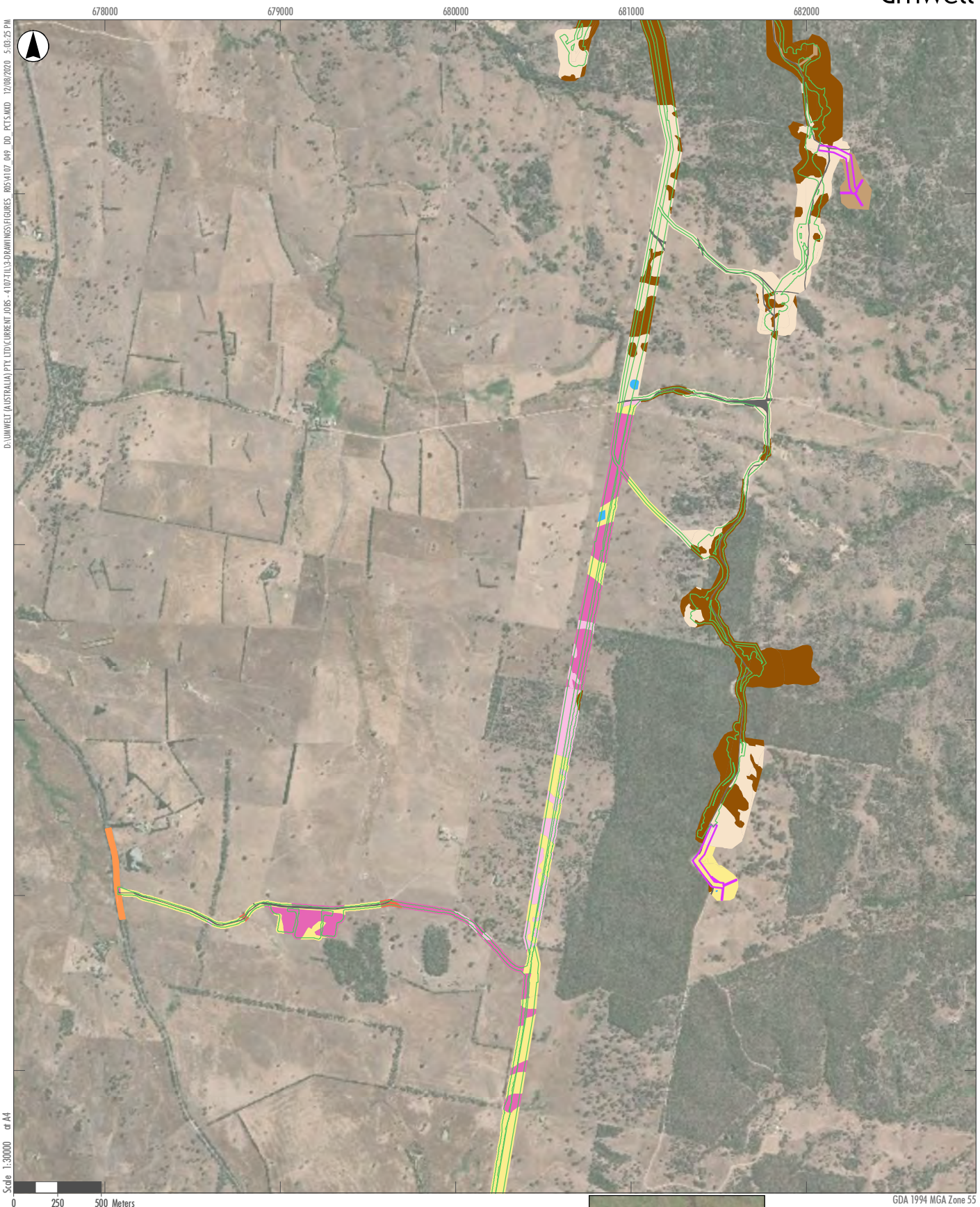


FIGURE 3.3.d

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

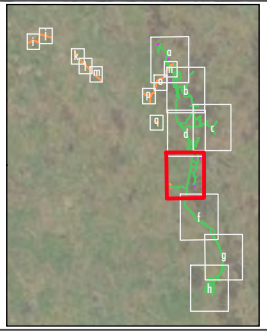


FIGURE 3.3.e

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - Wind Farm

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

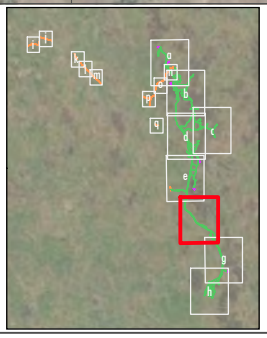


FIGURE 3.3.f

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

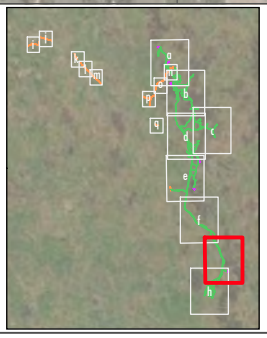
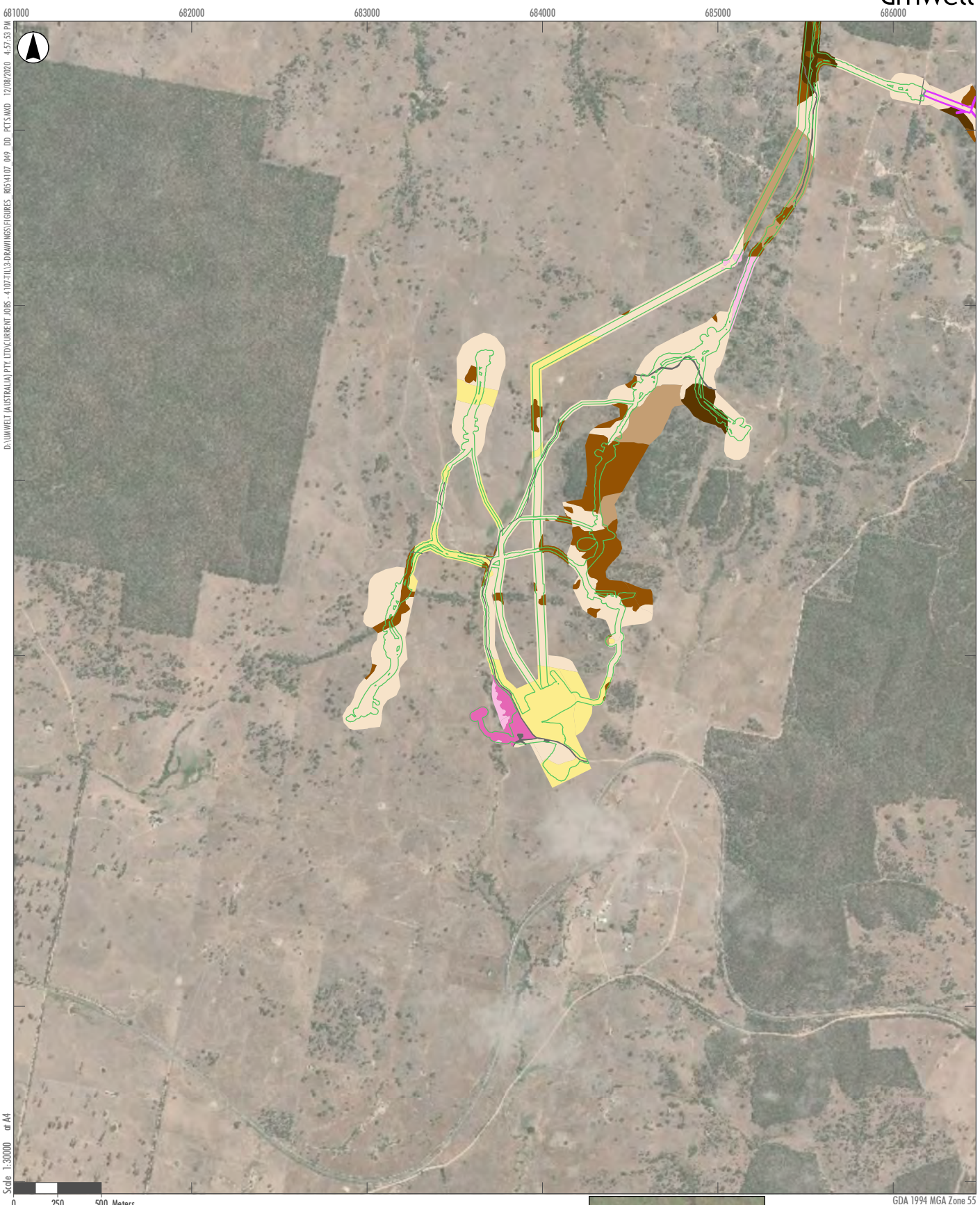


FIGURE 3.3.g

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



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Scale 1:30000 at A4

Legend

- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

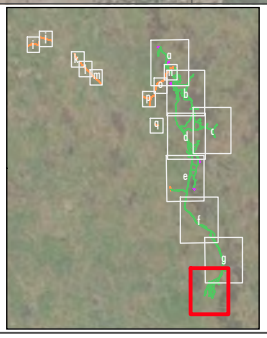

FIGURE 3.3.h

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
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- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

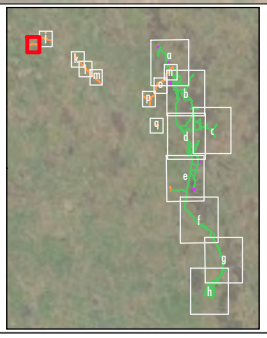

FIGURE 3.3.i

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
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- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

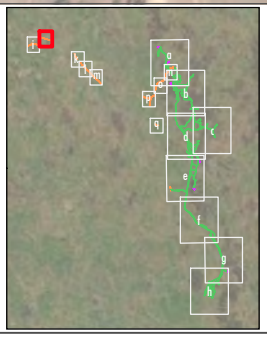


FIGURE 3.3.j

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

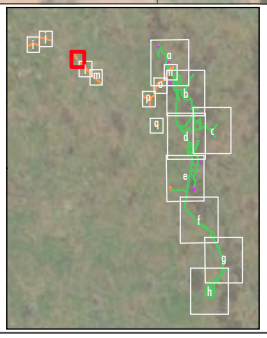


FIGURE 3.3.k

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

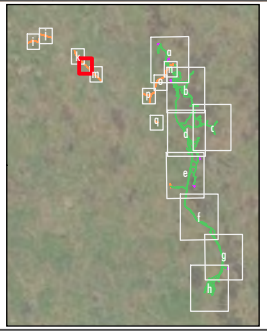


FIGURE 3.3.I

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

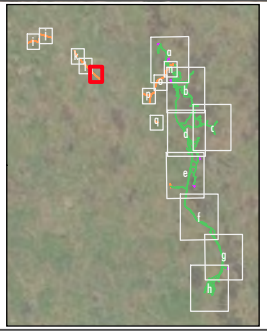


FIGURE 3.3.m

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - External Roads

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

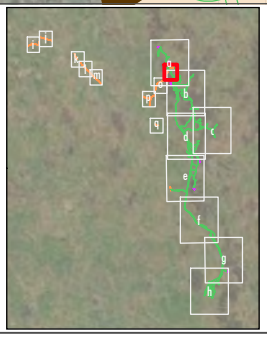


FIGURE 3.3.n

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

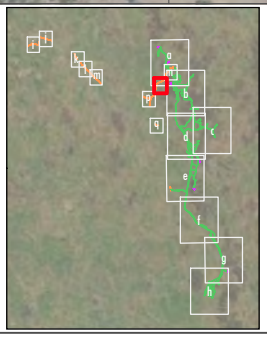


FIGURE 3.3.o

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

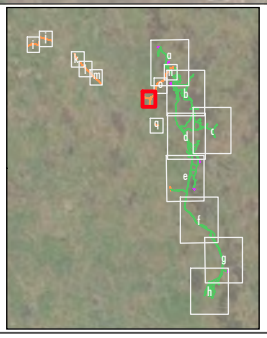


FIGURE 3.3.p

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads

PCT, Condition in the Rye Park Wind Farm

- Zone 1 - PCT289 - Moderate to Good
- Zone 2 - PCT335 - Moderate to Good
- Zone 3 - PCT350 - Moderate to Good
- Zone 4 - PCT350 - Moderate to Good - DNG
- Zone 5 - PCT351 - Moderate to Good
- Zone 6 - PCT351 - Moderate to Good - DNG
- Zone 7 - PCT351 - Moderate to Good - Acacia Shrubland
- Zone 8 - PCT351 - Moderate to Good - Sifton Bush Shrubland
- Zone 9 - PCT351 - Moderate to Good - Argyle Apple Forest
- Zone 10 -Non-native Vegetation
- Access Tracks/Roads
- Water Body

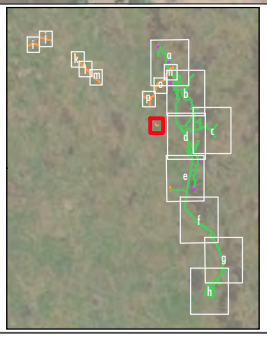


FIGURE 3.3.q

Plant Community Types and Vegetation Zones in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Zone 1 – PCT289 Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate to Good

PCT Name	Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion	
Condition	**Moderate to Good**	
Formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)	
Class	Upper Riverina Dry Sclerophyll Forests	
Percent cleared	60.00	
Area in Indicative Development Footprints (ha)	0.78	
Patch Size Class (ha)	101	
General Description	A shrubby open forest recorded within the Indicative Development Footprint – External Roads, specifically within the road reserves along Grassy Creek Road (refer to **Figure 3.3**).	
Canopy Description	An intact open canopy (40 - 50 per cent) of several species of eucalypts, dominated by bundy (*Eucalyptus goniocalyx*), red stringybark (*Eucalyptus macrorhyncha*) and mugga ironbark (*Eucalyptus sideroxylon*). The native mistletoe, *Amyema miquelii*, is also common throughout and contributes to the canopy cover.	
Mid-storey Description	A sparse (20 per cent) mid-storey of emerging canopy species as well as several native shrubs, including early wattle (*Acacia genistifolia*), sifton bush (*Cassinia arcuata*), Parramatta wattle (*Acacia parramattensis*) and *Pultenaea* sp.	
Ground Cover Description	This community supported a mid-dense groundcover of native grasses, sub-shrubs and rushes. Common native grasses included purple wiregrass (*Aristida ramosa*), ringed wallaby grass (*Rytidosperma caespitosum*), redanther wallaby grass (*Rytidosperma pallidum*) and hairy panic (*Panicum effusum*). Other native species characteristic in this stratum included wattle mat-rush (*Lomandra filiformis* subsp. *coriacea*), false sarsaparilla (*Hardenbergia violacea*) and *Hovea heterophylla*. Introduced species were also common, including quaking grass (*Briza maxima*) and perennial ryegrass (*Lolium perenne*).	
PCT Allocation	Vegetation Zone 1 was aligned with PCT 289 as it supports nine (19.6 per cent) species of the total 46 species identified as characteristic for the PCT as listed on the VIS Classification Database (BCD 2020c). These nine species make up 47.3 per cent of the total species recorded for Vegetation Zone 1. PCT 289 was determined to be the best overall fit in terms of diagnostic species and the community's location in the landscape.	
BC Act Status	This vegetation zone is not consistent with any TEC listed under the BC Act.	
EPBC Act Status	This vegetation zone is not consistent with any TEC listed under the EPBC Act.	

Zone 2 – PCT 335 Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate to Good

PCT Name	Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion	
Condition	Moderate to Good	
Formation	Freshwater Wetlands	
Class	Inland Floodplain Swamps	
Percent cleared	83.00	
Area in Indicative Development Footprints (ha)	5.50	
Patch Size Class (ha)	101	
General Description	This vegetation zone was restricted to watercourses (incl. drainage lines, ephemeral creeks etc) in low lying areas of the Indicative Development Footprints (refer to **Figure 3.3**). All patches of this vegetation zone have been exposed to historical and ongoing grazing (predominantly sheep grazing) and other agricultural pressures. In the absence of fencing, the biodiversity value of this vegetation has been substantially reduced. Species diversity and cover of native species was reduced, while these measures are increased for weed species. Native species diversity was as low as four species in one plot.	
Canopy Description	No canopy layer was present in this vegetation zone.	
Mid-storey Description	No mid-storey layer was present in this vegetation zone.	
Ground Cover Description	The dense groundcover was generally under 1.5 m in height, and was dominated by tall sedge (*Carex appressa*), austral rush (*Juncus australis*), common couch (*Cynodon dactylon*) and *Juncus* sp., with scattered occurrences of tussock grass (*Poa labillardierei* var. *labillardierei*). Exotic species co-dominate this vegetation zone, common species being prairie grass (*Bromus catharticus*), phalaris (*Phalaris aquatica*), spear thistle (*Cirsium vulgare*), catsear (*Hypochaeris radicata*), wild oats (*Avena fatua*) and squirrel tail fescue (*Vulpia bromoides*).	
PCT Allocation	Vegetation Zone 2 was aligned with PCT 335 as it supports a number of the species and stratum specifics identified for the PCT as listed on the VIS Classification Database (BCD 2020c). The ground stratum is dominated by tall sedge (*Carex appressa*), a key diagnostic species of PCT 335, and contains 18% of the species listed on the VIS Classification Database (BCD 2020c). PCT 335 was determined to be the best overall fit in terms of diagnostic species and the community's location in the landscape.	
BC Act Status	This vegetation zone is not consistent with any TEC listed under the BC Act.	
EPBC Act Status	This vegetation zone is not consistent with any TEC listed under the EPBC Act.	

Zone 3 – PCT 350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion – Moderate to Good

PCT Name	PCT 350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion	
Condition	**Moderate to Good**	
Formation	Grassy Woodlands	
Class	Southern Tableland Grassy Woodlands	
Percent cleared	87.00	
Area in Indicative Development Footprints (ha)	20.08	
Patch Size Class (ha)	101	
General Description	Occurred on the fertile soils of the valley floors and lower slopes of the Indicative Development Footprints (refer to **Figure 3.3**). Primarily the patches of remnant woodland were restricted to along or in proximity to road reserves and watercourses (incl. drainage lines, ephemeral creeks etc). All patches of this vegetation zone have been exposed to historical and ongoing grazing (predominantly sheep grazing) and other agricultural pressures. Although the degree to which the patches have been disturbed varies across the site, none of them persist unaffected by such disturbances. Native species diversity and cover are the main characteristics affected.	
Canopy Description	The sparse to mid-dense canopy generally ranged between 8 m and 18 m in height, with emergent trees reaching up to 23 m. It was dominated by yellow box (*Eucalyptus melliodora*) and Blakely's red gum (*Eucalyptus blakelyi*). Box mistletoe (*Amyema miquelii*) occurred within mature individuals of these species. There was one location where river red gum (*Eucalyptus camaldulensis*) and apple box (*Eucalyptus bridgesiana*) were also recorded within the canopy. While it wasn't recorded in any plots, several rapid vegetation assessments recorded candlebark (*Eucalyptus rubida* subsp. *rubida*), and although this species occurred in Vegetation Zone, it was not considered to be a characteristic species.	
Mid-storey Description	The mid-storey was generally absent or sparse and, where it occurred, ranged between 0.5 m and 3 m in height. Dominant species included silver tea-tree (*Leptospermum multicaule*), silver wattle (*Acacia dealbata*), black wattle (*Acacia mearnsii*), hoary guinea flower (*Hibbertia obtusifolia*), eggs and bacon (*Dillwynia sericea*), gorse bitter pea (*Daviesia ulicifolia*) and urn heath (*Melichrus urceolatus*). Mid-dense areas of regenerating canopy species, yellow box (*Eucalyptus melliodora*) and Blakely's red gum (*Eucalyptus blakelyi*), also occurred in this zone.	

PCT Name	PCT 350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
Condition	Moderate to Good
Ground Cover Description	The mid-dense to dense groundcover comprised of a range of rushes, sedges and native grasses. Common species include wattle mat-rush (*Lomandra filiformis* subsp. *coriacea*), woodrush (*Luzula densiflora*), spiny-headed mat-rush (*Lomandra longifolia*), stinking pennywort (*Hydrocotyle laxiflora*) and tall sedge (*Carex appressa*). Dominant native grasses included weeping grass (*Microlaena stipoides* var. *stipoides*), purple wiregrass (*Aristida ramosa*), threeawn speargrass (*Aristida vagans*), hairy panic (*Panicum effusum*), rough speargrass (*Austrostipa scabra* subsp. falcata), mountain wallaby grass (*Rytidosperma monticola*), wallaby grass (*Rytidosperma* sp.), tussock grass (*Poa labillardierei* var. *labillardierei*) and short wallaby grass (*Rytidosperma carphoides*). Common weeds included catsear (*Hypochaeris radicata*), sheep sorrel (*Acetosella vulgaris*), rat's tail fescue (*Vulpia myuros*), spear thistle (*Cirsium vulgare*), sea barley grass (*Hordeum marinum*), squirrel tail fesque (*Vulpia bromoides*), scarlet pimpernel (*Anagallis arvensis*), great brome (*Bromus diandrus*), soft brome (*Bromus hordeaceus*) and perennial ryegrass (*Lolium perenne*).
PCT Allocation	Vegetation Zone 3 was aligned with PCT 350 as it supports a number of the species and stratum specifics identified for the PCT as listed on the VIS Classification Database (BCD 2020c). Its canopy is dominated by yellow box (*Eucalyptus melliodora*) and Blakely's red gum (*Eucalyptus blakelyi*), while silver wattle (*Acacia dealbata*) and hoary guinea flower (*Hibbertia obtusifolia*) dominate the shrub layer within the middle stratum. All of these are key diagnostic species of PCT 350. Careful analysis of Vegetation Zone 3 against the similarly described PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion. Both PCTs had detailed descriptions of upper, mid and ground strata within the VIS Classification Database (BCD 2020c). Analysis of plot data (Vegetation Zones 3 and 4) found that it had a higher proportion of species characteristic of PCT 350 (52.6 per cent) compared to PCT 277 (46.2 per cent). Furthermore, those recorded characteristic species comprised a higher proportion of all species recorded within the remnant (Vegetation Zone 3) and derived form (Vegetation Zone 4) of this vegetation for PCT 350 (24 per cent) compared with PCT 277 (14.4 per cent). This analysis concluded that PCT 350 was the best overall fit in terms of diagnostic species and the community's location in the landscape.
BC Act Status	Many patches of this vegetation zone are consistent with the *White Box Yellow Box Blakely's Red Gum Grassy Woodland* and Derived Native Grassland CEEC. Refer to **Section 3.2.3.1** for further information and see **Figure 3.4** for locality.
EPBC Act Status	Many patches of this vegetation zone are consistent with the *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC. Refer to **Section 3.2.3.2** for further information and see **Figure 3.4** for locality.

Zone 4 – PCT 350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion – Derived Native Grassland

PCT Name	Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion	
Condition	**Derived Native Grassland**	
Formation	Grassy Woodlands	
Class	Southern Tableland Grassy Woodlands	
Percent cleared	87.00	
Area in Indicative Development Footprints (ha)	17.52	
Patch Size Class (ha)	101	
General Description	Occurred on the fertile soils of the valley floors and lower slopes of the Indicative Development Footprints (refer to **Figure 3.2**). Primarily the patches of derived native grasslands occurred where the land rises out of the watercourses (incl. drainage lines, ephemeral creeks etc). This vegetation zone has all but been removed from the road reserves, other than very restricted patches towards Boorowa, NSW. All patches of this vegetation zone have been exposed to historical and ongoing grazing (predominantly sheep grazing) and other agricultural pressures. Although the degree to which the patches have been disturbed varies across the site, none of them persist unaffected by such disturbances. Native species diversity and cover were the main characteristics affected.	
Canopy Description	No intact canopy layer was present in this vegetation zone, however scattered yellow box (*Eucalyptus melliodora*) and Blakely's red gum (*Eucalyptus blakelyi*) do occur.	
Mid-storey Description	No mid-storey layer was present in this vegetation zone.	
Ground Cover Description	The mid-dense (40 to 70 per cent) groundcover was generally very low in height as a result of intensive grazing pressures. Common species included native grasses kangaroo grass (*Themeda australis*), purple wiregrass (*Aristida ramosa*), red grass (*Bothriochloa macra*), weeping grass (*Microlaena stipoides* var. *stipoides*), short wallaby grass (*Rytidosperma carphoides*), rough speargrass (*Austrostipa scabra* subsp. *falcata*), Queensland bluegrass (*Dichanthium sericeum*) and wallaby grass (*Rytidosperma* sp.). Sporadic occurrences of young shrub species included ploughshare wattle (*Acacia gunnii*) and silver wattle (*Acacia dealbata*). Numerous weed species were common throughout the vegetation zone and even become co-dominant in some locations. Dominant species included sheep sorrel (*Acetosella vulgaris*), *Romulea rosea*, common centaury (*Centaurium erythraea*), soft brome (*Bromus molliformis*), smooth catsear (*Hypochaeris glabra*), paspalum (*Paspalum dilatatum*), phalaris (*Phalaris aquatica*), sea barley grass (*Hordeum marinum*), squirrel tail fescue (*Vulpia bromoides*) and lamb's tongue (*Plantago lanceolata*).	

PCT Name	Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
Condition	Derived Native Grassland
PCT Allocation	Vegetation Zone 4 was aligned with PCT 350 based on its position in the landscape, consistency in species composition and proximity to the remnant woodland form of the PCT (Vegetation Zone 3).
BC Act Status	Many patches of this vegetation zone are consistent with the *White Box Yellow Box Blakely's Red Gum Grassy Woodland* and Derived Native Grassland CEEC. Refer to **Section 3.2.3.1** for further information and see **Figure 3.4** for locality.
EPBC Act Status	Many patches of this vegetation zone are consistent with the *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC. Refer to **Section 3.2.3.2** for further information and see **Figure 3.4** for locality.

Zone 5 – PCT 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion – Moderate to Good

PCT Name	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	
Condition	**Moderate to Good**	
Formation	Dry Sclerophyll Forests (Shrubby sub-formation)	
Class	Southern Tableland Dry Sclerophyll Forests	
Percent cleared	60.00	
Area in Indicative Development Footprints (ha)	84.81	
Patch Size Class (ha)	101	
General Description	This was the dominant remnant vegetation zone within the Indicative Development Footprints. Occurring as an open forest on the shallow (and at times skeletal) soils of mid to upper slopes of the entire ridgeline across the Project (refer to **Figure 3.3**). In the absence of fencing, the impacts from grazing and agricultural pressures were substantially less compared with PCT 350, as stock appeared to only use these patches for intermittent shelter rather than permanent shelter or for foraging purposes. However, across the Indicative Development Footprints this PCT has been exposed to varying degrees of historical clearing, resulting in a number of condition classes being mapped across the Project (Vegetation Zones 5 to 9).	
Canopy Description	The mid-dense canopy generally ranged between 10 m and 18 m in height. It was dominated by inland scribbly gum (*Eucalyptus rossii*), red stringybark (*Eucalyptus macrorhyncha*), brittle gum (*Eucalyptus mannifera*) and bundy (*Eucalyptus goniocalyx*). Box mistletoe (*Amyema miquelii*) occurred in the canopy throughout the Vegetation Zone, at times in large numbers but generally scattered. Other species included apple box (*Eucalyptus bridgesiana*), broad-leaved peppermint (*Eucalyptus dives*) and red box (*Eucalyptus polyanthemos*).	
Mid-storey Description	The mid-storey was generally sparse or absent, and ranged between 1 and 6 metres in height. It was dominated by regenerating canopy eucalypts, interspersed with shrub species including silver tea-tree (*Leptospermum multicaule*), Parramatta wattle (*Acacia parramattensis*) and daphne heath (*Brachyloma daphnoides*).	

PCT Name	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Condition	Moderate to Good
Ground Cover Description	The mid-dense groundcover was comprised predominately of native grasses. Dominant species included speargrass (*Austrostipa scabra*), redanther wallaby grass *(Rytidosperma pallidum*), mountain wallaby grass (*Rytidosperma monticola*) and short wallaby grass (*Rytidosperma carphoides*), with occurrences of purple wiregrass (*Aristida ramosa*) and snowgrass (*Poa sieberiana*). Rushes, sub-shrubs and heaths also occur in this stratum, with common species including wattle mat-rush (*Lomandra filiformis* subsp. *coriacea*), blueberry lily (*Dianella revoluta*), false sarsaparilla (*Hardenbergia violacea*), parrot-pea (*Dillwynia phylicoides*), ivy goodenia (*Goodenia hederacea* subsp. *hederacea*), hoary guinea flower (*Hibbertia obtusifolia*), urn heath (*Melichrus urceolatus*), *Monotoca scoparia* and *Hovea heterophylla*. Weed species occurred scattered throughout but are generally low in diversity and cover. Common species included red brome (*Bromus rubens*), perennial rye grass (*Lolium perenne*) and soft brome (*Bromus molliformis*), sheep sorrel (*Acetosella vulgaris*) and catsear (*Hypochaeris radicata*).
PCT Allocation	Vegetation Zone 5 was aligned with PCT 351 as it supports a number of the species and stratum specifics identified for the PCT as listed on the VIS Classification Database (BCD 2020c). Its canopy is dominated by brittle gum (*Eucalyptus mannifera*), red stringybark (*Eucalyptus macrorhyncha*) and bundy (*Eucalyptus goniocalyx*), and contains six of the seven key diagnostic canopy species listed in for PCT 351. Careful analysis of Vegetation Zone 5 was undertaken against the similarly aligned PCT 353, Inland Scribbly Gum - Red Stringybark - box - Daviesia latifolia - snow grass open forest on sandy loam soils from acid volcanics in the Boorowa - Young region of the NSW South Western Slopes Bioregion. Analysis of plot data (Vegetation Zones 5 and 6) found that it had a higher proportion of species characteristic of PCT 351 (54.7 per cent) compared to PCT 353 (42.1 per cent). Furthermore, those recorded characteristic species comprised a higher proportion of all species recorded within the remnant (Vegetation Zone 5) and derived form (Vegetation Zone 6) of this vegetation for PCT 351 (28.7 per cent) compared with PCT 353 (7.9 per cent). The analysis found that PCT 351 was the best overall fit in terms of diagnostic species and the community's location in the landscape.
BC Act Status	This vegetation zone is not consistent with any TEC listed under the BC Act.
EPBC Act Status	This vegetation zone is not consistent with any TEC listed under the EPBC Act.

Zone 6 – PCT 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion – Derived Native Grassland

PCT Name	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	
Condition	**Derived Native Grassland**	
Formation	Dry Sclerophyll Forests (Shrubby sub-formation)	
Class	Southern Tableland Dry Sclerophyll Forests	
Percent cleared	60.00	
Area in Indicative Development Footprints (ha)	173.99	
Patch Size Class (ha)	101	
General Description	This Vegetation Zone occurred where historical clearing occurred but ongoing active land management, predominantly grazing, has largely prevented mid-storey and ground stratum species from recolonising. It predominantly occurs on the mid to upper slopes and ridgelines throughout the Indicative Development Footprints (refer to **Figure 3.3**).	
Canopy Description	No canopy layer was present in this vegetation zone, however scattered canopy trees did occur throughout the Vegetation Zone.	
Mid-storey Description	No intact mid-storey layer was present in this Vegetation Zone, however Parramatta wattle (*Acacia parramattensis*) shrubs were observed scattered throughout.	
Ground Cover Description	The mid-dense to dense groundcover was less than 1 metre in height and was comprised predominately of native grasses, interspersed with sub-shrubs, sedges and rushes. Common native grasses present included rough speargrass (*Austrostipa scabra* subsp. *falcata*), short wallaby grass (*Rytidosperma carphoides*), Queensland bluegrass (*Dichanthium sericeum*), mountain wallaby grass (*Rytidosperma monticola*), weeping grass (*Microlaena stipoides* var. *stipoides*), purple wiregrass (*Aristida ramosa*), redanther wallaby grass (*Rytidosperma pallidum*), windmill grass (*Chloris truncata*) and a barley grass (*Hordeum* sp.). Other species present in this stratum included early wattle (*Acacia genistifolia*), hoary guinea flower (*Hibbertia obtusifolia*), wattle mat-rush (*Lomandra filiformis* subsp. *coriacea*), a sedge (*Juncus* sp.), pennyroyal (*Mentha satureioides*) and *Oxalis perennans*. Weed species were common throughout this Vegetation Zone, dominant species included subterranean clover (*Trifolium subterraneum*), sheep sorrel (*Acetosella vulgaris*), wild oats (*Avena fatua*), catsear (*Hypochaeris radicata*), smooth catsear (*Hypochaeris glabra*), lamb's tongue (*Plantago lanceolata*), proliferous pink (*Petrorhagia nanteuilii*), squirrel tail fescue (*Vulpia bromoides*), silvery hairgrass (*Aira cupaniana*), *Oxalis perennans*, paspalum (*Paspalum dilatatum*) and a barley grass (*Hordeum* sp.).	

PCT Name	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Condition	Derived Native Grassland
PCT Allocation	Vegetation Zone 6 was aligned with PCT 351 based on its position in the landscape, consistency in species composition and proximity to the remnant forest form of the PCT (Vegetation Zone 5).
BC Act Status	This vegetation zone is not consistent with any TEC listed under the BC Act.
EPBC Act Status	This vegetation zone is not consistent with any TEC listed under the EPBC Act.

Zone 7 – PCT 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion – Acacia shrubland

PCT Name	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	
Condition	**Acacia Shrubland**	
Formation	Dry Sclerophyll Forests (Shrubby sub-formation)	
Class	Southern Tableland Dry Sclerophyll Forests	
Percent cleared	60.00	
Area in Indicative Development Footprints (ha)	8.53	
Patch Size Class (ha)	101	
General Description	This Vegetation Zone represented the eldest patches of PCT 351 since clearing disturbances (**Figure 3.3**). While no intact canopy strata occurred, remnant canopy trees occur sporadically throughout the Vegetation Zone. The Vegetation Zone was characterised by a mid-storey that was generally med-dense, but did open up in some locations.	
Canopy Description	No canopy layer was present in this vegetation zone, however inland scribbly gum (*Eucalyptus rossii*) was observed as scattered remnant trees.	
Mid-storey Description	The mid-dense mid-storey ranged between 1.5 and 7 metres in height. Dominant species included Parramatta wattle (*Acacia parramattensis*), silver wattle (*Acacia dealbata*) and cough bush (*Cassinia laevis*). A sparse shrub layer was also present, ranging between 0.3 and 1.5 metres in height. Dominant species included silver tea-tree (*Leptospermum multicaule*) and hoary guinea flower (*Hibbertia obtusifolia*), with occurrences of sifton bush (*Cassinia arcuata*), urn heath (*Melichrus urceolatus*) and daphne heath (*Brachyloma daphnoides*).	
Ground Cover Description	The mid-dense to dense groundcover was generally under 0.3 metres in height and is comprised predominately of native grasses. Dominant species included weeping grass (*Microlaena stipoides* var. *stipoides*), mountain wallaby grass (*Rytidosperma monticola*), speargrass (*Austrostipa scabra*), wallaby grass (*Rytidosperma fulva*), short wallaby grass (*Rytidosperma carphoides*) and brown-back wallaby grass (*Rytidosperma duttoniana*), with occurrences of purple wiregrass (*Aristida ramosa*) and snowgrass (*Poa sieberiana*). Other common native species included wattle matt-rush (*Lomandra filiformis* subsp. *coriacea*), poverty raspwort (*Gonocarpus tetragynus*). The cover of weed species was generally low to moderate, common species included silvery hairgrass (*Aira caryophyllea*), catsear (*Hypochaeris radicata*) and silvery hairgrass (*Aira cupaniana*).	

PCT Name	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Condition	Acacia Shrubland
PCT Allocation	Vegetation Zone 7 was aligned with PCT 351 based on its position in the landscape, consistency in species composition and proximity to the remnant forest form of the PCT (Vegetation Zone 5).
BC Act Status	This vegetation zone is not consistent with any TEC listed under the BC Act.
EPBC Act Status	This vegetation zone is not consistent with any TEC listed under the EPBC Act.

Zone 8 – PCT 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion – Sifton Bush Shrubland

PCT Name	**Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion**	
Condition	**Sifton Bush Shrubland**	
Formation	Dry Sclerophyll Forests (Shrubby sub-formation)	
Class	Southern Tableland Dry Sclerophyll Forests	
Percent cleared	60.00	
Area in Indicative Development Footprints (ha)	84.18	
Patch Size Class (ha)	101	
General Description	This Vegetation Zone occurred where historical clearing has occurred and in the absence of ongoing active land management, sifton bush (*Cassinia arcuata*) has recolonised to a point where it is structurally dominant. It predominantly occurred on the upper slopes and ridgelines throughout the Indicative Development Footprints (refer to **Figure 3.3**).	
Canopy Description	No canopy layer was present in this vegetation zone.	
Mid-storey Description	The mid-dense to dense mid-storey ranged between 1 and 4 metres in height. The stratum was dominated by sifton bush (*Cassinia arcuata*), with occurrences of dolly bush (*Cassinia aculeata*), cough bush (*Cassinia laevis*), silver wattle (*Acacia dealbata*) and white dogwood (*Ozothamnus diosmifolius*).	
Ground Cover Description	The Vegetation Zone generally supported a sparse groundcover, a likely result from the density of the mid-storey stratum. A range of sub-shrubs, rushes, heaths, ferns and native grasses were recorded throughout. Dominant species included wattle mat-rush (*Lomandra filiformis* subsp. *coriacea*), urn heath (*Melichrus urceolatus*), hoary guinea flower (*Hibbertia obtusifolia*), rock fern (*Cheilanthes sieberi*) and rough speargrass (*Austrostipa scabra* subsp. *scabra*), mountain wallaby grass (*Rytidosperma monticola*), purple wiregrass (*Aristida ramosa*), wallaby grass (*Rytidosperma fulva*) and small-flowered wallaby grass (*Rytidosperma setacea*). While weed species are common throughout the Vegetation Zone, they are generally low in cover. Common species included catsear (*Hypochaeris radicata*), sheep sorrel (*Acetosella vulgaris*), spear thistle (*Cirsium vulgare*), St. John's wort (*Hypericum perforatum*), common centaury (*Centaurium erythraea*), silvery grass (*Aira cupaniana*).	
PCT Allocation	Vegetation Zone 8 was aligned with PCT 351 based on its position in the landscape, consistency in species composition and proximity to the remnant forest form of the PCT (Vegetation Zone 5).	
BC Act Status	This vegetation zone is not consistent with any TEC listed under the BC Act.	
EPBC Act Status	This vegetation zone is not consistent with any TEC listed under the EPBC Act.	

Zone 9 – PCT 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion – Argyle Apple Variant

PCT Name	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	
Condition	**Argyle Apple Variant**	
Formation	Dry Sclerophyll Forests (Shrubby sub-formation)	
Class	Southern Tableland Dry Sclerophyll Forests	
Percent cleared	60.00	
Area in Indicative Development Footprints (ha)	0.62	
Patch Size Class (ha)	101	
General Description	This Vegetation Zone occurred as discrete patches within the Indicative Development Footprints (**Figure 3.3**). The Vegetation Zone is associated with minor gullies and other positions of the landscape which capture cool air.	
Canopy Description	The sparse canopy ranges reached up to 25 metres in height and was dominated by argyle apple (*Eucalyptus cinerea*), bundy (*Eucalyptus goniocalyx*), broad-leaved peppermint (*Eucalyptus dives*) and yellow box (*Eucalyptus melliodora*). Mistletoe (*Amyema* sp.) occurred within mature individuals of these species.	
Mid-storey Description	No mid-storey layer was present in this vegetation zone.	
Ground Cover Description	The mid-dense groundcover was generally under 1 metre in height, and was dominated by redanther wallaby grass (*Rytidosperma pallidum*) and snowgrass (*Poa sieberiana*). Other species in this stratum included wattle mat-rush (*Lomandra filiformis* subsp. *coriacea*), urn heath (*Melichrus urceolatus*), eggs and bacon (*Dillwynia sericea*) and hoary guinea flower (*Hibbertia obtusifolia*).	

PCT Name	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Condition	Argyle Apple Variant
PCT Allocation	Vegetation Zone 9 was determined to have the best overall fit with PCT 351, despite the canopy characteristics of this Vegetation Zone being seemingly different (dominance of argyle apple [*Eucalyptus cinerea*]) when compared to the remnant Vegetation Zone 5 of PCT 351. Careful analysis of this Vegetation Zone was undertaken against PCT 653 Apple Box - Yellow Box - Argyle Apple dry open forest of the South Eastern Highlands Bioregion and NSW South Western Slopes Bioregion. However it was determined that the overall composition of the upper, mid and ground stratum species for Vegetation Zone 5 more closely aligned with PCT 351. Analysis of plot data for Vegetation Zone 9 found that it had a higher proportion of species characteristic of PCT 653 (41.7 per cent) compared to PCT 351 (34 per cent). However, those recorded characteristic species comprised a substantially higher proportion of all species recorded within Vegetation Zone 9 for PCT 351 (50 per cent) compared with PCT 653 (13.9 per cent). Furthermore, PCT 653 is described to occur on clay loams in broad river flats or moist alluvial fans which is not consistent with Vegetation Zone 9. The analysis found that PCT 351 was the best overall fit in terms of diagnostic species and the community's location in the landscape.
BC Act Status	This vegetation zone is not consistent with any TEC listed under the BC Act.
EPBC Act Status	This vegetation zone is not consistent with any TEC listed under the EPBC Act.

3.2.2 Non-native Vegetation

The Indicative Development Footprints contained a range of non-native vegetation types, including roads, tracks and waterbodies. A total of 105.18 hectares of this mapping unit was identified within the Indicative Development Footprints.

Broad grassland areas have been extensively cleared of native flora species through the intensive and historic agricultural land use previously discussed in **Section 1.1.1**. These agricultural grasslands predominantly support exotic grasses and herbs (refer to **Plate 3.1**). The most abundant exotic grass species present include squirrel tail fescue (*Vulpia bromoides*), soft brome (*Bromus hordeaceus*), silvery hairgrass (*Aira cupaniana*), prairie grass (*Bromus catharticus*), red brome (*Bromus rubens*) and paspalum (*Paspalum dilatatum*), which dominate the native vegetation in some areas. Subterranean clover (*Trifolium subterraneum*), sheep sorrel (*Acetosella vulgaris*), catsear (*Hypochaeris radicata*) and yellow suckling clover (*Trifolium dubium*) are also abundant in areas. Other areas of non-native vegetation comprise planted windrows and shelter belts of non-native cypress trees.

The introduced grass species, Chilean needle-grass (*Nassella neesiana*), has not been recorded by Umwelt on any of the extensive surveys completed. This is important to note given this species provides suitable habitat for the golden sun moth.

A total of seven BAM Vegetation Integrity Plots were undertaken in the Non-native Vegetation. All BAM Vegetation Integrity Plots were run together within the online BAM Credit Calculator (BAMCC), they have a Vegetation Integrity score of 14.0 for the South West Slopes BAMCC and 11.9 for the South East Highlands BAMCC. Both of which are below the offsetting threshold of 17 (where it is associated with ecosystem-credit habitat or a VEC).

Ten weeds present in the Development Corridors are classed as High Threat Weed species under the BAM, and are identified in the flora species list in **Appendix C**.

Plate 3.1 Non-native Vegetation in the Indicative Development Footprint – Wind Farm

3.2.3 Threatened Ecological Communities

Two threatened ecological communities were recorded within the Indicative Development Footprints, being:

- White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act)
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (EPBC Act).

It is noted that in relation to the BC Act listed CEEC above, a Final Determination was made on 17 July 2020 update the conservation status of this TEC from its previous status of EEC to CEEC. At the time of the BDAR that was placed on public exhibition, there was a Preliminary Determination to change the listing status of this TEC to Critically Endangered in NSW.

Analysis of consistency with the scientific determinations for these TECs were undertaken, with consideration of the advice provided by the NSW Threatened Species Scientific Committee and/or the Commonwealth Threatened Species Scientific Committee guidelines for interpreting listings for species, populations and ecological communities under the BC Act and EPBC Act respectively. Detailed analysis of the vegetation zones with respect to the NSW Threatened Species Scientific Committee and/or the Commonwealth Threatened Species Scientific Committee determinations is provided below. Specifically, only Vegetation Zones 3 and 4 were assessed against the TECs described above as the remaining Vegetation Zones do not have the potential to align with these or alternative TECs.

3.2.3.1 White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act

White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland is listed as a CEEC under the BC Act. At the time of the BDAR being placed on exhibition originally, this community was known as White Box Yellow Box Blakely's Red Gum Woodland and was listed as an EEC under the BC Act.

The Final Determination to update the conservation status of this TEC from EEC to CEEC only occurred on 17 July 2020. Due to time constraints in relation to the response to submissions phase, Umwelt has not had the opportunity to analyse the data captured for Vegetation Zones 3 and 4 for the Project against the updated Final Determination for the CEEC (BC Act). As the original assessment of these vegetation zones against the Final Determination for the original EEC resulted in almost all of their mapped extents aligning with the EEC, it is not anticipated that the updated conservation status will affect the extent of the newly finalised CEEC (BC Act) within the Project.

The NSW Threatened Species Scientific Committee updated the community to CEEC (BC Act) which is in keeping with the Commonwealth listing (**Section 3.2.3.2**). This is part of reassessments being undertaken using the Common Assessment Method (CAM), whereby all jurisdictions in Australia are seeking to list entities consistently. In addition to a new Final Determination for the CEEC (BC Act), there is also a detailed report by explaining the conservation assessment for the CAM.

In summary, the analysis presented below has been completed against the Final Determination for the original EEC community (NSW Scientific Committee 2002), however we have used the outcomes of this analysis to align the vegetation with the newly listed White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC.

The community is known to occur from the Queensland border in the north, to the Victorian border in the south. It occurs in the tablelands and western slopes of NSW and is characterised by the presence or prior

occurrence of white box (*Eucalyptus albens*), yellow box (*Eucalyptus melliodora*) and/or Blakely's red gum (*Eucalyptus blakelyi*).

A comprehensive analysis of Vegetation Zones 3 and 4 was undertaken to determine if it conforms to the original EEC Final Determination (NSW Scientific Committee 2002). Therefore, the Constituent Species, Assemblage of Species, Particular Area and Supplementary Descriptors sections below refer to an analysis using the Final Determination for the original EEC (NSW Scientific Committee 2002). However the Summary section following these considers the outcome of the analysis against the updated CEEC.

Constituent Species

The species recorded within Vegetation Zones 3 and 4 in the Indicative Development Footprints comprise species, and/or taxa below species rank, as required by the Act.

This included the current or previous presence of canopy species, yellow box (*Eucalyptus melliodora*) and Blakely's red gum (*Eucalyptus blakelyi*).

Assemblage of Species

Due to the broad geographic range of this EEC, the NSW Scientific Committee (2002) lists 95 species as characterising the assemblage of species for *White Box Yellow Box Blakely's Red Gum Woodland* EEC. As part of ecological investigations for the proposal, 12 BAM Vegetation Integrity Plots (7 in Vegetation Zone 3 and five in Vegetation Zone 4) were sampled in *White Box Yellow Box Blakely's Red Gum Woodland EEC* across the Indicative Development Footprints.

Within the Indicative Development Footprints, either yellow box (*Eucalyptus melliodora*) or Blakely's red gum (*Eucalyptus blakelyi*) was recorded in all BAM Vegetation Integrity Plots for Vegetation Zone 3 or nearby for the Vegetation Zone 4. On average, Vegetation Zone 3 supported 23.2 per cent species identified as characteristic of the TEC, this included a maximum of 30.8 per cent and minimum of 13 per cent.

For Vegetation Zone 4, an average of 22.5 per cent of species recorded were characteristic of the TEC, this included a maximum of 33.3 per cent and minimum of 16 per cent.

Particular Area

In relation to the particular area of the *White Box Yellow Box Blakely's Red Gum Woodland* EEC, the NSW Scientific Committee (2002) states that the community occurs within the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands and NSW South Western Slopes Bioregions.

The area in which this community occurs within the Indicative Development Footprints is situated within the NSW South Western Slopes Bioregion and South Eastern Highlands (refer to **Section 1.2.2**).

Supplementary Descriptors

In relation to supplementary descriptors, the NSW Scientific Committee (2002) includes the following key information pertaining to the *White Box Yellow Box Blakely's Red Gum Woodland EEC*:

- *occurs on relatively fertile soils, generally between 400 and 800 millimetre isohyets, and at an altitude of circa 170 metres to circa 1200 metres*
- *the shrub layer is generally sparse or absent, though it may be locally common, and*

- *condition states may range from relatively good to highly degraded, such as paddock remnants with a weedy understorey and only a few hardy natives left. The tree layer may be absent as a result of past clearing or thinning.*

Of the above supplementary descriptors, the *White Box Yellow Box Blakely's Red Gum Woodland EEC* present in the Indicative Development Footprints occurs on relatively fertile soil. This community was recorded at altitudes of approximately between 550 metres and 750 metres above sea level. The shrub layer is generally absent to sparse, and while some of this may have been as a result of past clearing and grazing management, shrubs were most likely always sparse. While the overstorey is relatively intact in the woodland components and absent in the derived native grasslands forms, the understorey has also been substantially modified and degraded as a result of the past clearing and grazing management. While some native grasses and herbs persist, the diversity is substantially reduced which is heightened for Vegetation Zone 4 compared with Vegetation Zone 3. Floristic analysis of the relevant Vegetation Zones is provided below in **Table 3.3**.

Table 3.3 Floristic Analysis of *White Box Yellow Box Blakely's Red Gum Woodland EEC*

BAM Vegetation Integrity Plot ID	Total EEC Spp.	Native Plot Spp. (exotic spp.)	No. of EEC Spp. in Plot	% of EEC Spp. in Plot	% of total EEC Spp.	Assessment
Vegetation Zone 3 (PCT350-Moderate/Good)						
Q1	95	28 (7)	8	22.9	8.4	Proportion of TEC species recorded is considered reasonable.
Q06	95	8 (6)	4	28.6	4.2	Proportion of TEC species recorded is considered reasonable.
Q15	95	12 (1)	3	23.1	3.2	Proportion of TEC species recorded is considered reasonable.
Q31	95	16 (5)	4	19.0	4.2	Proportion of TEC species recorded is considered low.
Q43	95	15 (5)	5	25.0	5.3	Proportion of TEC species recorded is considered reasonable.
DMRP1	95	19 (4)	3	13.0	3.2	Proportion of TEC species recorded is considered low.
P03	95	6 (7)	4	30.8	4.2	Proportion of TEC species recorded is considered reasonable.
Average	**NA**	**14.9 (5)**	**4.4**	**23.2**	**4.7**	

BAM Vegetation Integrity Plot ID	Total EEC Spp.	Native Plot Spp. (exotic spp.)	No. of EEC Spp. in Plot	% of EEC Spp. in Plot	% of total EEC Spp.	Assessment
Vegetation Zone 4 (PCT350-DNG)						
Q11	95	15 (10)	4	16.0	4.2	Proportion of TEC species recorded is considered low.
Q32	95	8 (10)	3	16.7	3.2	Proportion of TEC species recorded is considered low.
DMRP3	95	22 (3)	5	20.0	5.3	Proportion of TEC species recorded is considered reasonable.
4107_JAN_02	95	15 (15)	8	26.7	8.4	Proportion of TEC species recorded is considered reasonable.
4107_Feb_03	95	5 (4)	3	33.3	3.2	Proportion of TEC species recorded is considered reasonable.
Average	**na**	**13 (8.4)**	**4.6**	**22.5**	**4.8**	

Summary

Based on the detailed assessment described above, both Vegetation Zones 3 and 4 were found to conform with previous *White Box Yellow Box Blakely's Red Gum Woodland EEC* listed under the BC Act. Both Vegetation Zones were identified as conforming with the four components of the TEC, being Constituent Species, Assemblage of Species, Particular Area and Supplementary Descriptors.

As described above, the conservation status of this community was updated to White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act on 17 July 2020. We have therefore assumed that the outcomes of this analysis is consistent with the new TEC.

The Indicative Development Footprints therefore support a total of 37.50 hectares of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act within Vegetation Zones 3 (20.08 hectares) and 4 (17.42 hectares) (see **Figure 3.4**). Impacts to the CEEC under the BC Act is less (**12.70 hectares**) than the impact threshold of 50.2 hectares for this TEC as identified in Consent Condition 19(a) of the existing State Approval. While the Project does impact on the CEEC, it has successfully avoided 12.70 hectares of the CEEC threshold. As noted in **Section 1.1.2.1** reference to the EEC was made prior to the determination of the CEEC.

Approximately 69.04 hectares of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act was identified within the wider Development Corridors. Therefore, 31.54 hectares of the CEEC in the Development Corridors has been avoided by the Project and considerable amounts of the CEEC occur beyond the Development Corridors in the local region. As described in **Section 4.0**, RPRE has made a number of changes to their detailed design to avoid and minimise impacts to this CEEC.

3.2.3.2 White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the EPBC Act

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is listed as a CEEC under the EPBC Act. This community occurs in and along the western slopes and tablelands of the Great Dividing Range from Southern Queensland through NSW to central Victoria. It is characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of white box, yellow box or Blakely's red gum trees.

A comprehensive analysis of this vegetation community was undertaken to determine if it conformed to Listing Advice provided by the Department of the Environment under the EPBC Act (TSSC 2006).

Particular Area

In relation to the particular area of the *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC*, the TSSC (2006) states that the community occurs within the Brigalow Belt South, Nandewar, New England Tableland, South Eastern Queensland, Sydney Basin, NSW North Coast, South Eastern Highlands, South East Corner, NSW South Western Slopes, Victorian Midlands and Riverina Bioregions.

The area in which this community occurs within the Indicative Development Footprints is situated within the NSW South Western Slopes and South Eastern Highlands Bioregion (refer to **Section 1.1.1**).

Additional Criteria

Detailed assessment of the vegetation communities described and mapped within the Indicative Development Footprints was undertaken to determine whether the vegetation present met the condition class thresholds identified in the Listing Advice (TSSC 2006). These thresholds have been incorporated into an identification flowchart for the CEEC within the EPBC Act Policy Statement (DEH 2006) for the community which was also utilised during the assessment.

- **Is, or was previously, at least one of the most common overstorey species white box, yellow box or Blakely's red gum?**

Vegetation Zones 3 and 4 identified in the Indicative Development Footprints and assessed against the White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC criteria have, or were found to previously have had, either yellow box (*Eucalyptus melliodora*) or Blakely's red gum (*Eucalyptus blakelyi*) as one of the dominant overstorey species.

- **Does the patch have predominantly native understorey?**

A majority of patches of Vegetation Zone 3 and 4 identified in the Indicative Development Footprints were assessed as having a predominantly native understorey, despite these patches having been heavily grazed and pasture improved or at least impacted by adjacent pasture improvement.

- **Is the patch 0.1 hectare or greater in size?**

Due to the restricted nature of the Indicative Development Footprints, a majority of patches strictly within the Development Footprint were smaller than the required 0.1 hectare size. A process was undertaken to identify which patches extended outside the bounds of the Development Footprint and therefore met the area patch requirements of the EPBC Act community. This process utilised the wider mapping of Vegetation Zones in the Development Corridor. Only patches of Vegetation Zones 3 and 4 found to be at least 0.1 hectares in size were considered further in the TEC analysis.

- **Are there 12 or more native understorey species present (excluding grasses), of which at least one is deemed an important species.**

The majority of patches of Vegetation Zone 3 and 4 identified in the Indicative Development Footprints were found to support more than 12 native understorey species (excluding grasses), including a deemed important species. In the absence of meeting this level of diversity and composition, a patch must be at least 2 hectares in size AND support an average of 20 or more mature trees per hectare OR have natural regeneration of the dominant canopy species. Analysis of the relevant Vegetation Zones against these measures is provided below in **Table 3.4**.

Table 3.4 Floristic analysis of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC

BAM Vegetation Integrity Plot ID	Total CEEC Spp.	Native Plot Spp. (exotic spp.)	No. of CEEC Spp. in Plot	% of CEEC Spp. in Plot	% of total CEEC Spp.	12 Native Understorey Spp. (ex. Grasses)	Important Spp.	Is the patch size at least 2 hectares?	Are there at least 20 mature trees per hectare or natural regeneration of canopy species?	Assessment
Vegetation Zone 3 (PCT350-Moderate/Good)										
Q1	473	28 (7)	19	54.3	4.0	Yes	Yes	N/A	N/A	Conforming - Proportion of TEC species recorded is considered reasonable.
Q06	473	8 (6)	6	42.9	1.3	No	No	Yes	Yes	Conforming – based on being a larger patch and supporting mature trees.
Q15	473	12 (1)	7	53.8	1.5	No	Yes	Yes	Yes	Conforming – based on being a larger patch and supporting mature trees.
Q31	473	16 (5)	10	47.6	2.1	No	Yes	No	Yes	Conforming – based on being a larger patch and supporting mature trees.
Q43	473	15 (5)	10	50.0	2.1	No	Yes	Yes	Yes	Conforming – based on being a larger patch and supporting mature trees.
DMRP1	473	19 (4)	11	47.8	2.3	No	Yes	Yes	Yes	Conforming – based on being a larger patch and supporting mature trees.

BAM Vegetation Integrity Plot ID	Total CEEC Spp.	Native Plot Spp. (exotic spp.)	No. of CEEC Spp. in Plot	% of CEEC Spp. in Plot	% of total CEEC Spp.	12 Native Understorey Spp. (ex. Grasses)	Important Spp.	Is the patch size at least 2 hectares?	Are there at least 20 mature trees per hectare or natural regeneration of canopy species?	Assessment
P03	473	6 (7)	6	46.2	1.3	No	Yes	Yes	Yes	Conforming – based on being a larger patch and supporting mature trees.
Average	**NA**	**14.9 (5)**	**9.9**	**48.9**	**2.1**	**14.3**	**85.7**			
Vegetation Zone 4 (PCT350-DNG)										
Q11	473	15 (10)	10	40.0	2.1	No	Yes	Yes	Yes	Conforming - based on being a larger patch (incl. adjoining woodland) and supporting mature trees or regenerating canopy trees.
Q32	473	8 (10)	5	27.8	1.1	No	Yes	Yes	Yes	Conforming - Proportion of TEC species recorded is considered reasonable.
DMRP3	473	22 (3)	18	72.0	3.8	Yes	Yes	N/A	N/A	Conforming - based on being a larger patch (incl. adjoining woodland) and supporting mature trees or regenerating canopy trees.

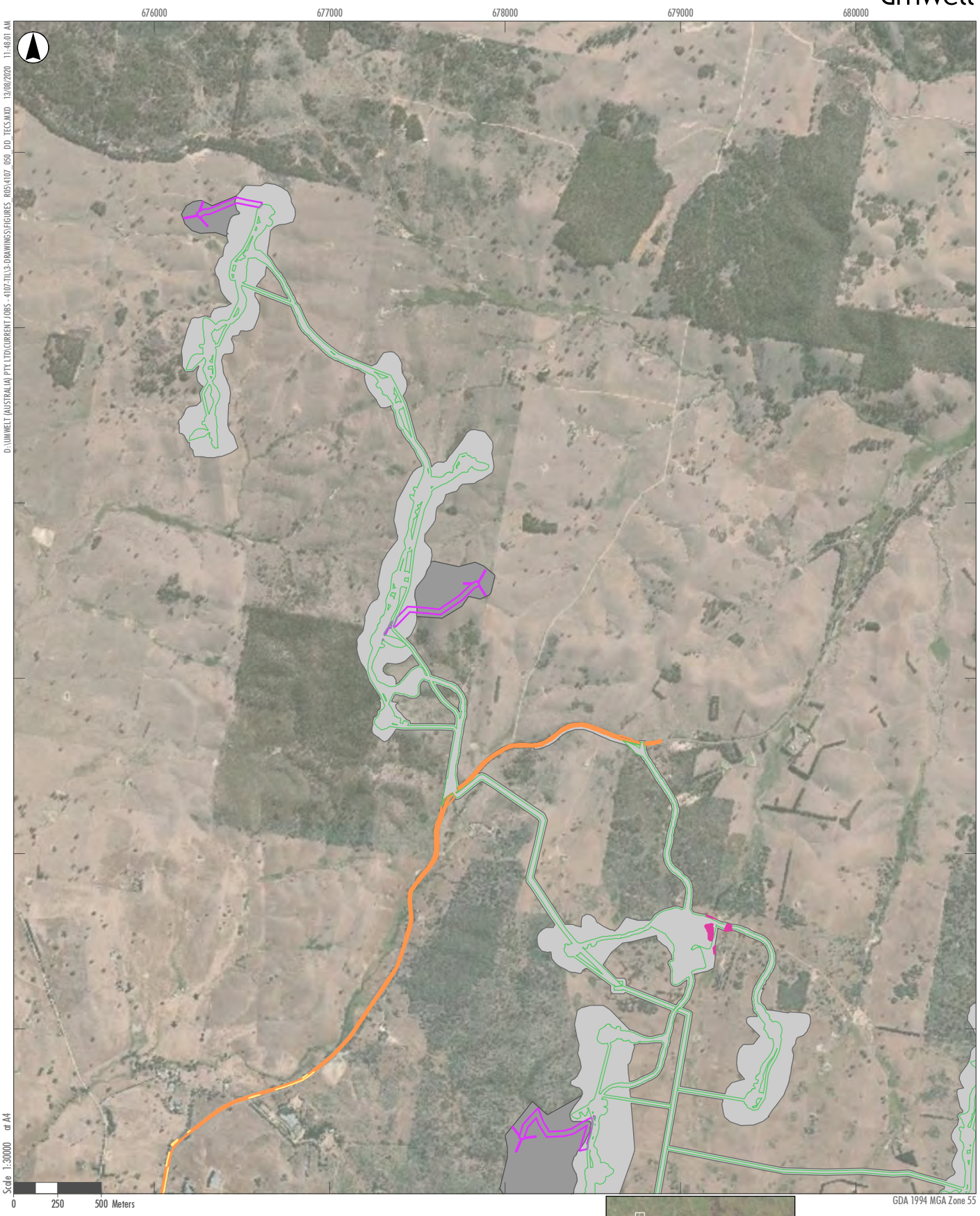
BAM Vegetation Integrity Plot ID	Total CEEC Spp.	Native Plot Spp. (exotic spp.)	No. of CEEC Spp. in Plot	% of CEEC Spp. in Plot	% of total CEEC Spp.	12 Native Understorey Spp. (ex. Grasses)	Important Spp.	Is the patch size at least 2 hectares?	Are there at least 20 mature trees per hectare or natural regeneration of canopy species?	Assessment
4107_JAN_02	473	15 (15)	11	36.7	2.3	No	Yes	Yes	Yes	Conforming - based on being a larger patch (incl. adjoining woodland) and supporting mature trees or regenerating canopy trees.
4107_Feb_03	473	5 (4)	4	44.4	0.8	No	No	Yes	Yes	Conforming - although less than 12 species were recorded, this plot was completed in extremely dry conditions. Therefore, Umwelt have assumed it would meet this requirement in better conditions.

Summary

Based on the detailed assessment described above, both Vegetation Zones 3 and 4 conform with *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC* under the EPBC Act. Both Vegetation Zones were identified as conforming with the multiple components of the TEC, being a combination of particular area, condition and size of patch, assemblage of species, density of mature trees and/or presence of natural canopy regeneration.

The Indicative Development Footprints is considered to support 35.73 hectares of *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC* within Vegetation Zones 3 (19.38 hectares) and 4 (16.35 hectares). See **Figure 3.4**. Impacts to the CEEC under the EPBC Act is 26.23 hectares more than the impact threshold of 9.5 hectares for this TEC as identified in Condition 3 of the existing Federal Approval (EPBC 2014/7163).

It is noted that 67.64 hectares of *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC* under the EPBC Act was identified within the Development Corridors. Therefore, 31.91 hectares of the CEEC has been avoided by the Project and will persist within the wider Development Corridors, and considerable amounts of the CEEC occur beyond the Development Corridors in the local region.



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads

Threatened Ecological Communities (BC Act & EPBC Act)

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act) / White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands CEEC (EPBC Act)

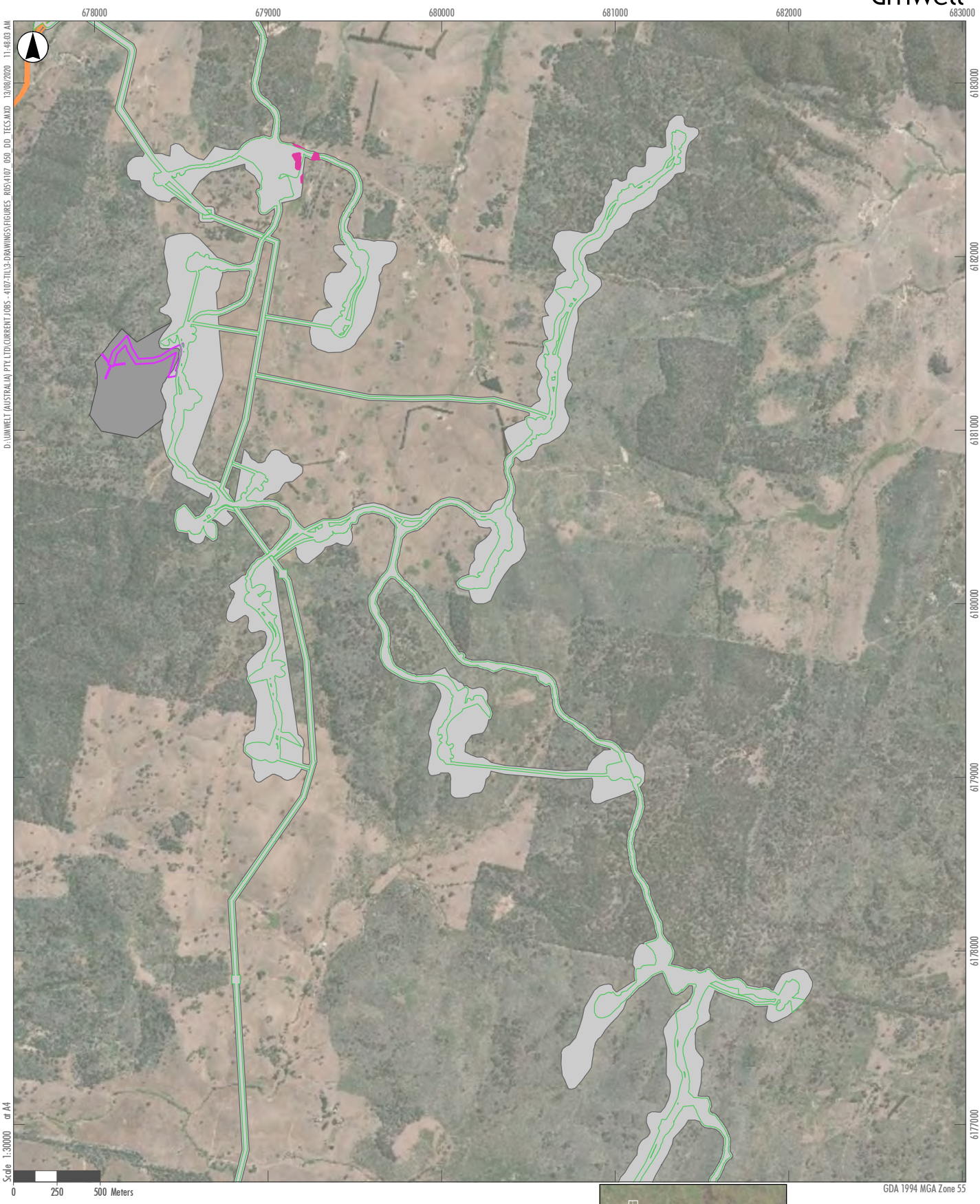
Threatened Ecological Communities (BC Act)

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act)

FIGURE 3.4.a

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads

Threatened Ecological Communities (BC Act & EPBC Act)

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act) / White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands CEEC (EPBC Act)

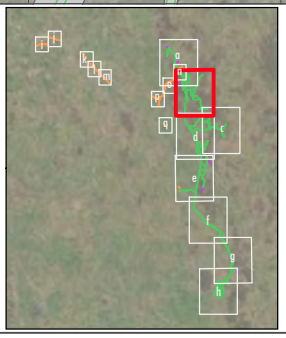


FIGURE 3.4.b

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Development Corridor - Wind Farm

Indicative Development Footprint - Wind Farm

Threatened Ecological Communities (BC Act & EPBC Act)

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act) / White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands CEEC (EPBC Act)

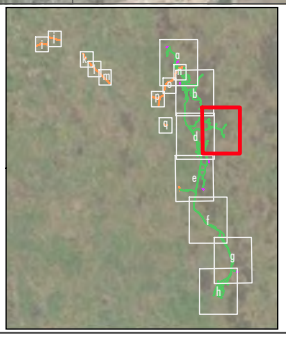
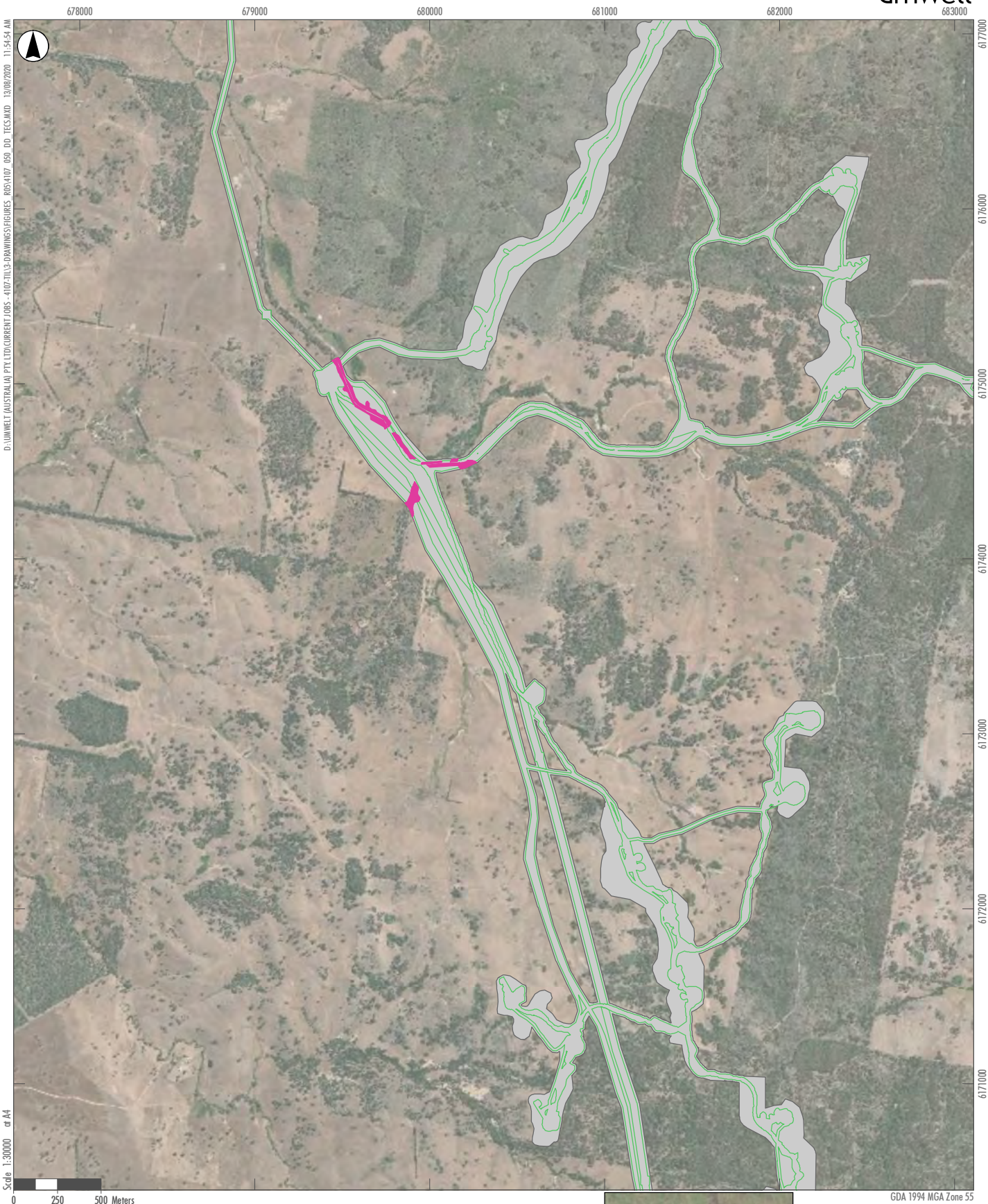


FIGURE 3.4.c

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm

Threatened Ecological Communities (BC Act & EPBC Act)

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act) / White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands CEEC (EPBC Act)

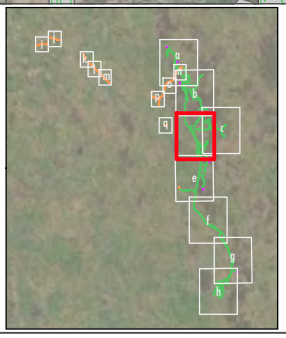
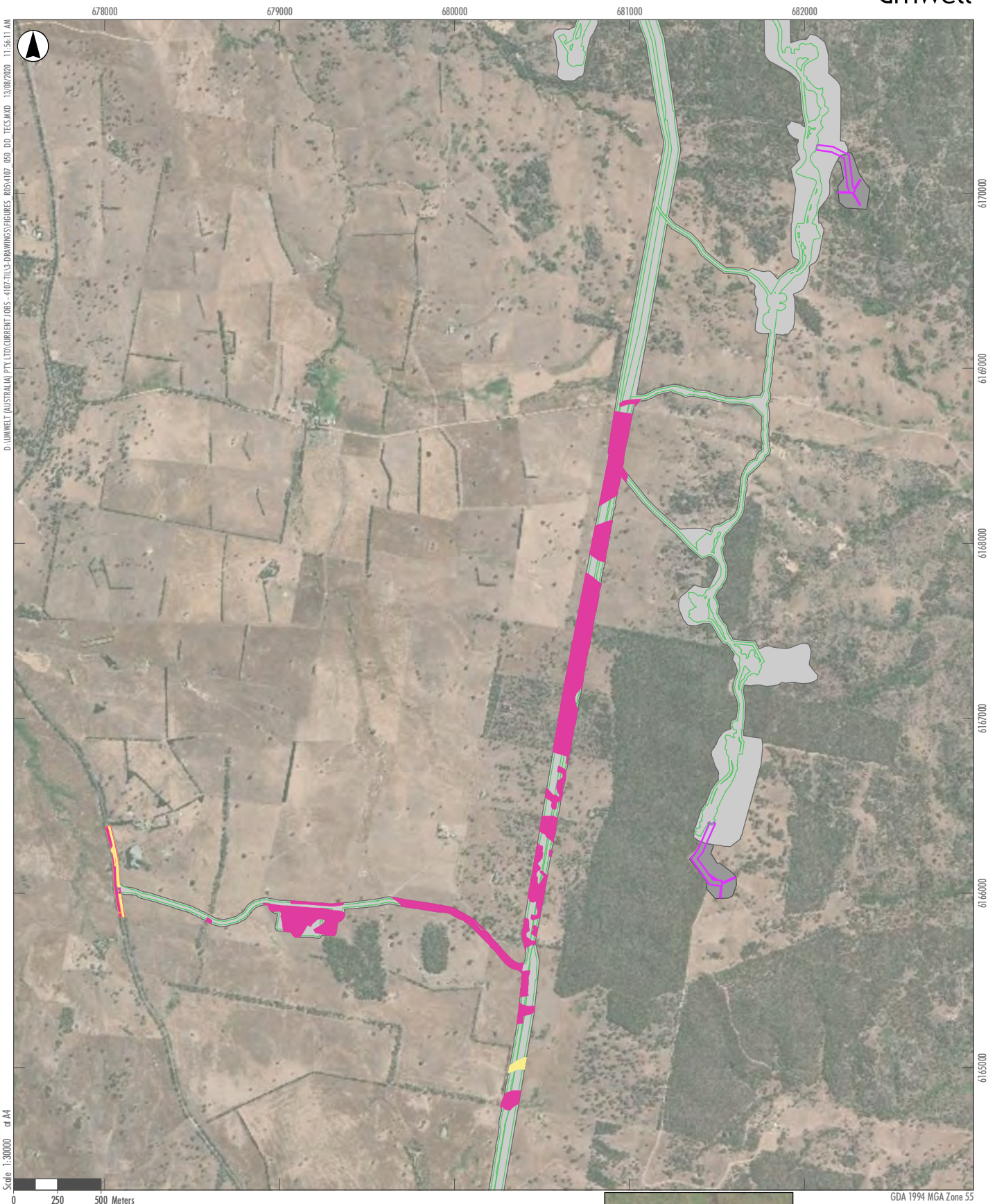


FIGURE 3.4.d

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads

Threatened Ecological Communities (BC Act & EPBC Act)

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act) / White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands CEEC (EPBC Act)

Threatened Ecological Communities (BC Act)

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act)

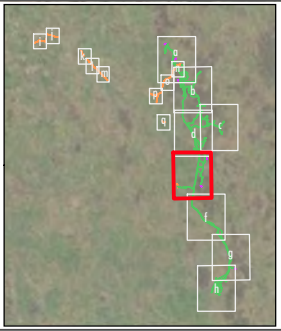


FIGURE 3.4.e

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm

Threatened Ecological Communities (BC Act & EPBC Act)

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act) / White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands CEEC (EPBC Act)

Threatened Ecological Communities (BC Act)

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act)

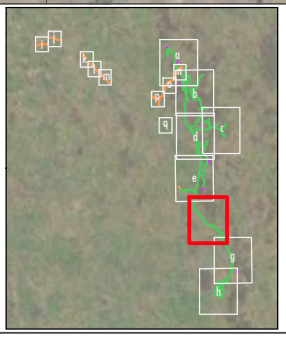
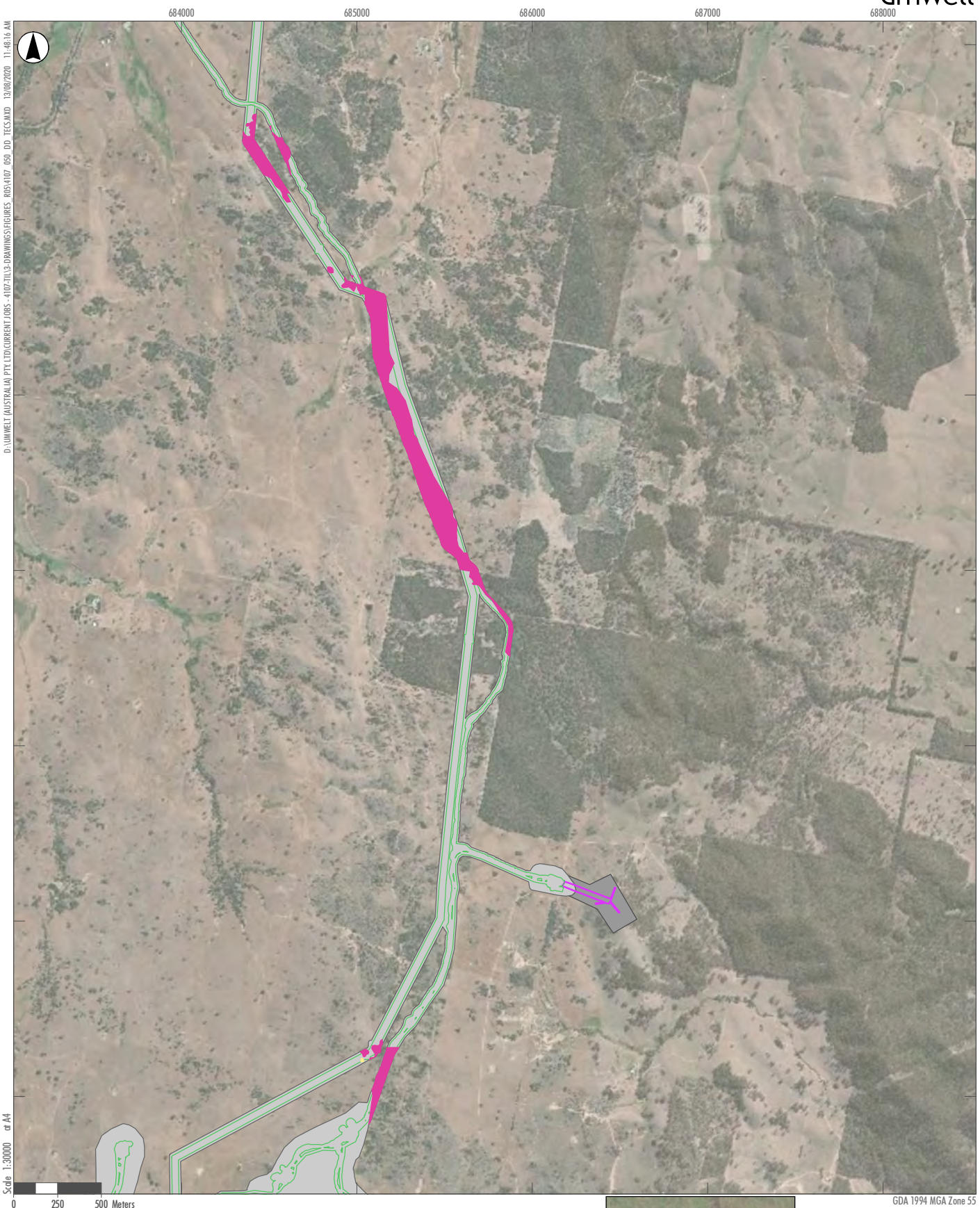


FIGURE 3.4.f

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts

Threatened Ecological Communities (BC Act & EPBC Act)

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act) / White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands CEEC (EPBC Act)

Threatened Ecological Communities (BC Act)

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act)

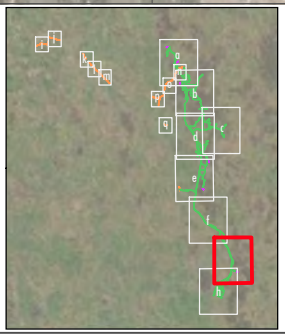


FIGURE 3.4.g

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

D:\UMWELT (AUSTRALIA) PTY LTD\CURRENT JOBS - 4107-TLL3-DRAWINGS\FIGURES_R05\4107_050_DD_TECS.MXD 13/08/2020 11:48:18 AM

Scale 1:30000 at A4

Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts

Threatened Ecological Communities (BC Act & EPBC Act)

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act) / White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands CEEC (EPBC Act)

Threatened Ecological Communities (BC Act)

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act)

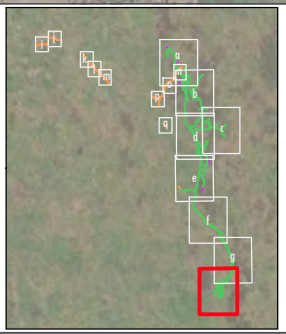


FIGURE 3.4.h

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

Threatened Ecological Communities (BC Act)

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act)

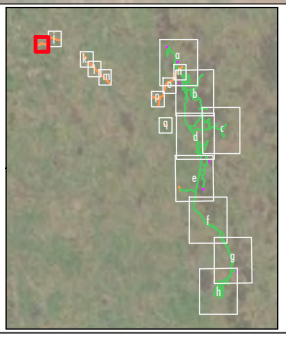


FIGURE 3.4.i

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

Threatened Ecological Communities (BC Act)

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act)

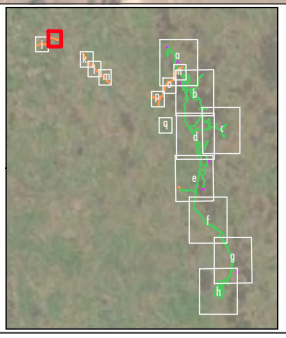


FIGURE 3.4.j

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads

Threatened Ecological Communities (BC Act & EPBC Act)

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act) / White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands CEEC (EPBC Act)

Threatened Ecological Communities (BC Act)

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act)

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 3.4.k

Threatened Ecological Communities in the Indicative Development Footprints

Legend

Indicative Development Footprint - External Roads

Threatened Ecological Communities (BC Act & EPBC Act)

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act) / White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands CEEC (EPBC Act)

FIGURE 3.4.I

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

Threatened Ecological Communities (BC Act)

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act)

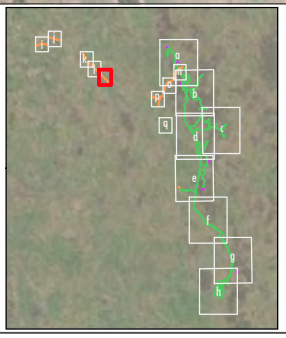


FIGURE 3.4.m

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 3.4.n

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

Threatened Ecological Communities (BC Act & EPBC Act)

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act) / White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands CEEC (EPBC Act)

Threatened Ecological Communities (BC Act)

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act)

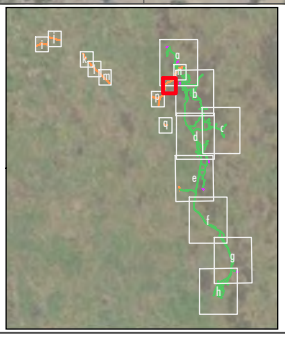


FIGURE 3.4.o

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

Threatened Ecological Communities (BC Act & EPBC Act)

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act) / White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands CEEC (EPBC Act)

Threatened Ecological Communities (BC Act)

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act)

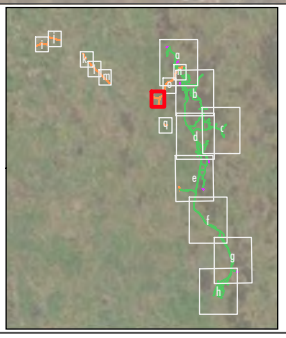


FIGURE 3.4.p

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

Threatened Ecological Communities (BC Act)

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act)

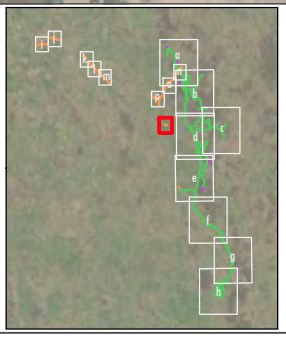


FIGURE 3.4.q

Threatened Ecological Communities in the Indicative Development Footprints

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

3.2.4 Vegetation Integrity Score

Table 3.5 below details the vegetation integrity scores for each vegetation zone in the Indicative Development Footprints. The vegetation integrity data for each of the vegetation zones is provided in **Appendix D**.

Table 3.5 Vegetation Zone Vegetation Integrity Scores

Veg Zone	PCT Name	Composition		Structure		Function		Current Vegetation Integrity Score	
		SWS IBRA	SEH IBRA	SWS IBRA	SEH IBRA	SWS IBRA	SEH IBRA	SWS IBRA	SEH IBRA
1	289 Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good*	55.2	-	80.4	-	94.7	-	**74.9**	**-**
2	335 Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good*	35.9	37.1	64.1	24.9	-	-	**47.9**	**30.4**
3	350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Moderate to Good*	49.3	34.9	90.7	84.0	99.0	93.5	**76.2**	**65.0**

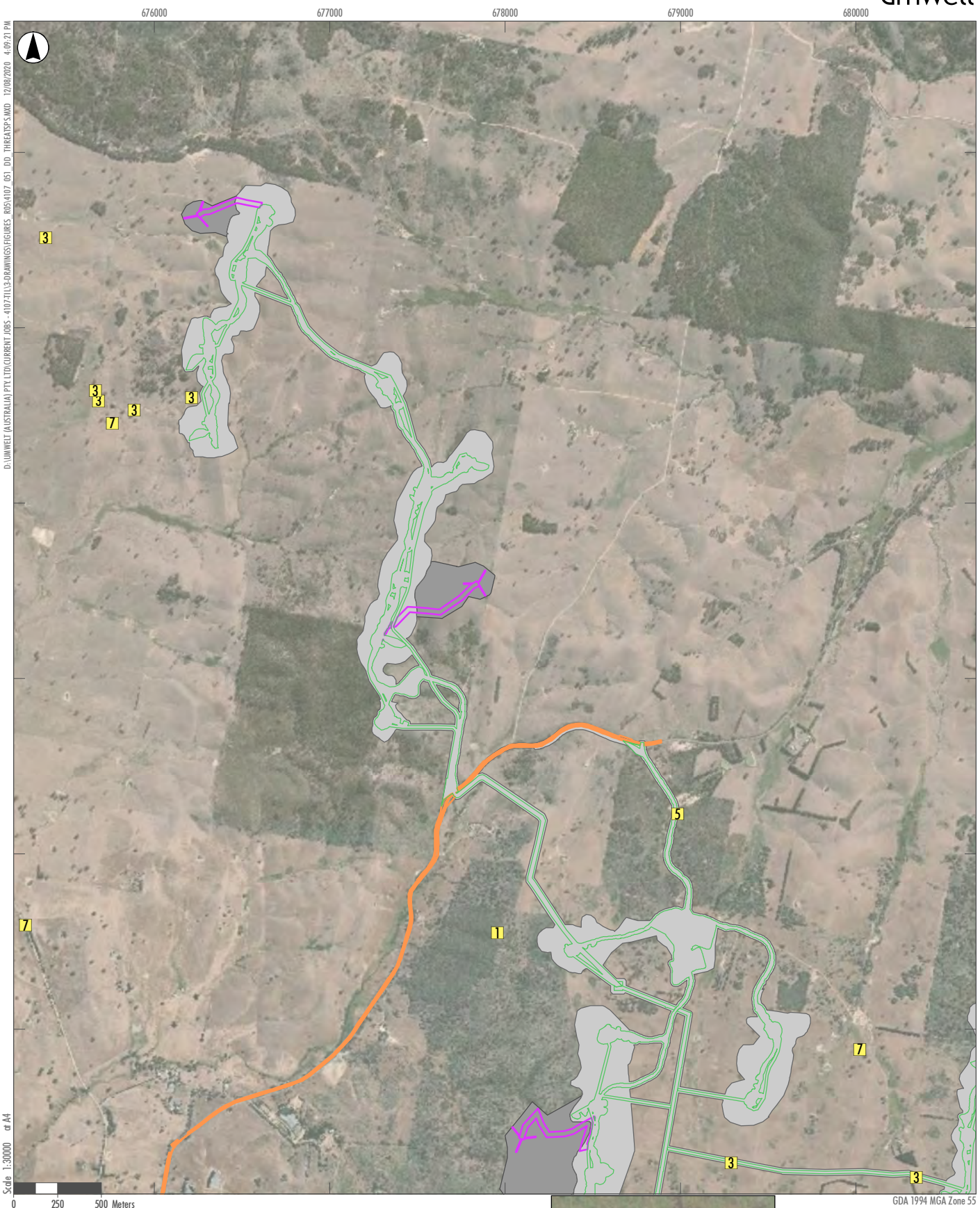
Veg Zone	PCT Name	Composition		Structure		Function		Current Vegetation Integrity Score	
		SWS IBRA	SEH IBRA	SWS IBRA	SEH IBRA	SWS IBRA	SEH IBRA	SWS IBRA	SEH IBRA
4	350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Derived Native Grassland*	37.7	29.1	35.9	51.8	29.7	29.7	**34.3**	**35.5**
5	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Moderate to Good*	68.8	58.1	87.4	95.9	90.6	90.5	**81.7**	**79.6**
6	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Derived Native Grassland*	23.4	22.5	21.4	30.3	16.4	15.6	**20.2**	**22.0**
7	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Acacia Shrubland*	57.5	48.5	49.5	78.4	35.7	34.7	**46.7**	**50.9**

Veg Zone	PCT Name	Composition		Structure		Function		Current Vegetation Integrity Score	
		SWS IBRA	SEH IBRA	SWS IBRA	SEH IBRA	SWS IBRA	SEH IBRA	SWS IBRA	SEH IBRA
8	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Sifton Bush Shrubland*	33.7	29.2	26.8	41.6	14.2	13.3	**23.4**	**25.3**
9	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Argyle Apple Forest*	56.2	-	59.1	-	97.3	-	**68.6**	**-**
10	Non-native Vegetation	15.9	12.9	6.9	5.2	25.3	25.3	**14.0**	**11.9**

3.3 Threatened Species within the Indicative Development Footprints

3.3.1 Ecosystem-credit Species

A list of the ecosystem-credit species predicted to occur by the BAM Calculator and/or the literature review and whether they are considered likely to occur in the vegetation zones within the Indicative Development Footprints is provided in **Appendix A**. Threatened species records are shown on **Figure 3.5**.



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads

Threatened Species Records

- 1 Glider Sp.
- 3 Golden Sun Moth
- 5 Little Eagle
- 7 Superb Parrot

FIGURE 3.5.a

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

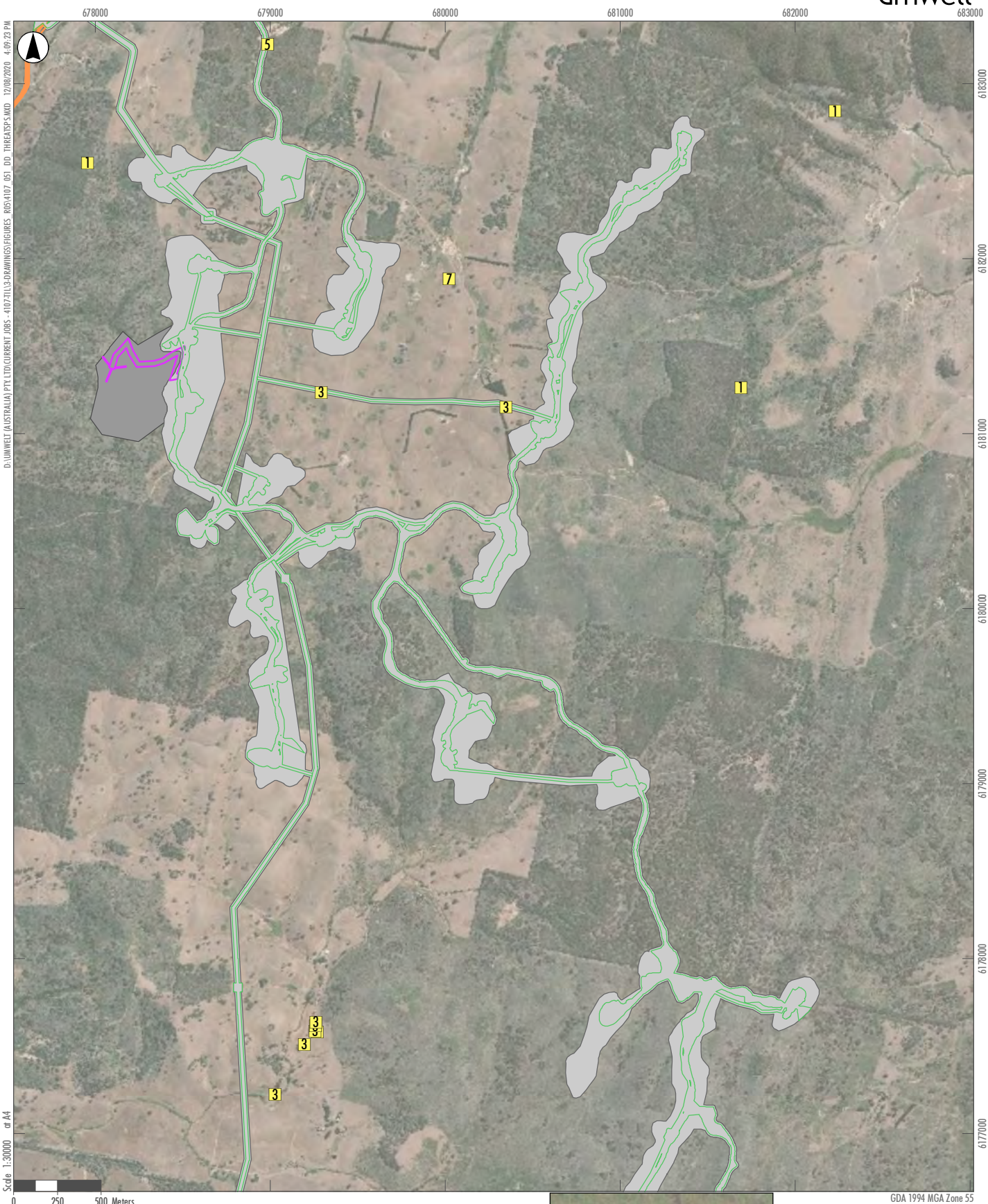


FIGURE 3.5.b

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Development Corridor - Wind Farm

Indicative Development Footprint - Wind Farm

Threatened Species Records

6 Southern Myotis

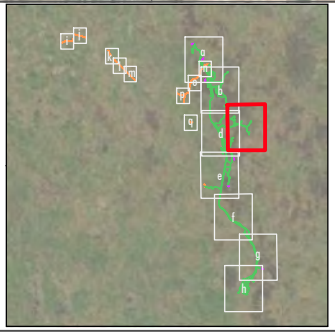


FIGURE 3.5.c

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

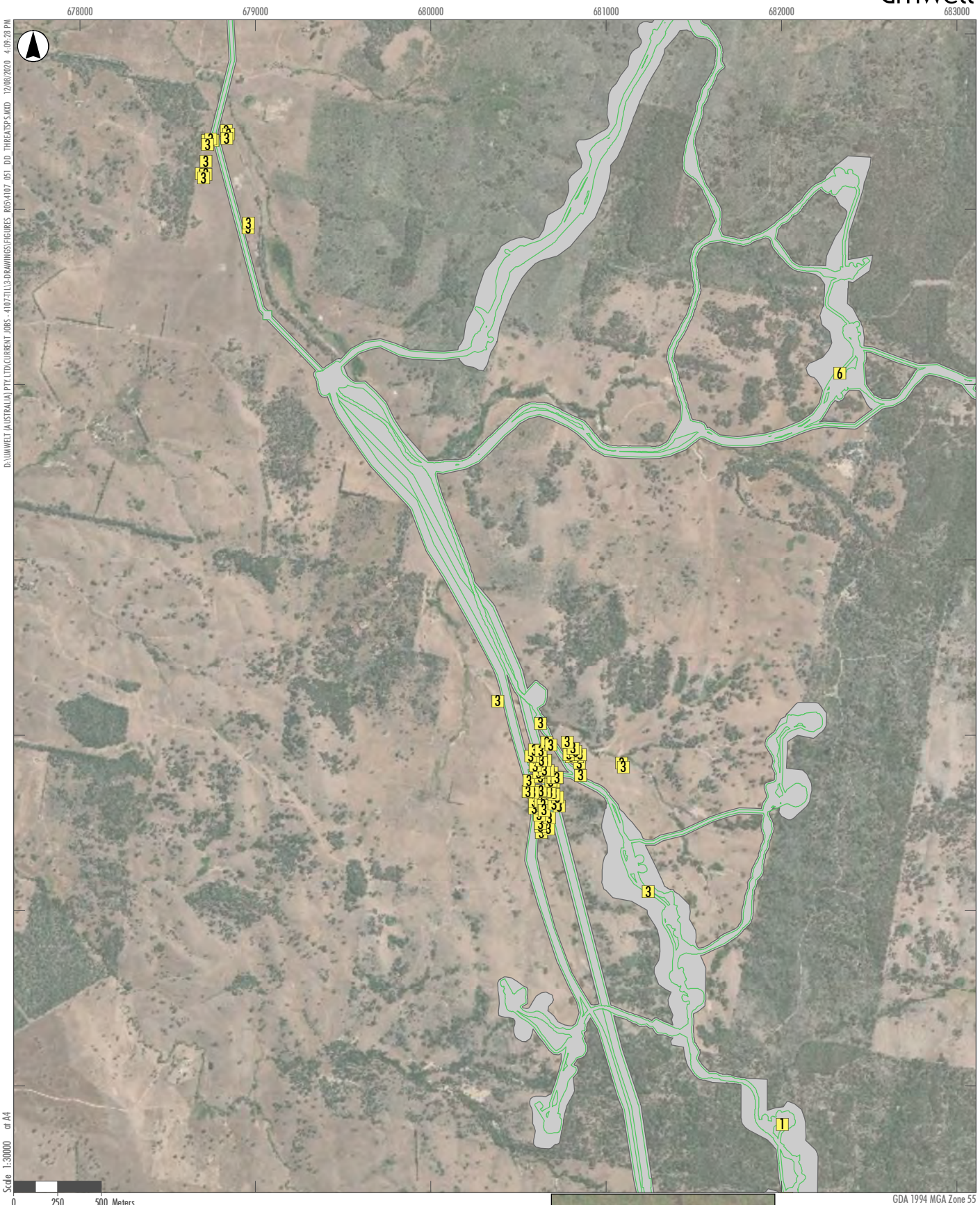
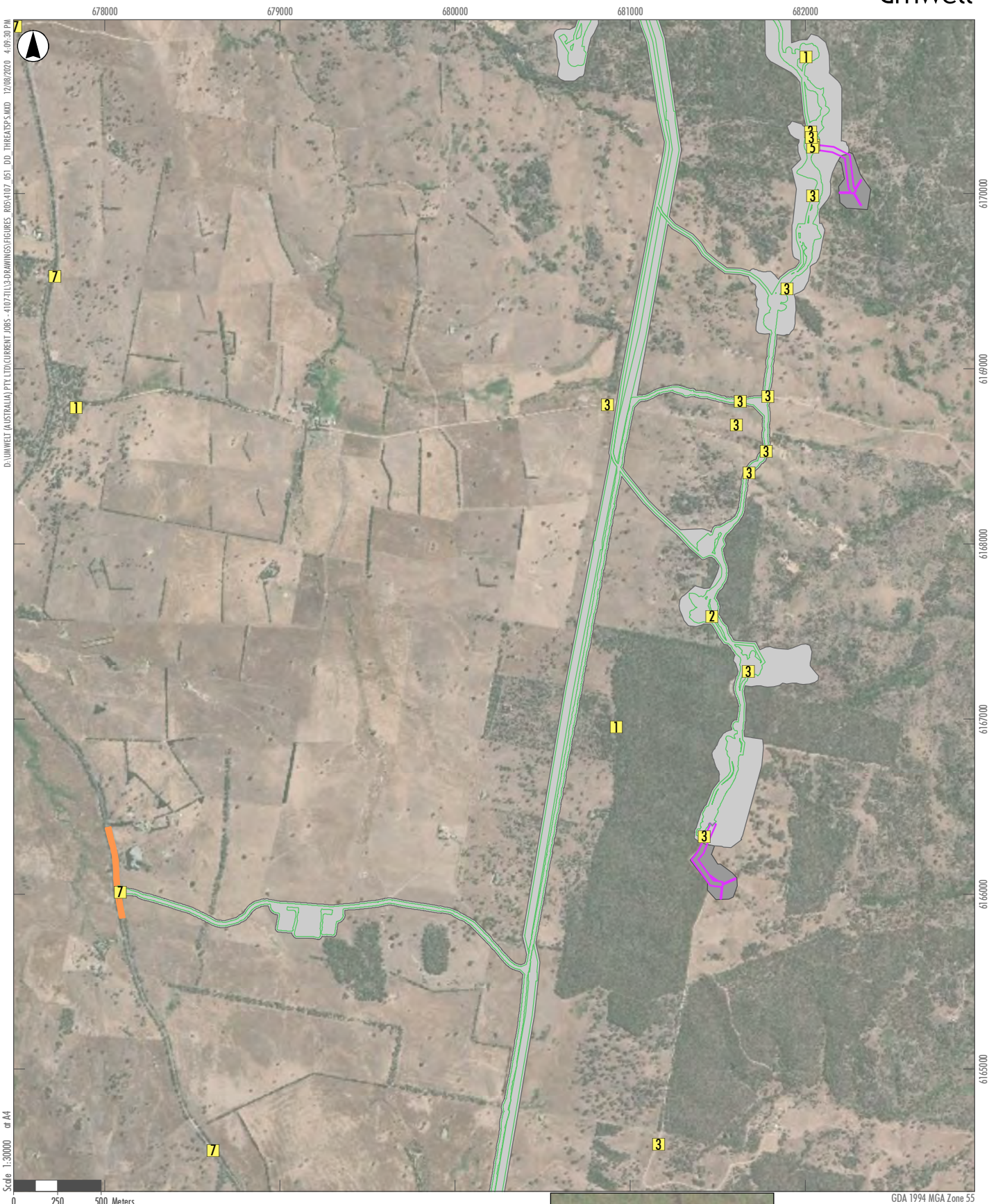


FIGURE 3.5.d

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads

Threatened Species Records

- [1] Glider Sp.
- [2] Squirrel Glider
- [3] Golden Sun Moth
- [5] Little Eagle
- [7] Superb Parrot

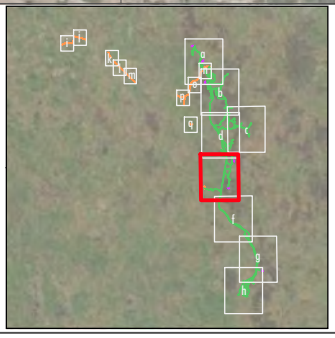


FIGURE 3.5.e

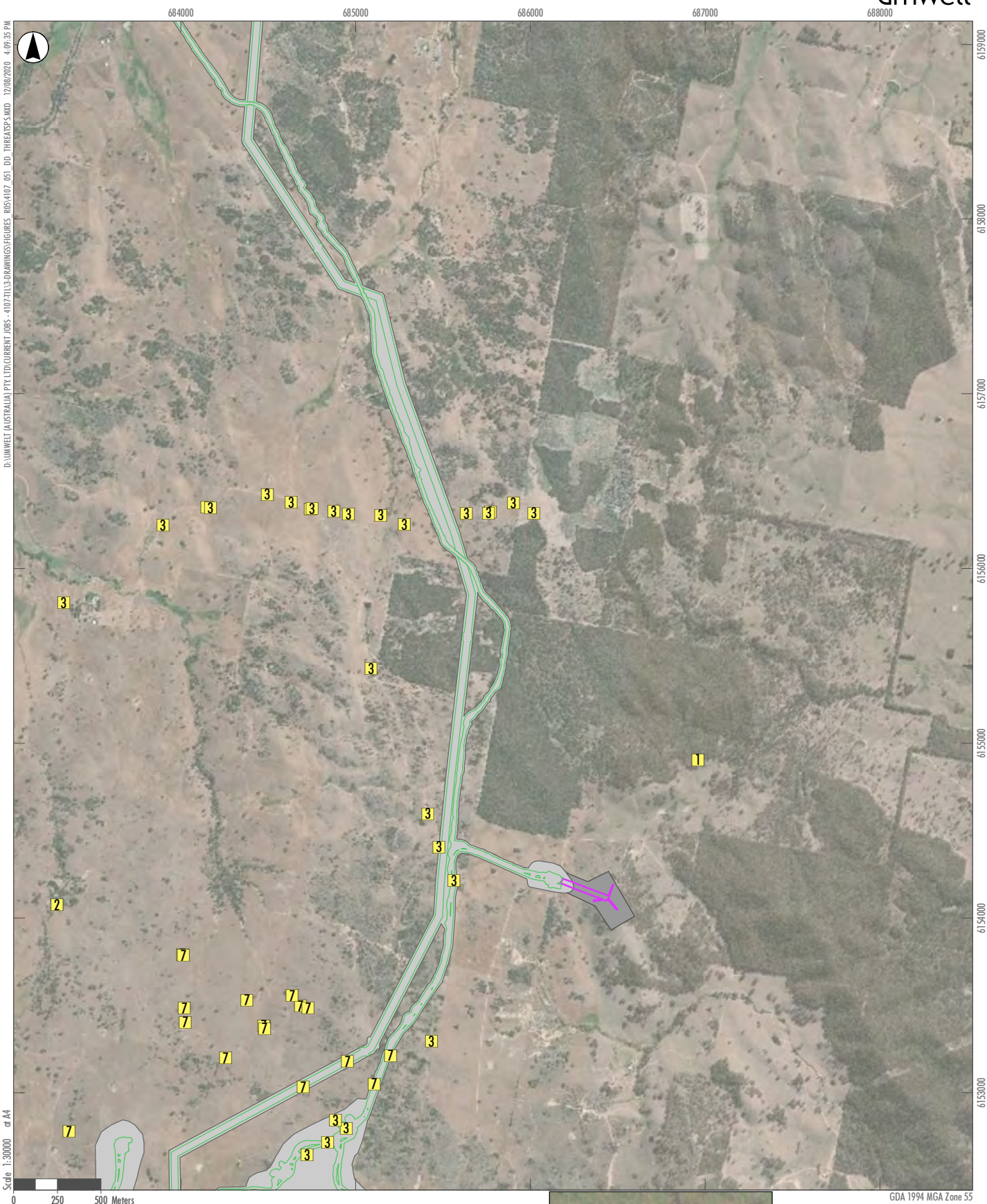
Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 3.5.f

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts

Threatened Species Records

- 1 Glider Sp.
- 2 Squirrel Glider
- 3 Golden Sun Moth
- 7 Superb Parrot

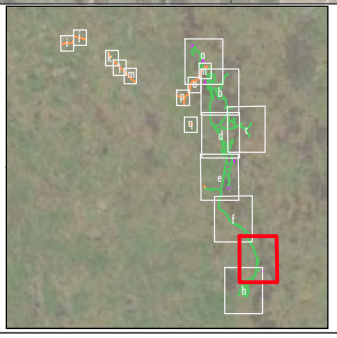
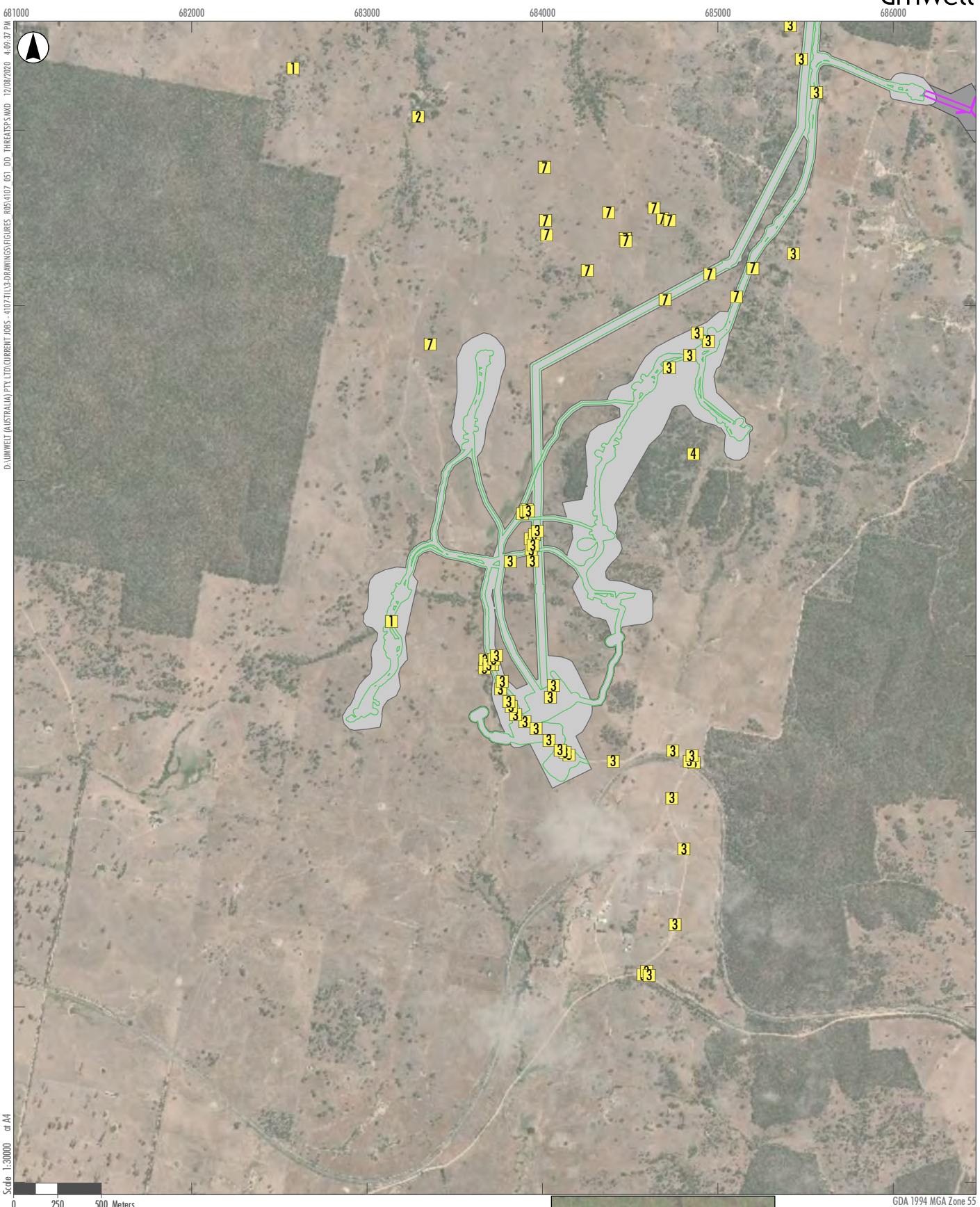


FIGURE 3.5.g

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts

Threatened Species Records

- 1 Glider Sp.
- 2 Squirrel Glider
- 3 Golden Sun Moth
- 4 Large bent-winged bat
- 7 Superb Parrot

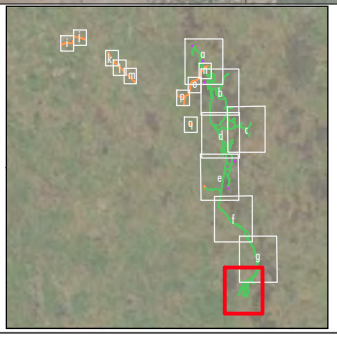


FIGURE 3.5.h

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

FIGURE 3.5.i

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

FIGURE 3.5.j

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

D:\UMWELT (AUSTRALIA) PTY LTD\CURRENT JOBS - 4107-7111\L3-DRAWINGS\FIGURES_R05\4107_051_DD_THREATSPS.MXD 12/08/2020 4:09:43 PM

Scale 1:10000 at A4

FIGURE 3.5.k

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 3.5.I

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 3.5.m

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 3.5.n

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

FIGURE 3.5.o

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 3.5.p

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

Threatened Species Records

7 Superb Parrot

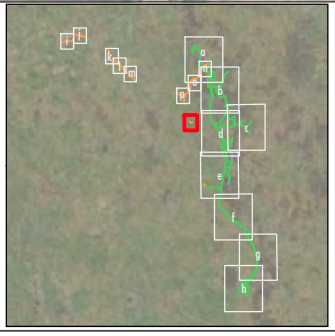


FIGURE 3.5.q

Threatened Species Records

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

3.3.2 Species-credit Species

A list of the species-credit species predicted to occur by the BAM Calculator and/or the literature review and a discussion on their inclusion or exclusion from the calculator assessment is provided in **Appendix B**. Species-credit species recorded or assumed present are shown in **Figure 3.5** and discussed broadly in **Table 3.6.** Further information on the surveys undertaken for these species is provided in **Appendix B**.

Table 3.6 Species-credit Species within the Indicative Development Footprints

Species	BC Act	EPBC Act	Species Presence	Justification
striped legless lizard *Delma impar*	V	V	**Yes (previously recorded by NGH Environmental [2014])**	The species was not recorded by Umwelt. This species was previously recorded at a single location in the north of the Indicative Development Footprint – Wind Farm during the planning approval process (NGH Environmental 2014) (**Figure 3.5**).
southern myotis *Myotis macropus*	V	-	**Yes (Assumed)**	Umwelt had just one confirmed record of the species occurring within the Indicative Development Footprint – External Roads (**Figure 3.5**).
squirrel glider *Petaurus norfolcensis*	V	-	**Yes (surveyed)**	This species was recorded at multiple locations within the Indicative Development Footprints, or in proximity to it, by Umwelt. It was not recorded previously during the planning approval process (NGH Environmental 2014 and 2016). The species was recorded through spotlighting surveys as well as through the use of remote survey cameras (**Figure 3.5**). The latter confirmed use of the site by both squirrel glider and sugar glider (*Petaurus breviceps*). All records for the species occurred in patches of remnant forest from PCTs 289, 350 and 351.
superb parrot *Polytelis swainsonii*	V	V	**Yes (surveyed)**	The species was recorded at several locations within the Indicative Development Footprints by Umwelt (**Figure 3.5**). The species is widely known to occur in the local area and was also recorded previously at several locations during the planning approval process (NGH Environmental 2014) (**Figure 3.5**).
golden sun moth *Synemon plana*	E	CE	**Yes (surveyed)**	The species was recorded at several locations within the Indicative Developments Footprint by Umwelt (**Figure 3.5**). The species was also recorded previously at several locations during the planning approval process (NGH Environmental 2014) (**Figure 3.7**).

3.3.3 Species Habitat Polygons and Biodiversity Risk Weighting

Species habitat polygons have been prepared for the species in the Development Corridors and Indicative Development Footprints outlined in **Table 3.7** below. Polygons are shown on **Figure 3.6**.

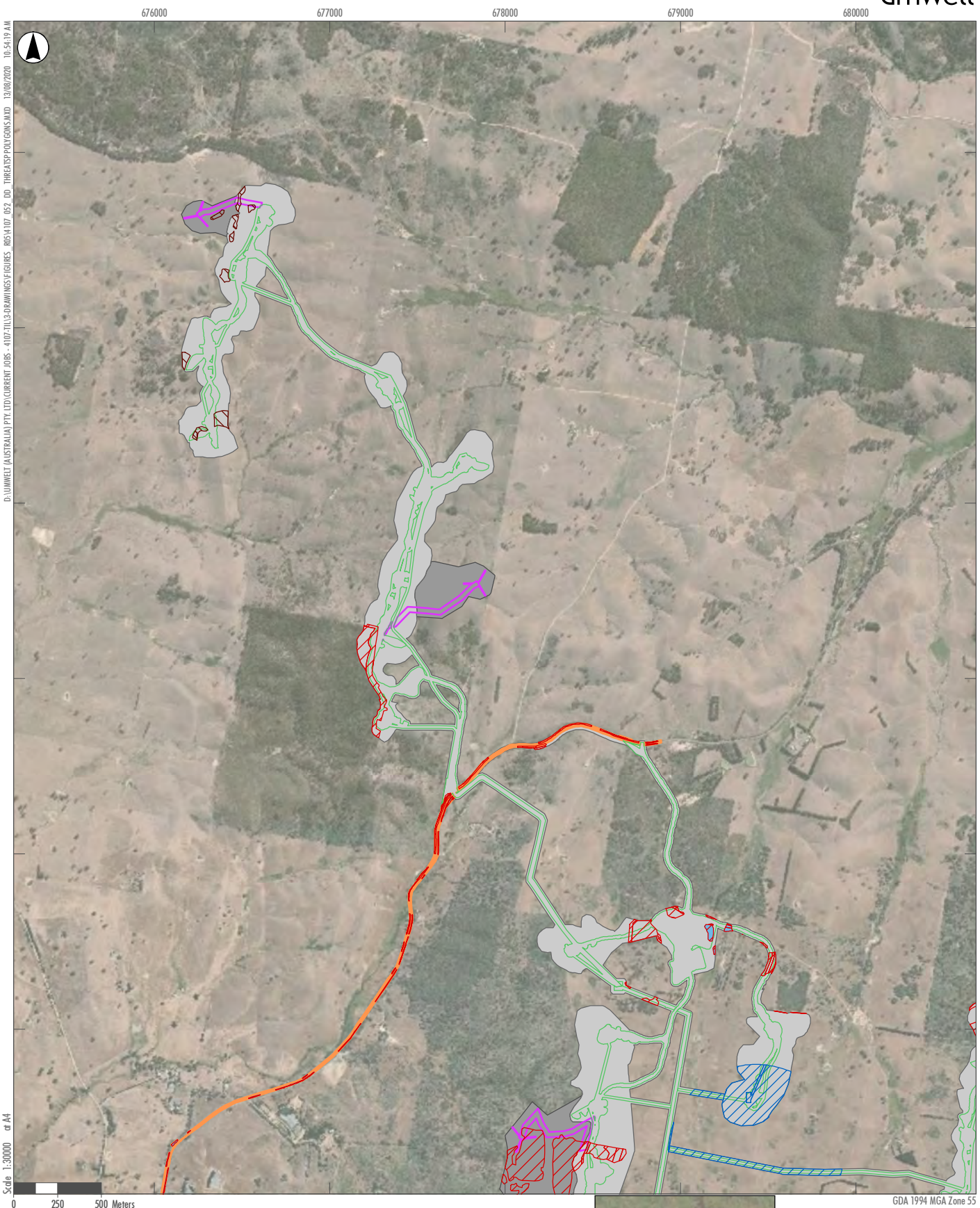
Table 3.7 Predicted Species-credit Species

Species	Biodiversity Risk Weighting	Species Habitat Polygon in Development Corridors (ha)	Species Habitat Polygon in Indicative Development Footprints (ha)	Species Habitat Polygon Description
striped legless lizard *Delma impar*	1.5	13.97	3.58	The species habitat polygon was determined based on the extent of a 500 m buffer from the confirmed record previously (identified by NGH Environmental) which intersects with Vegetation Zone 6 (refer **Figure 3.6**).The project will impact on 3.58 hectares of habitat for this species, avoiding a further 10.39 hectares.
southern myotis *Myotis macropus*	2	0.00	0.03	The TBDC for southern myotis describes the species as being "…dependent on waterways with pools of 3 metres wide or greater for foraging…" (TBDC 2020b). There is just one waterway that supports pools of water 3 m wide or greater, being Pudman Creek. Vegetation Zone 3 is the only remnant vegetation within 200 metres of this waterway, occurring along Grassy Creek Road. This species habitat polygon has been mapped based on patches of Vegetation Zones 3 within 200 metres of Pudman Creek (refer **Figure 3.6**). The project will impact on 0.03 hectares of habitat for this species, occurring entirely within the Indicative Development Footprint – External Roads.

Species	Biodiversity Risk Weighting	Species Habitat Polygon in Development Corridors (ha)	Species Habitat Polygon in Indicative Development Footprints (ha)	Species Habitat Polygon Description
squirrel glider *Petaurus norfolcensis*	2	258.63	102.97	All records for the species occurred in patches of remnant forest from PCTs 289, 350 and 351. There was no identifiable pattern across the Indicative Development Footprints where the species did and didn't occur. Thus, Vegetation Zones 1, 3 and 5 in the Indicative Development Footprints are considered to be suitable habitat for the species. Refer to **Figure 3.6** for the species polygon for this species. The Project will impact on 102.97 hectares of habitat for this species, avoiding a further 155.66 hectares.
superb parrot *Polytelis swainsonii*	2	36.33	20.08	Vegetation Zone 3 within the Indicative Development Footprints is considered to be suitable breeding habitat for the species. Foraging habitat is considered species credit habitat for the superb parrot. Refer to **Figure 3.6** for the species polygon for this species. The Project will impact on 20.08 hectares of habitat for this species, avoiding a further 16.25 hectares.
golden sun moth *Synemon plana*	3	113.89	43.20	Umwelt provide additional information below this table regarding the species polygon for this species. Consistent with the impact assessment for this species in the Biodiversity Assessment and Biodiversity Assessment Addendum (NGH Environmental 2014 and 2016), the species habitat polygon for this species is based on the extent of Vegetation Zones 4 and 6 that intersect with the extent of mapping described above. Refer to **Figure 3.7** for the species polygon for this species. The Project will impact on 43.20 hectares of habitat for this species, avoiding a further 70.69 hectares.

Umwelt has maintained the application of a 200 m buffer from known records of GSM within the Project to determine the extent of the species polygon is suitable and justifiable. Based on current knowledge, this approach is suitable and appropriate for determining the extent of the GSM species polygon. This approach takes into consideration acknowledgment the species will utilise habitat broader than the specific location of the record. With the limited mobility of the species 200 m buffers are considered to appropriate, especially given that in most occasions multiple records were made in proximity to one another. Where multiple records and their associated 200 m buffers do not interconnect, the species polygon mapping between buffers was extended to provide a continuation (and potential over-estimation) of habitat.

As part of the post-submission engagement between Tilt, Umwelt and the BDC, the BCD has provided further information and clarification of their view in the final weeks of preparation of the Submissions Report and the revised BDAR. This information has not been able to be adequately addressed in this Submissions Report, or in the revised BDAR, as the analysis of existing data and/or the collection and analysis of new data could not be undertaken in the limited timeframe available. However, it is noted that further engagement on this subject will be required in the short term to determine any further implications on project impacts and credit requirement for the GSM.



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Squirrel Glider Habitat
- Removed Squirrel Glider Habitat
- Striped Legless Lizard Habitat - Within 500m Buffer
- Superb Parrot - Breeding Habitat

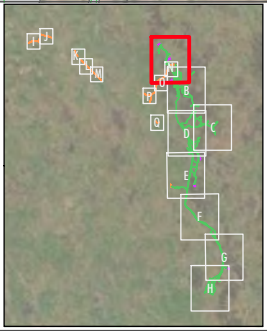
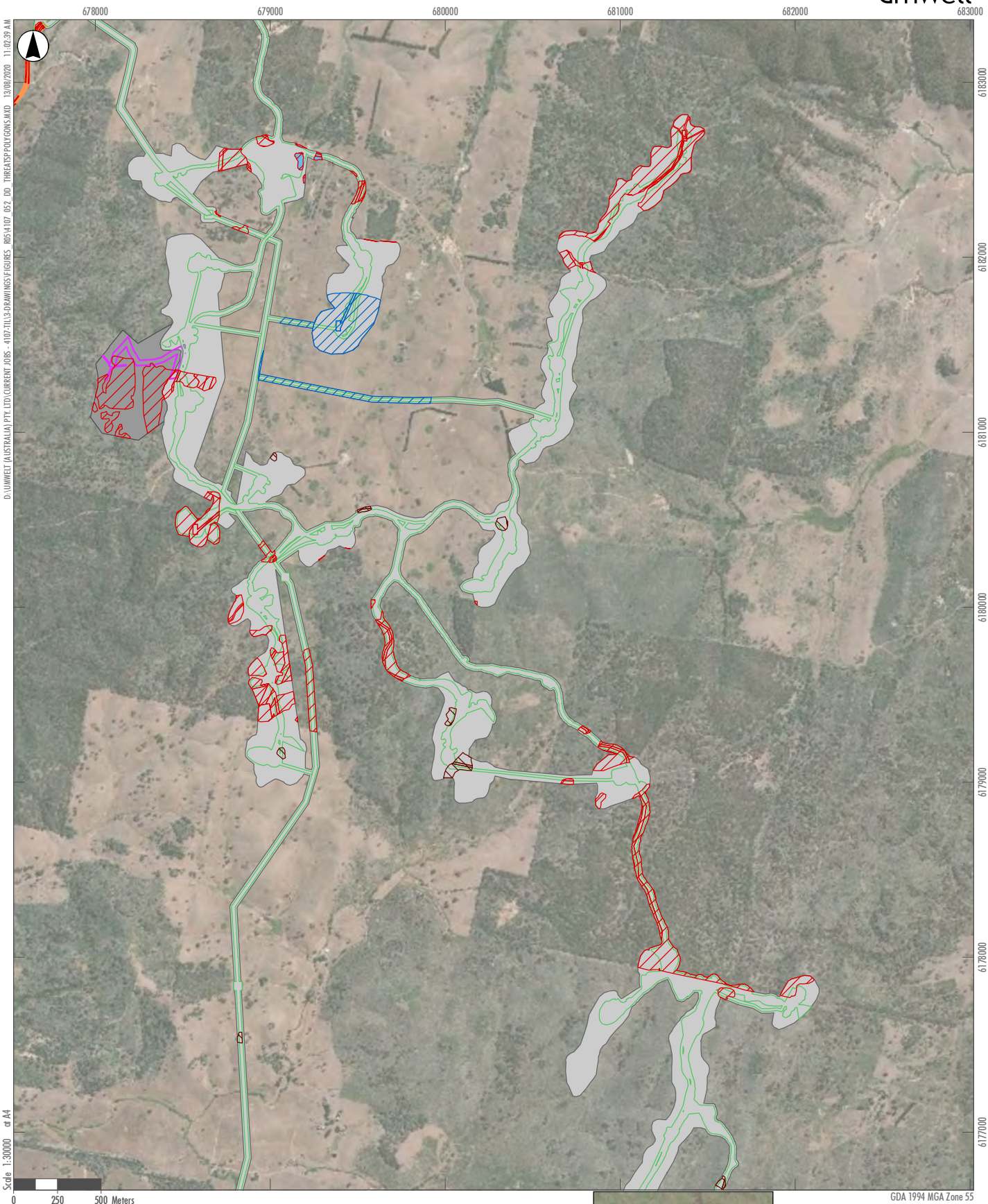


FIGURE 3.6.a

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Squirrel Glider Habitat
- Removed Squirrel Glider Habitat
- Striped Legless Lizard Habitat - Within 500m Buffer
- Superb Parrot - Breeding Habitat

FIGURE 3.6.b

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

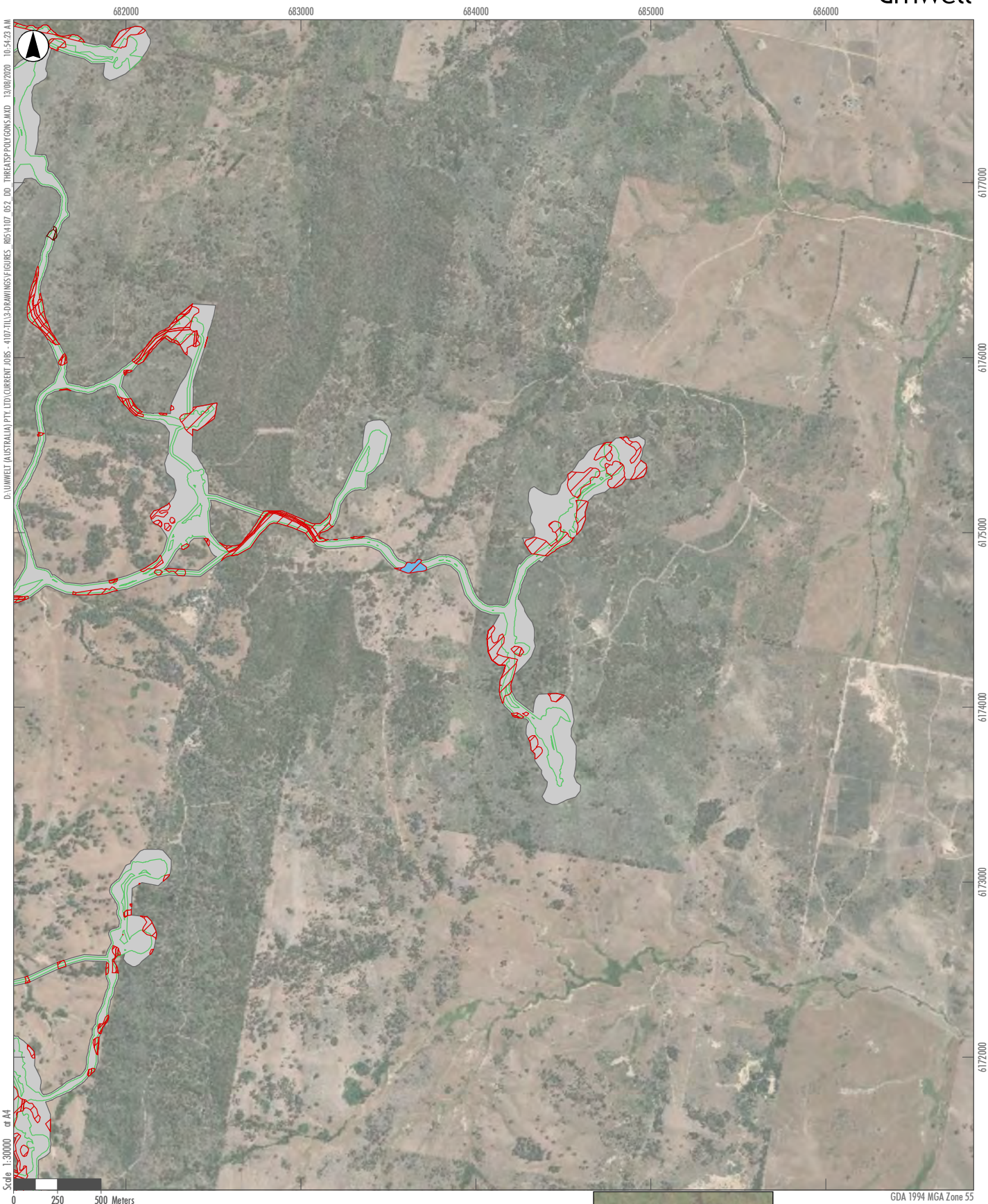


FIGURE 3.6.c

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

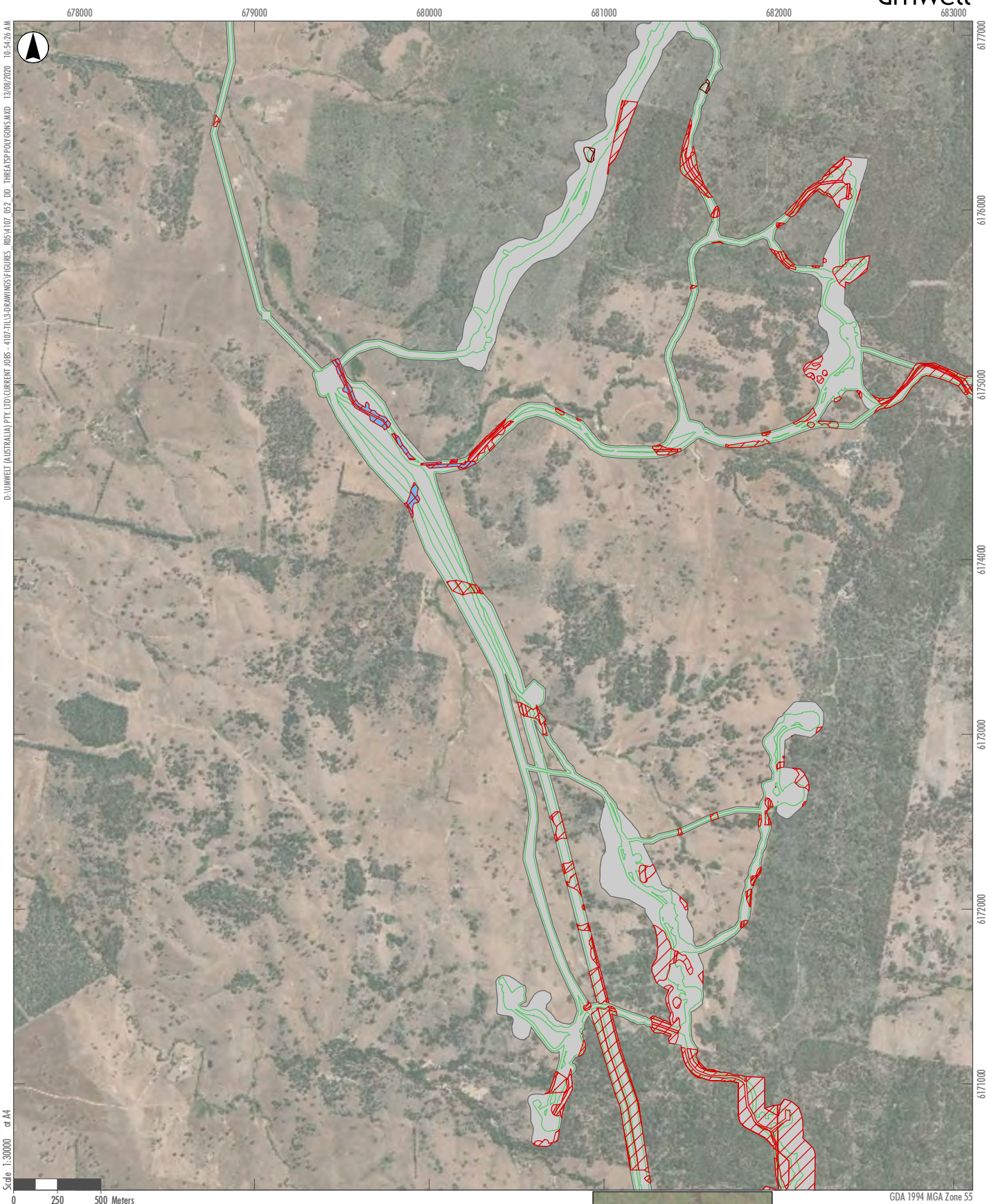


FIGURE 3.6.d

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

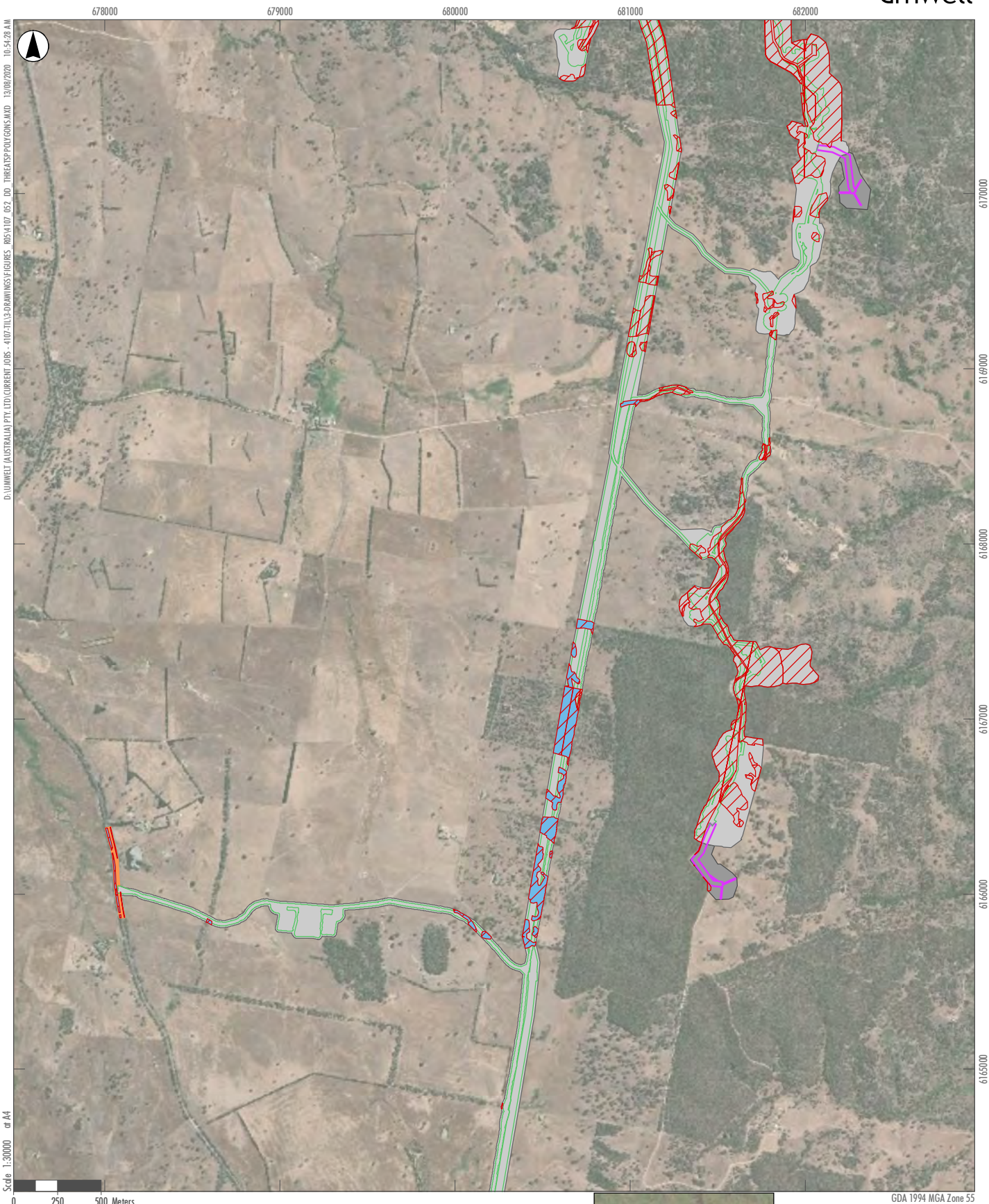


FIGURE 3.6.e

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 3.6.f

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

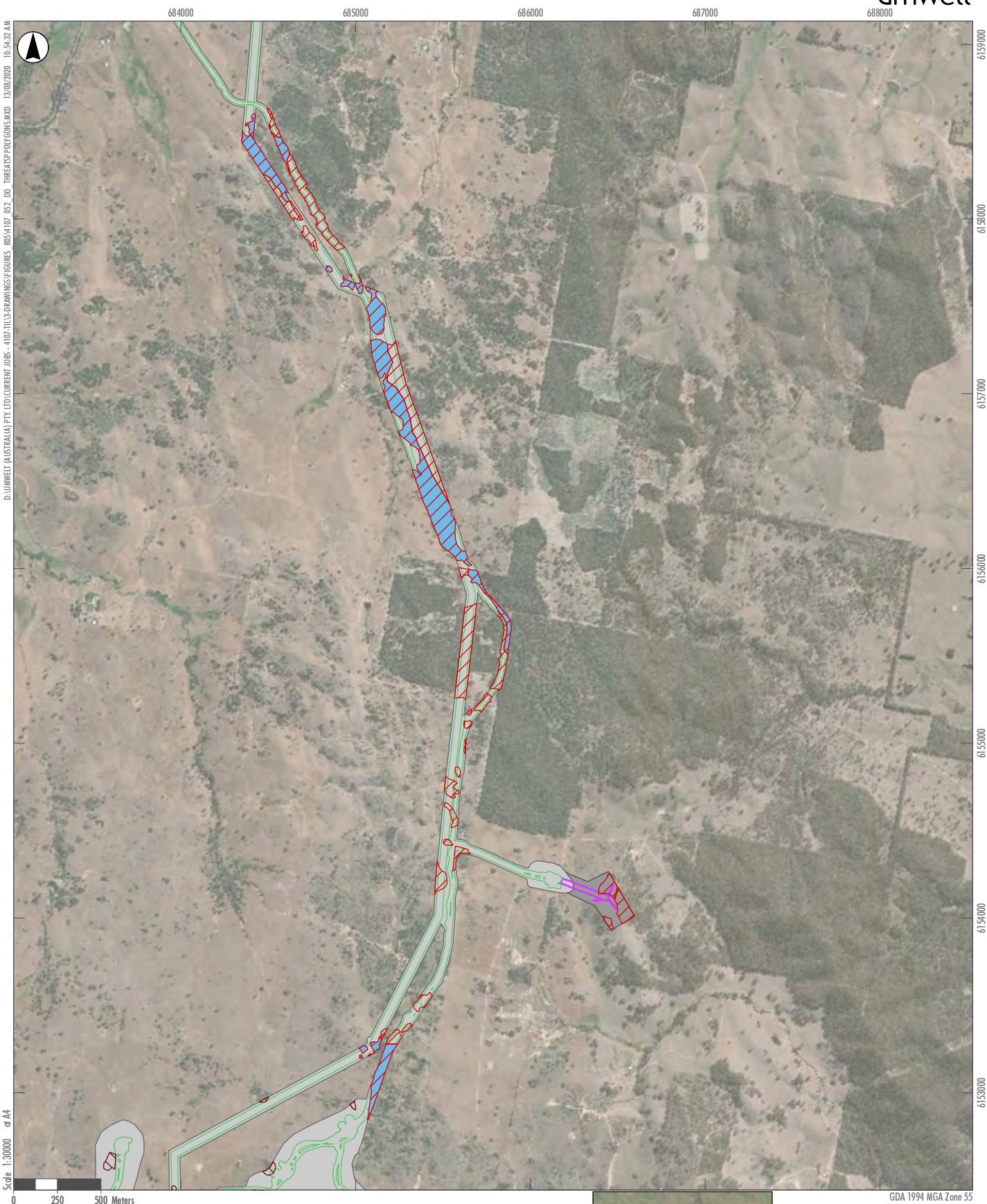


FIGURE 3.6.g

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

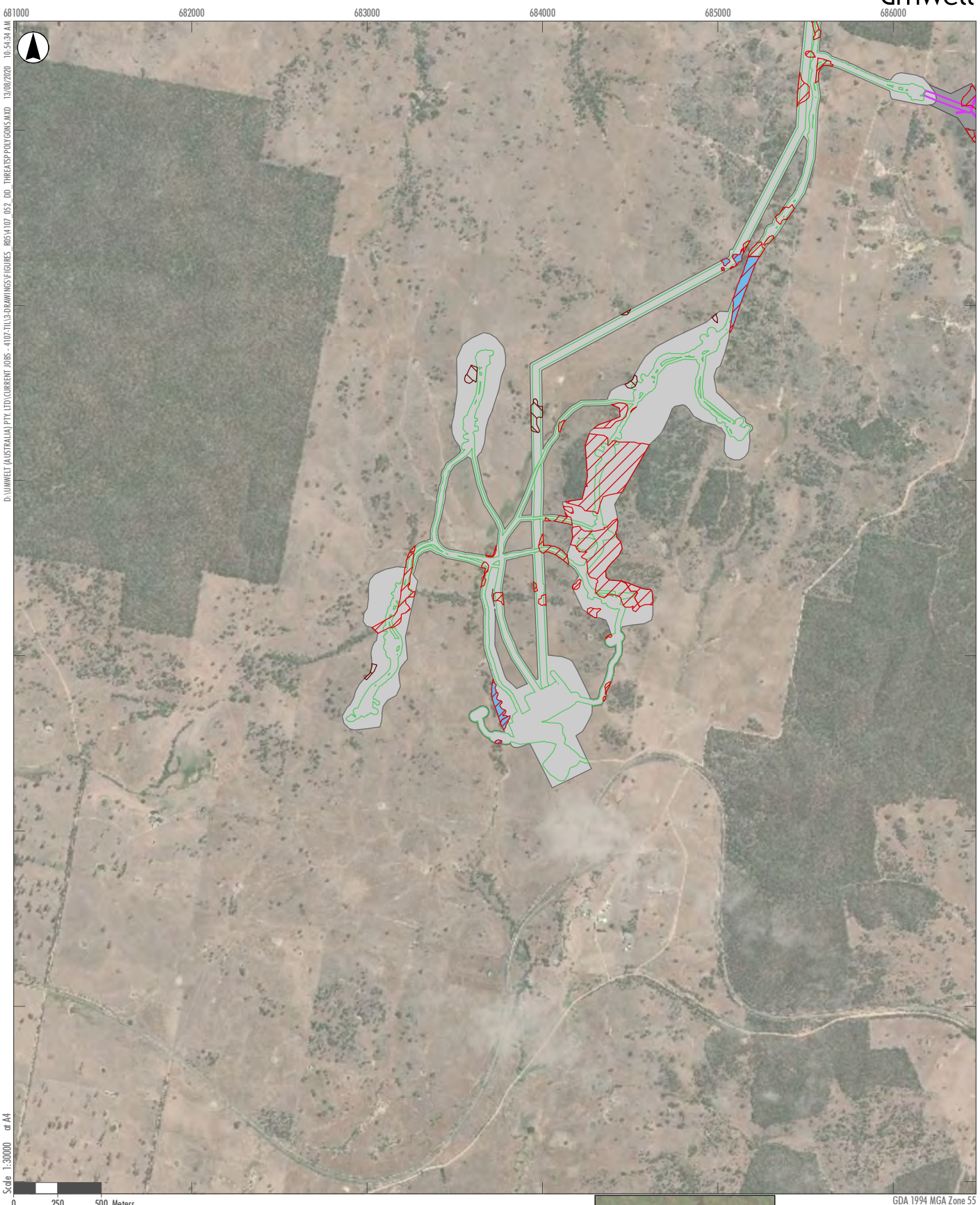


FIGURE 3.6.h

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 3.6.i

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 3.6.j

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 3.6.k

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

Indicative Development Footprint - External Roads

FIGURE 3.6.I

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

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Scale 1:10000 at A4

FIGURE 3.6.m

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

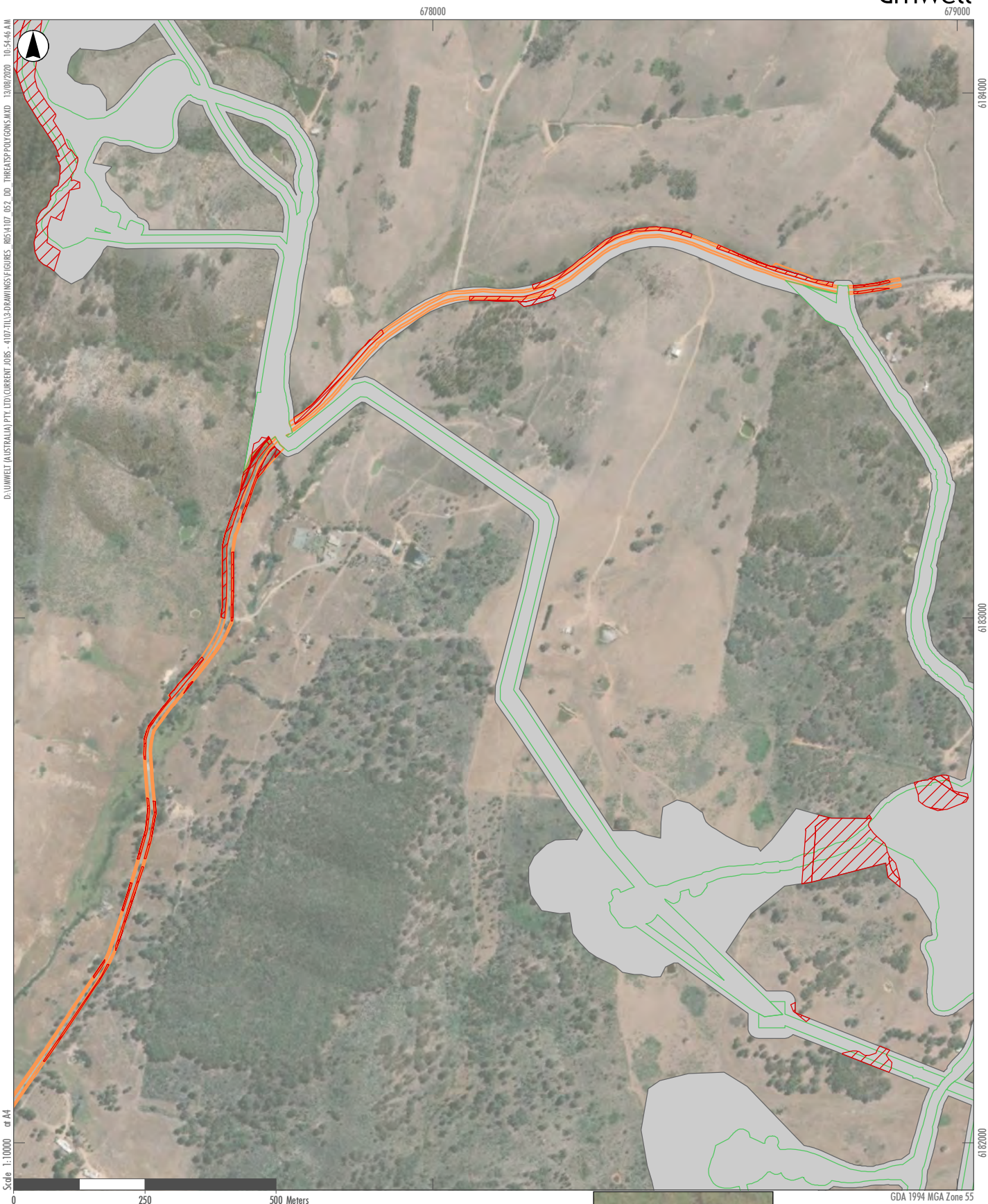


FIGURE 3.6.n

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 3.6.o

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 3.6.p

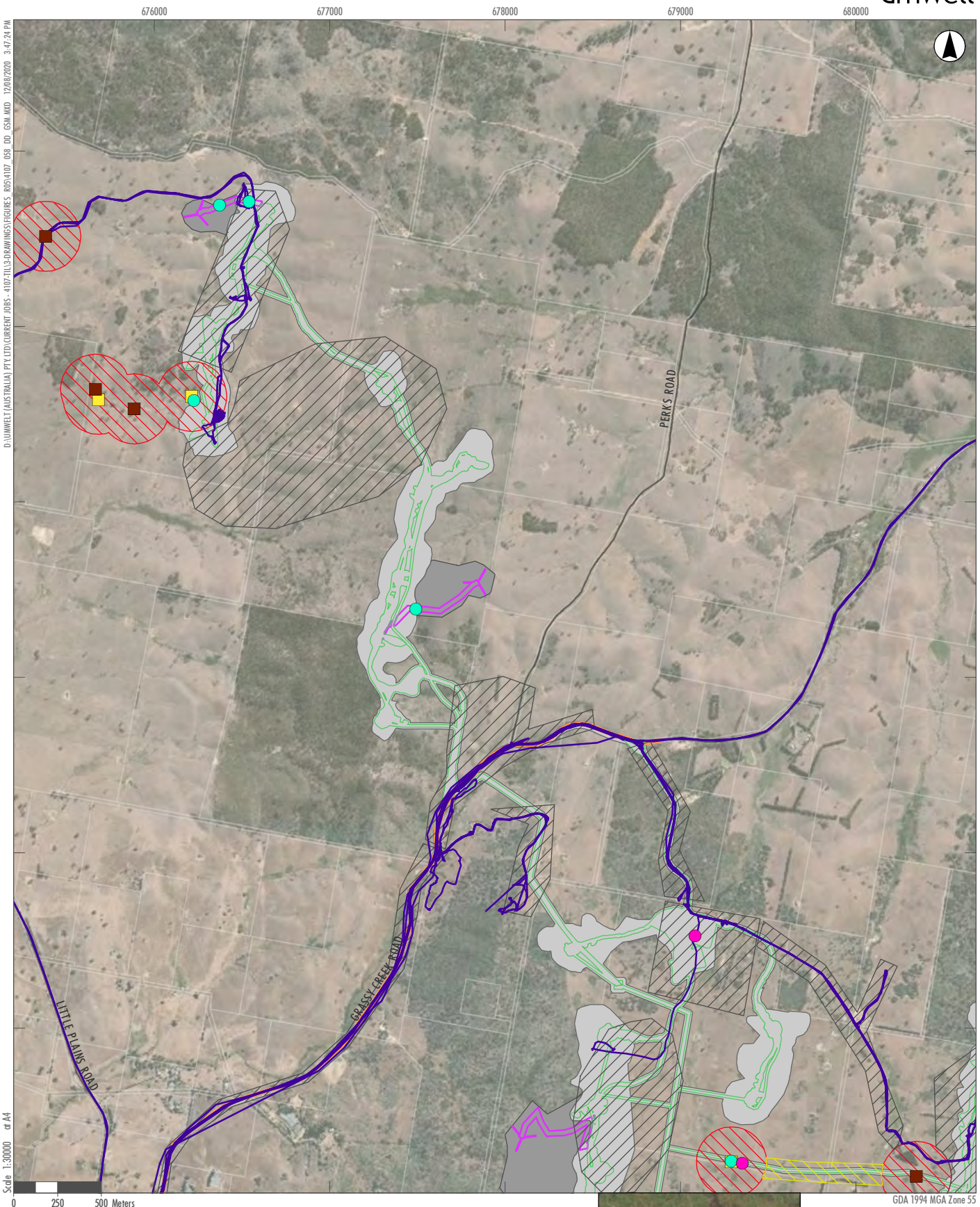
Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 3.6.q

Species Credit Species Polygons

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)



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Scale 1:30000 at A4

Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)
- Golden Sun Moth Record (Umwelt)
- Golden Sun Moth Record (NGH)
- Golden Sun Moth Record 200m Buffer
- Habitat Extension
- Golden Sun Moth Habitat Transects (Umwelt)
- Golden Sun Moth Habitat Transects (NGH)

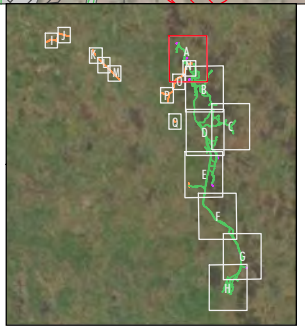
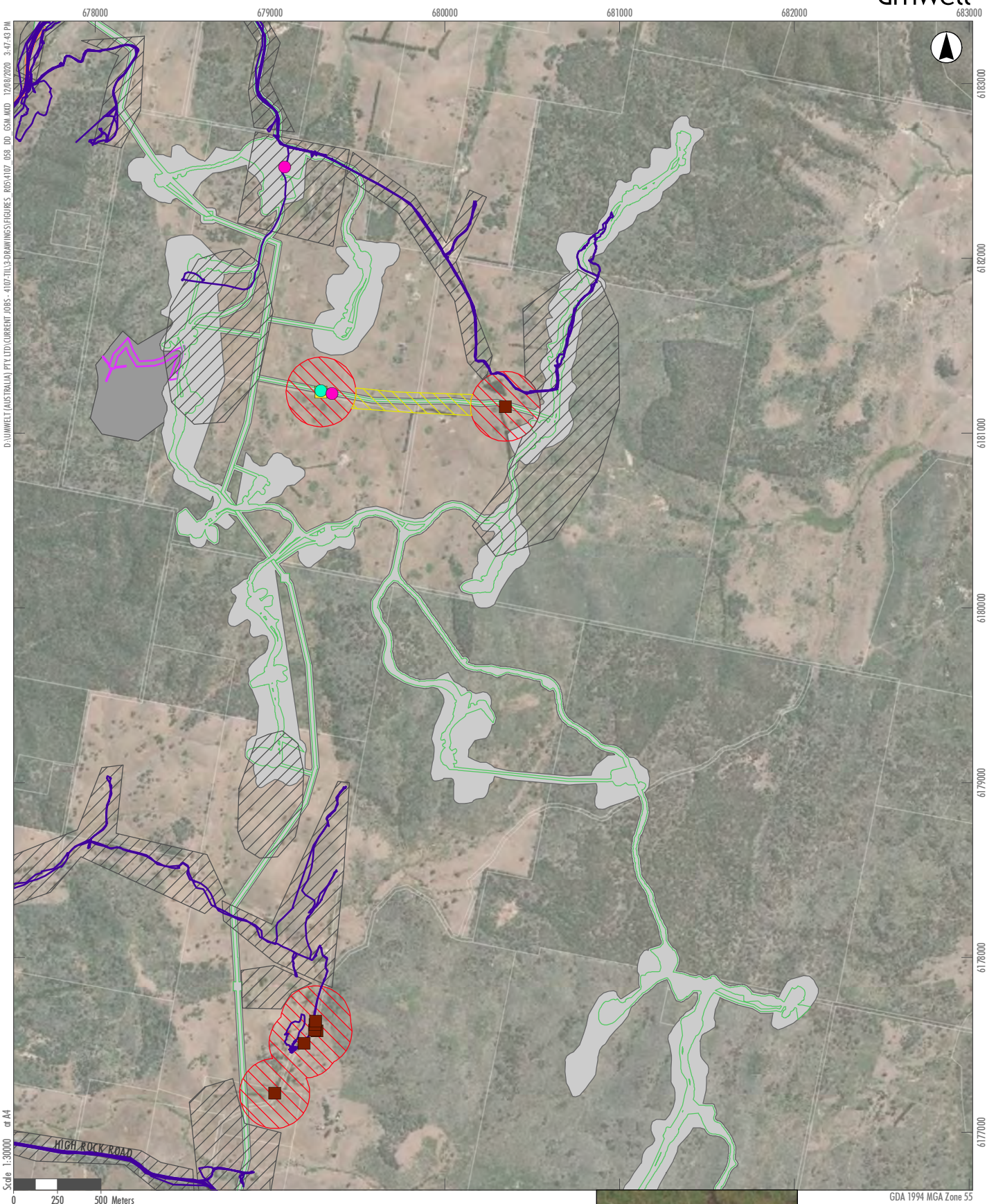


FIGURE 3.7.a

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)
- Golden Sun Moth Record (Umwelt)
- Golden Sun Moth Record (NGH)
- Golden Sun Moth Record 200m Buffer
- Habitat Extension
- Golden Sun Moth Habitat Transects (Umwelt)
- Golden Sun Moth Habitat Transects (NGH)

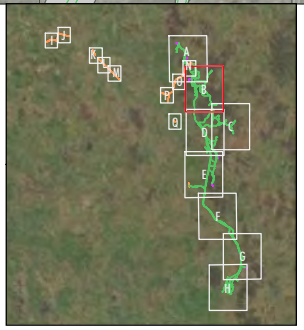
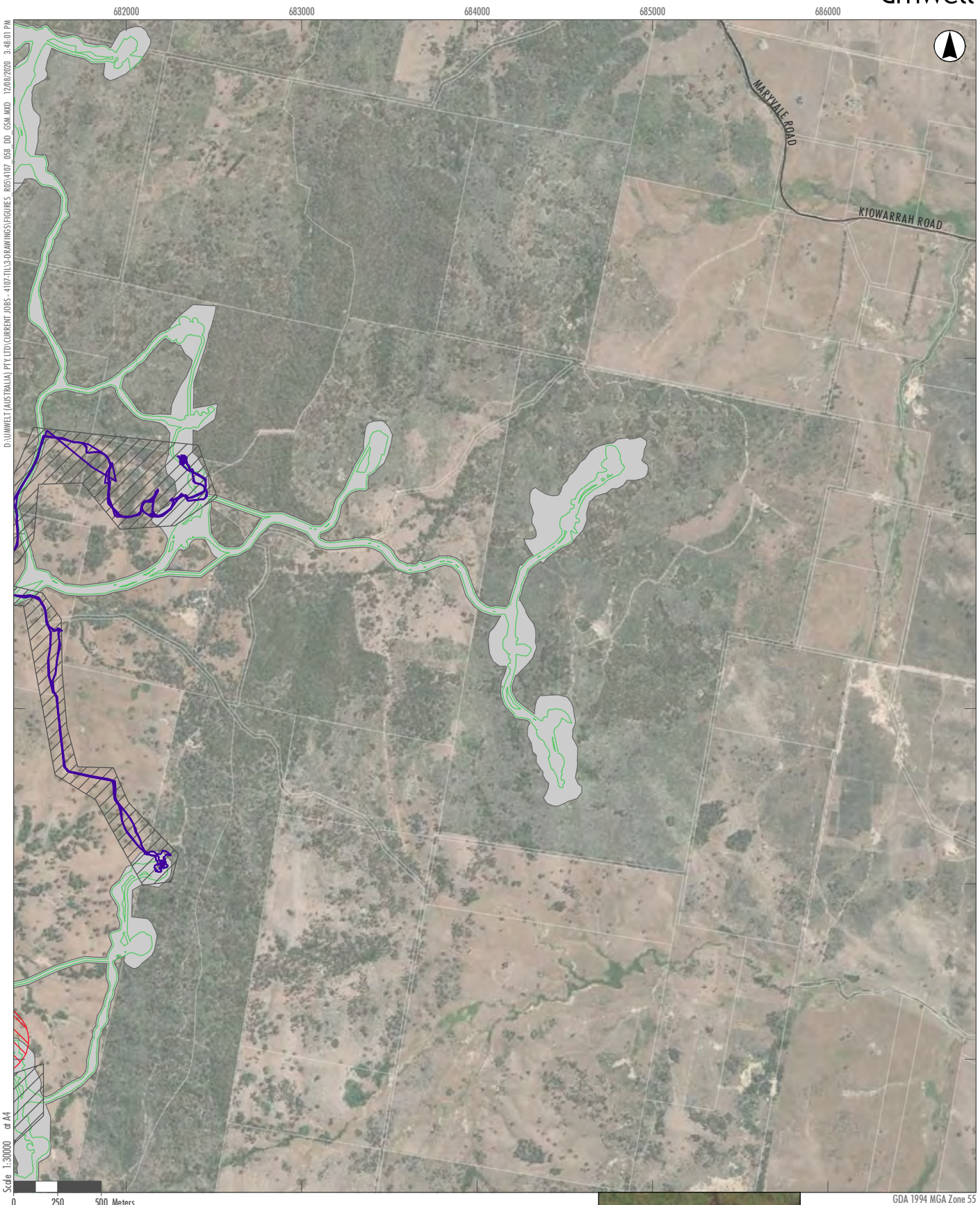


FIGURE 3.7.b

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)
- Golden Sun Moth Record 200m Buffer

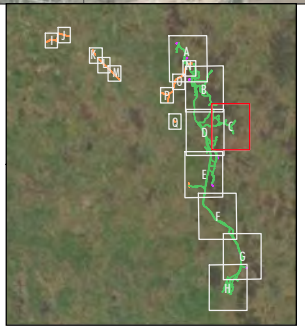
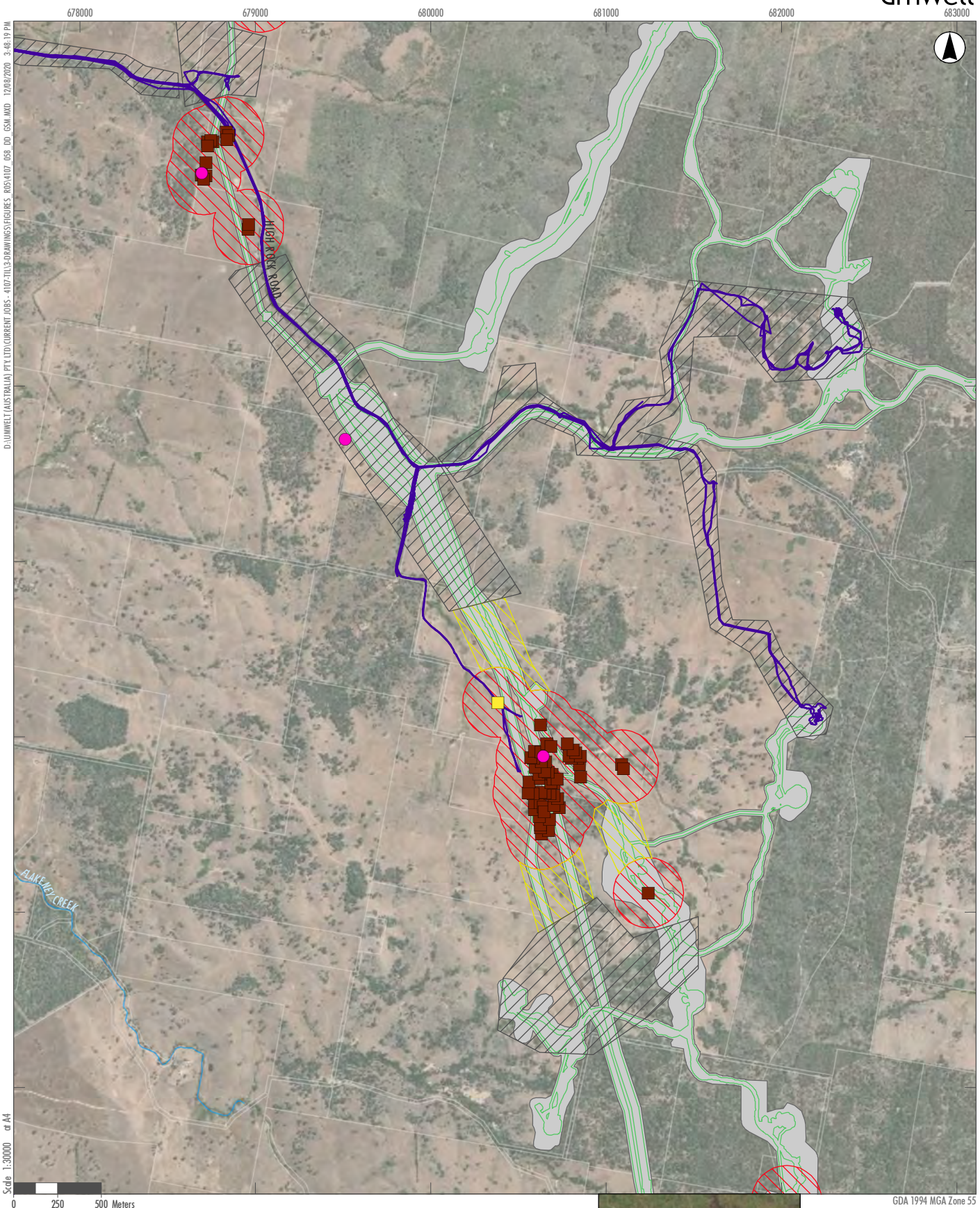


FIGURE 3.7.c

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)
- Golden Sun Moth Record (Umwelt)
- Golden Sun Moth Record (NGH)
- Golden Sun Moth Record 200m Buffer
- Habitat Extension
- Golden Sun Moth Habitat Transects (NGH)

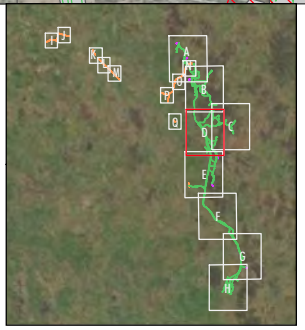
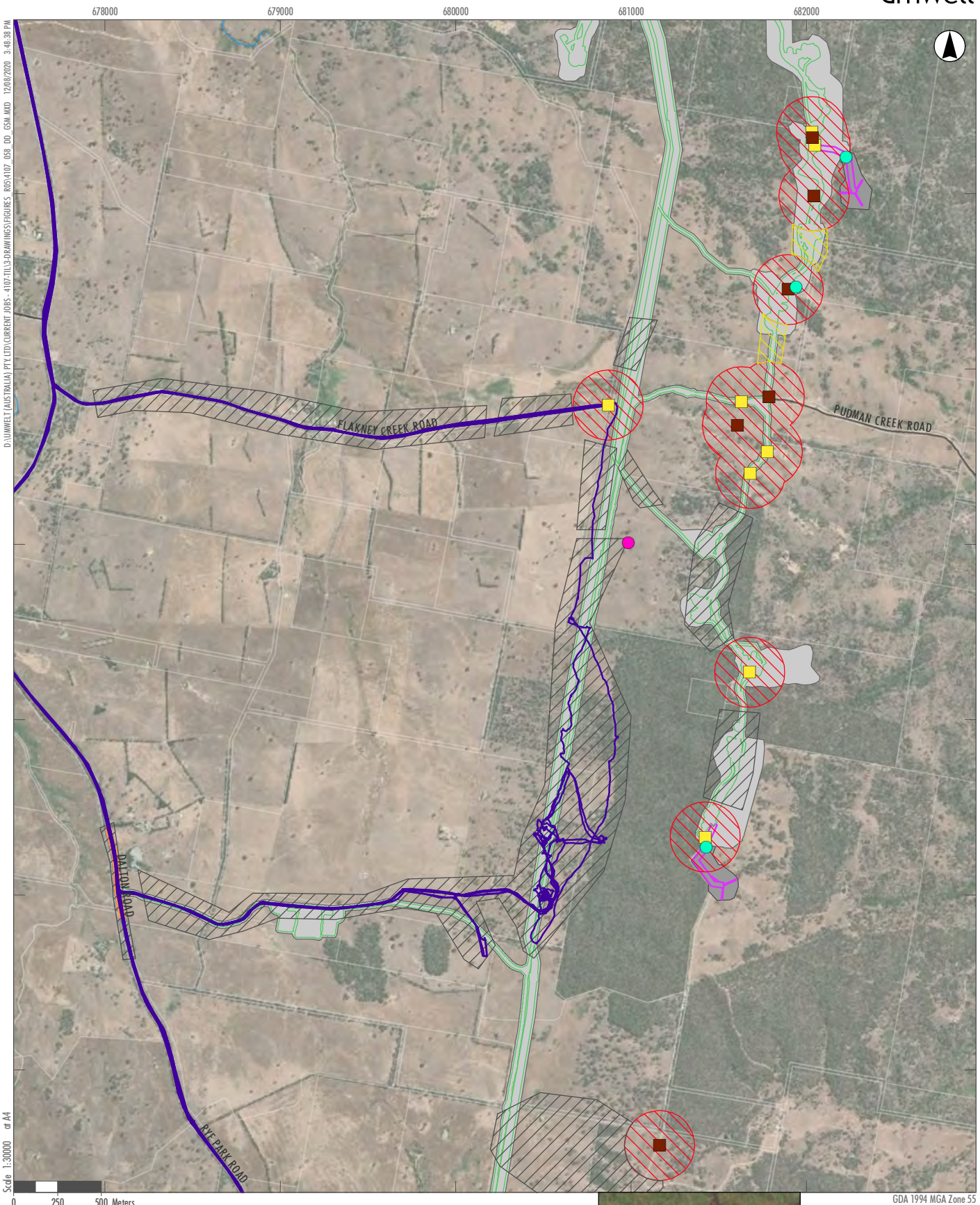


FIGURE 3.7.d

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Scale 1:30000 at A4

Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)
- Golden Sun Moth Record (Umwelt)
- Golden Sun Moth Record (NGH)
- Golden Sun Moth Record 200m Buffer
- Habitat Extension
- Golden Sun Moth Habitat Transects (Umwelt)
- Golden Sun Moth Habitat Transects (NGH)

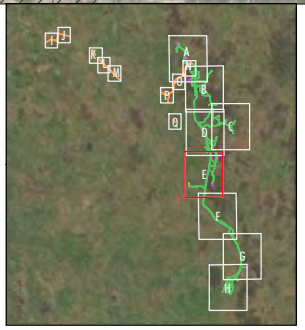
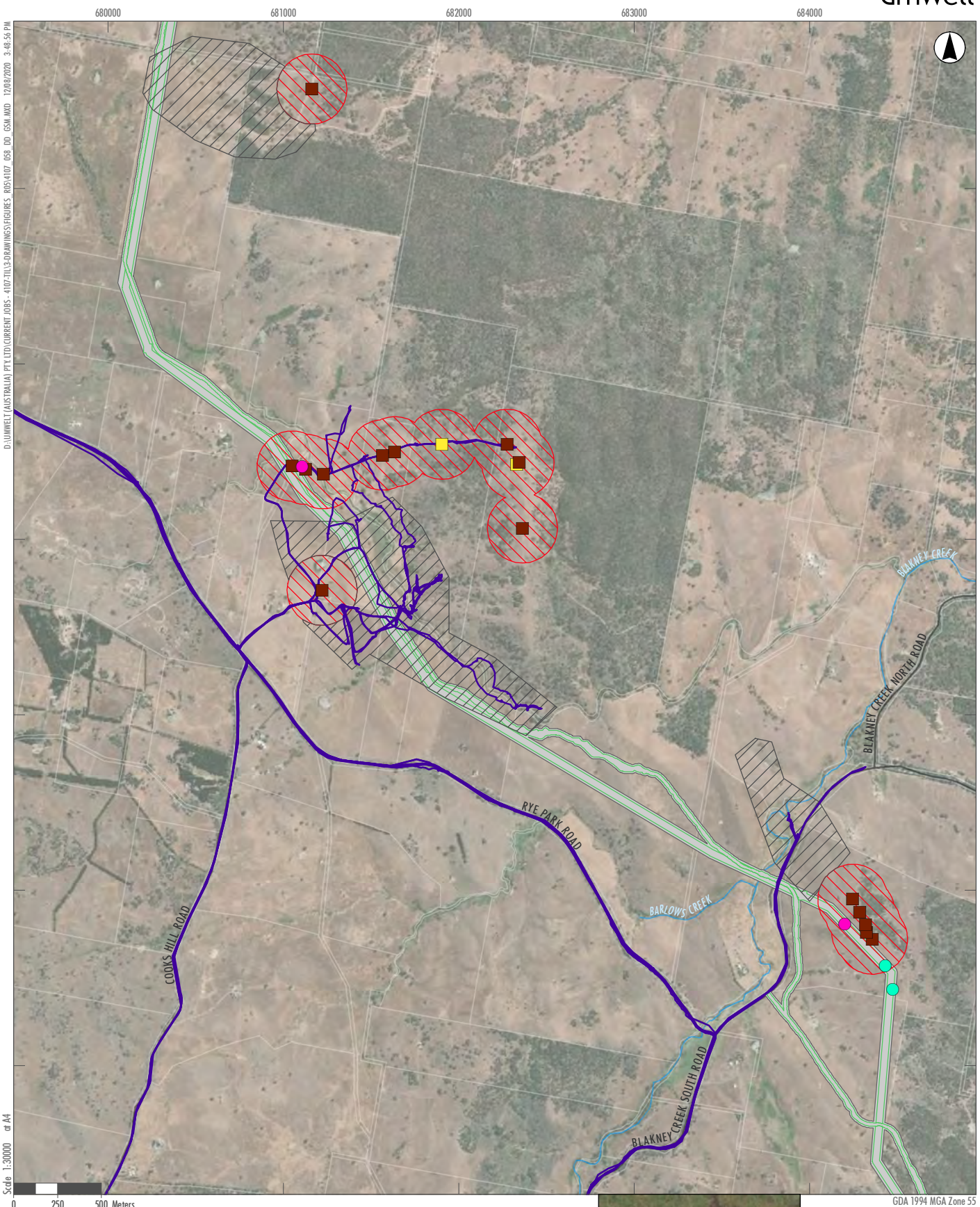


FIGURE 3.7.e

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)
- Golden Sun Moth Record (Umwelt)
- Golden Sun Moth Record (NGH)
- Golden Sun Moth Record 200m Buffer
- Golden Sun Moth Habitat Transects (Umwelt)
- Golden Sun Moth Habitat Transects (NGH)

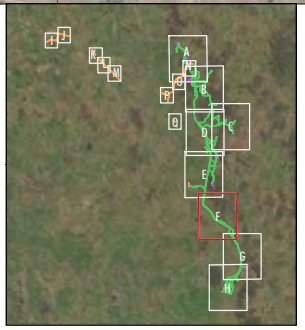
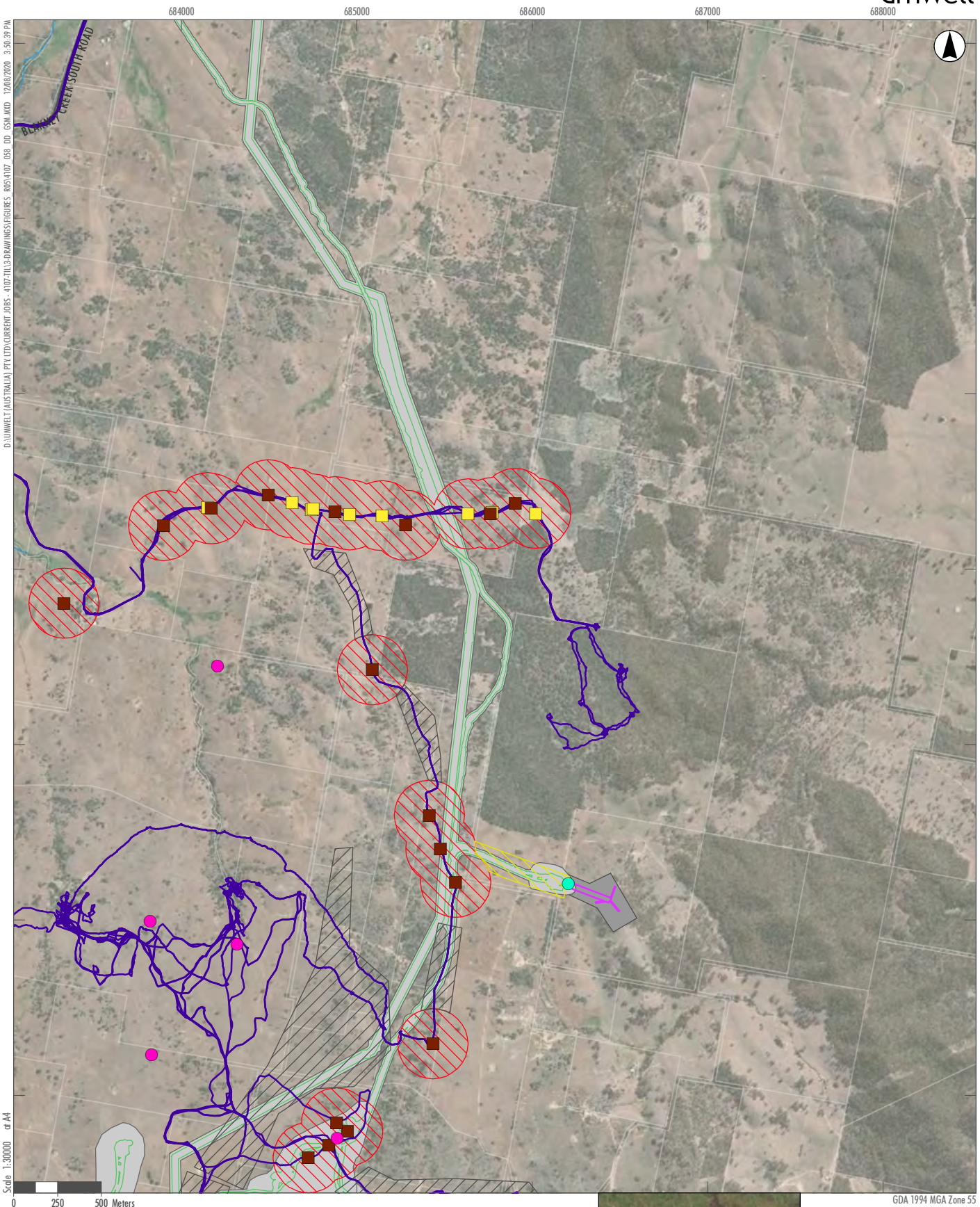


FIGURE 3.7.f

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)
- Golden Sun Moth Record (Umwelt)
- Golden Sun Moth Record (NGH)
- Golden Sun Moth Record 200m Buffer
- Habitat Extension
- Golden Sun Moth Habitat Transects (Umwelt)
- Golden Sun Moth Habitat Transects (NGH)

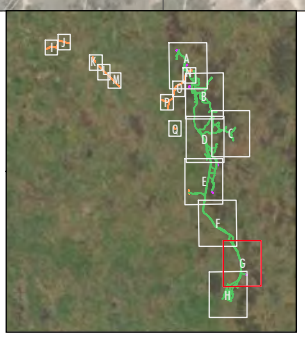
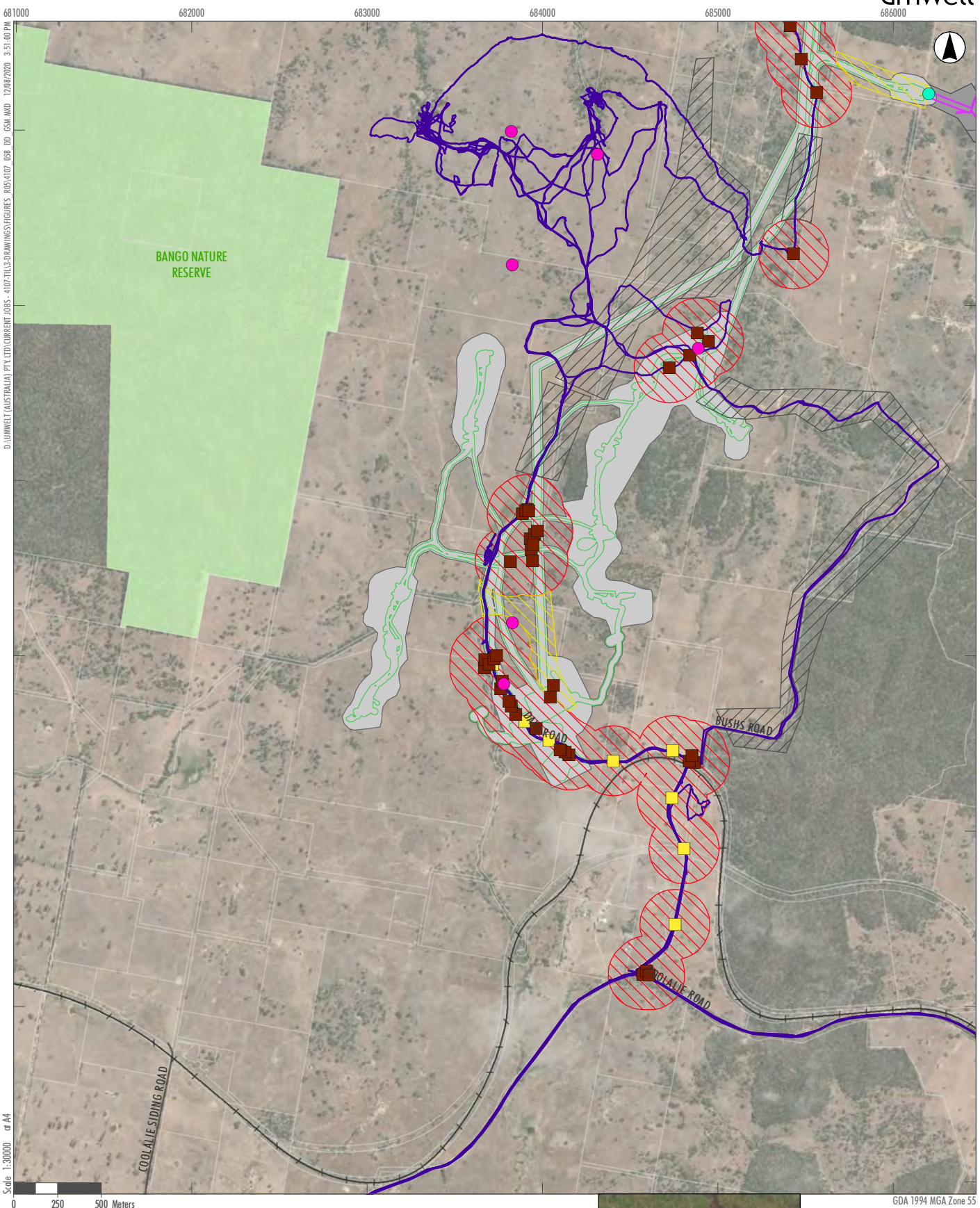


FIGURE 3.7.g

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Scale 1:30000 at A4

Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)
- Golden Sun Moth Record (Umwelt)
- Golden Sun Moth Record (NGH)
- Golden Sun Moth Record 200m Buffer
- Habitat Extension
- Golden Sun Moth Habitat Transects (Umwelt)
- Golden Sun Moth Habitat Transects (NGH)
- Nature Reserves

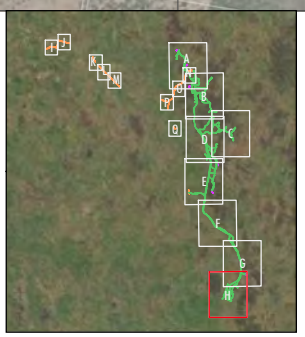


FIGURE 3.7.h

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)

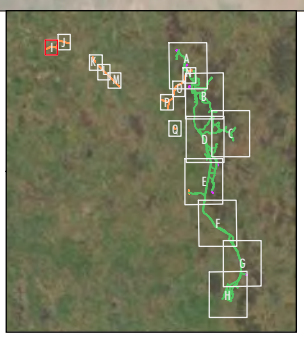


FIGURE 3.7.i

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)

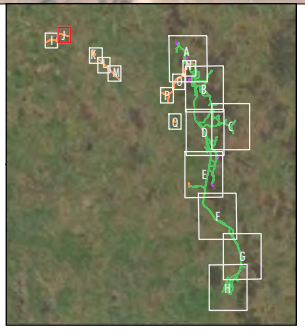
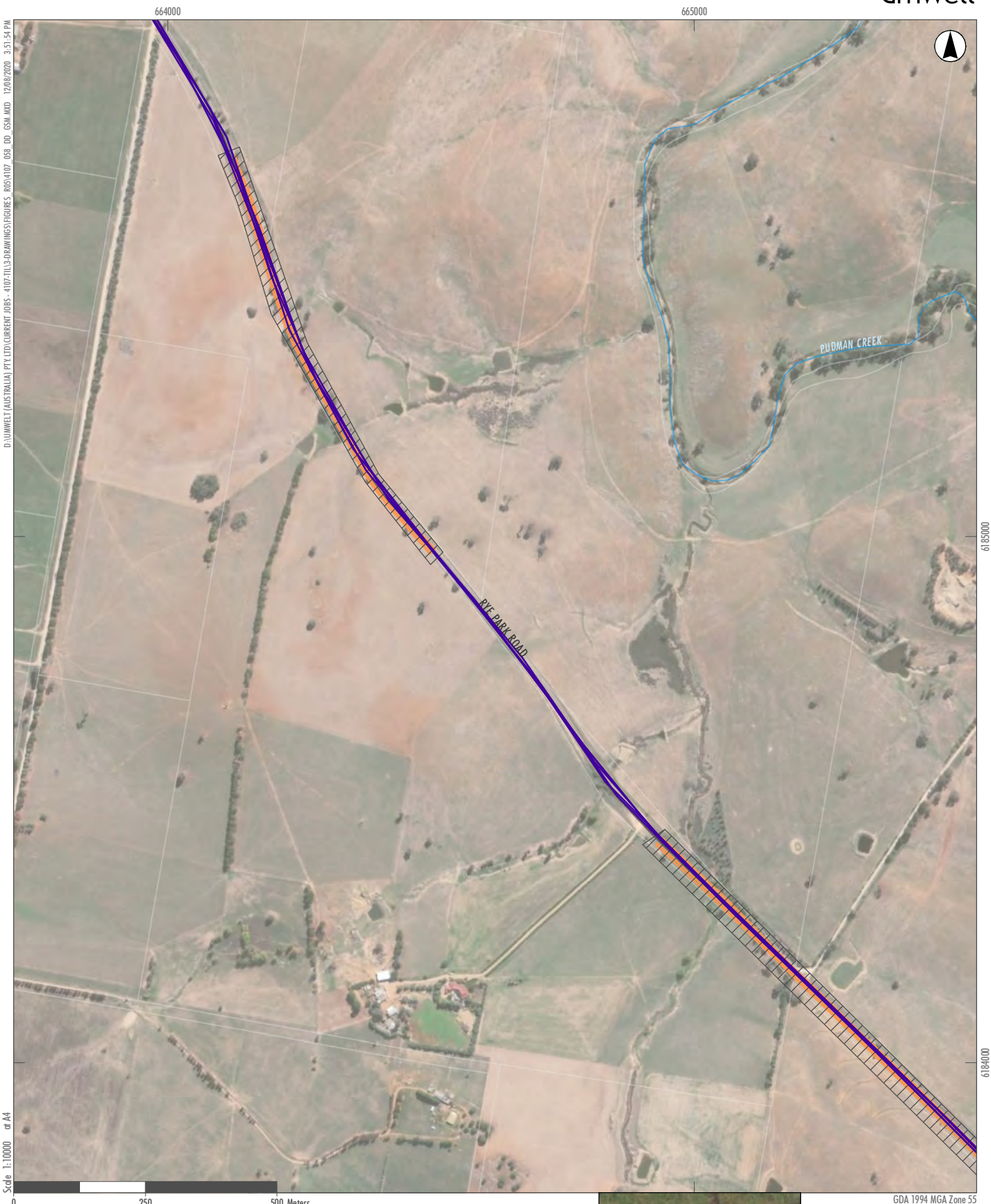


FIGURE 3.7.j

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprint - External Roads
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)

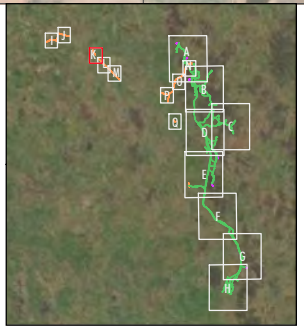


FIGURE 3.7.k

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)

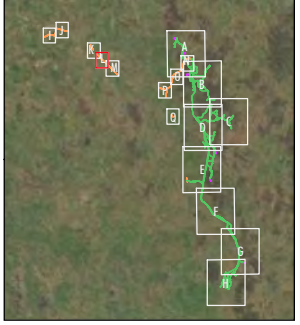


FIGURE 3.7.I

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

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Scale 1:10000 at A4

Legend

- Indicative Development Footprint - External Roads
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)

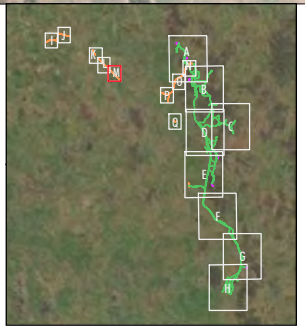
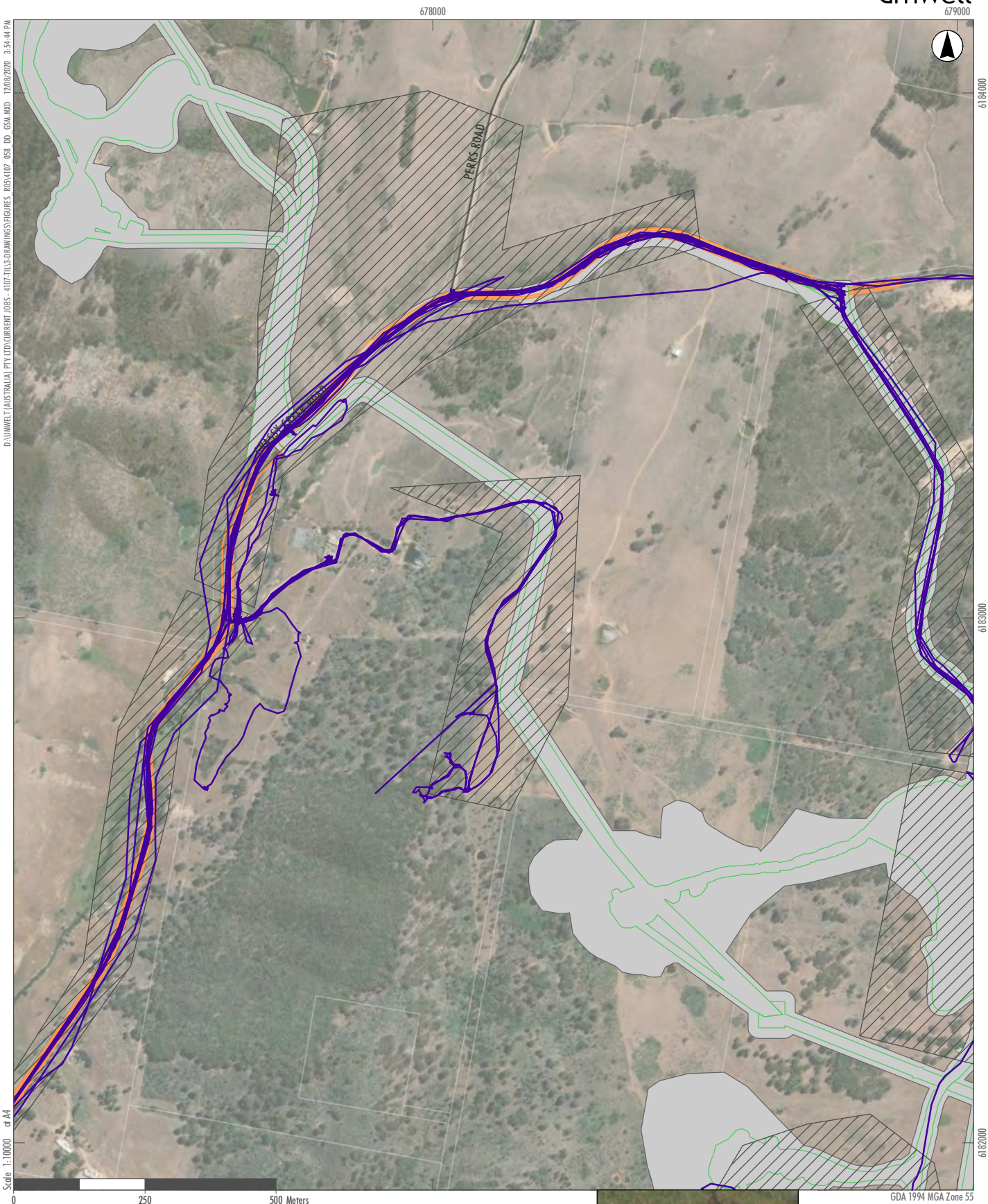


FIGURE 3.7.m

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Development Corridor - Wind Farm
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - External Roads
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)

FIGURE 3.7.n

Golden Sun Moth Detailed Analysis

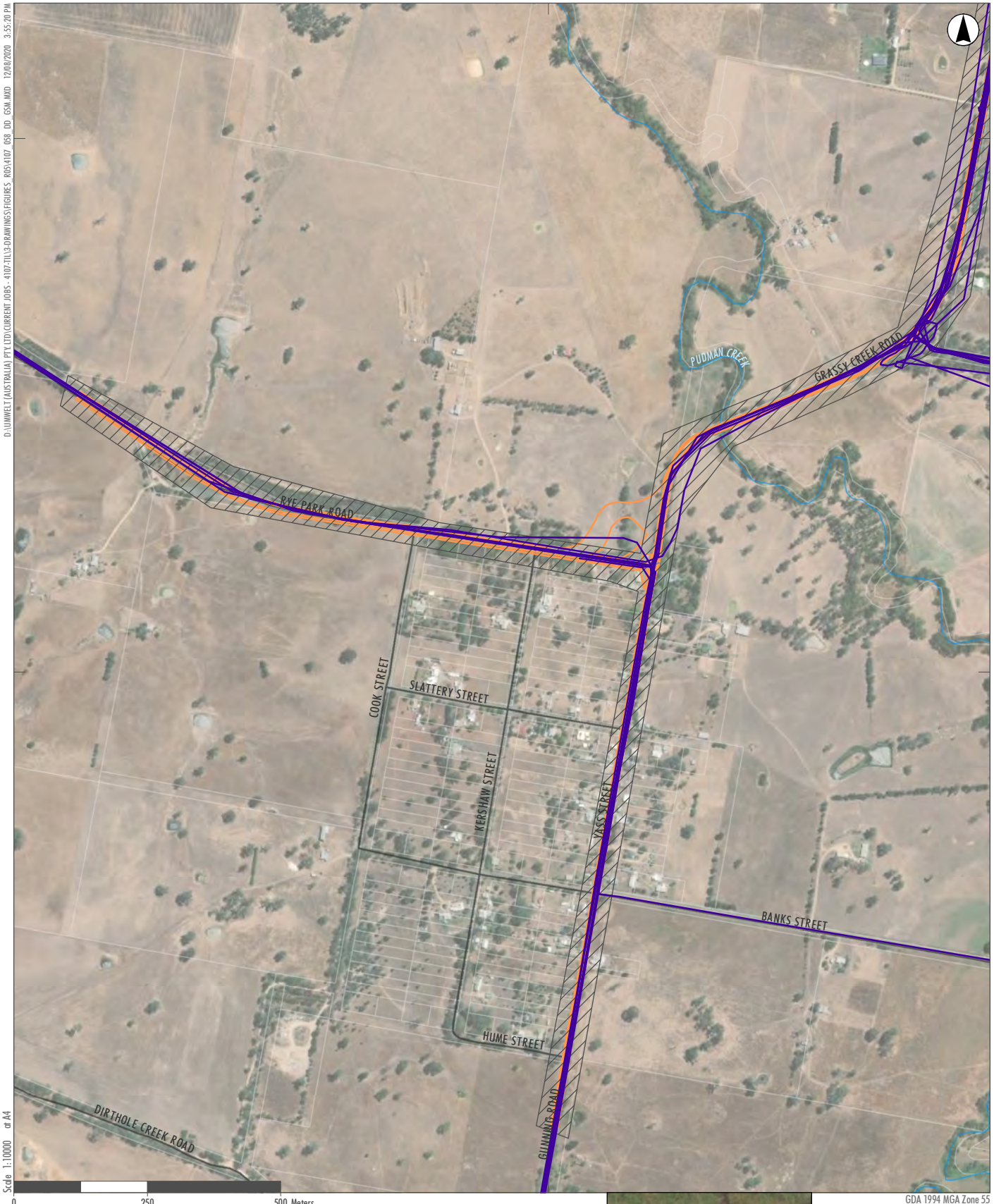
Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

Scale 1:10000 at A4

FIGURE 3.7.o

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)



Scale 1:10000 at A4

Legend

- Indicative Development Footprint - External Roads
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)

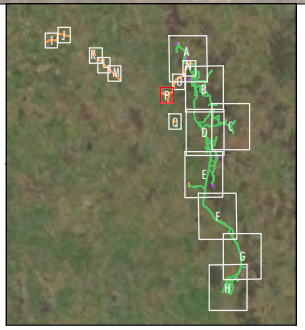


FIGURE 3.7.p

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprint - External Roads
- Seasonally Suitable Golden Sun Moth Survey Tracks (Umwelt)
- Areas Surveyed for Golden Sun Moth - No Records (Umwelt and NGH)

FIGURE 3.7.q

Golden Sun Moth Detailed Analysis

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Rye Park Renewable Energy Pty Ltd (2020)

4 Avoidance and Minimisation of Impacts

4.1 Avoidance and Minimisation of Native Vegetation and Habitat

The Project has undergone substantial changes in design since consideration began in 2011, many of which have been the result of specific avoidance measures as identified in Table 8.3 of the Biodiversity Assessment (NGH 2014). Since RPRE took ownership of the project in 2017, they have made additional changes to the project design with a focus on avoiding impacts to native vegetation and habitat where possible. A summary of these avoidance measures is provided below in **Table 4.1**.

We note that RPRE received written communication from BCD in regard to the project (BCD 2020d). Attachment 1 of this document presented BCD's preference of the hierarchy of avoidance for the Project. Unfortunately due to the timing in which it was provided, it was unable to be adequately considered and employed during the modification design changes to the Project. RPRE is committed to implementing the hierarchy of avoidance measures through the final design phase of the Indicative Development Footprints. It is expected that additional avoidance of Box Gum Woodland (BC Act and EPBC Act), superb parrot habitat and hollow bearing trees will be possible for the project, particularly in regard to the finalisation of the Indicative Development Footprint – External Roads. In doing so, RPRE will seek to prioritise avoidance in minimisations in those areas of concern for BCD (2020).

Despite this document not being available through the modification design phase of the Project, and despite the overall footprint of the Project being increased, the avoidance measures detailed below in **Table 4.1** are of significance for the Project. Key areas of Box Gum Woodland TECs (BC Act and EPBC Act), key threatened species habitat for squirrel glider, superb parrot, and golden sun moth, as well as intact patches of PCT 351 have all been avoided by the Project. Furthermore, through assistance from Umwelt, RPRE will continue to seek additional avoidance of these biodiversity values through finalisation of the detailed design once a turbine and preferred contractor(s) is selected.

Table 4.1 Summary of Avoidance Measures

Measure	Outcome
Reduction in number of wind turbines from 92 to 80 (12 less)	• Turbines 6, 35, 38, 52, 53, 56, 77, 102, 103 104, 140 and 149 have been removed. • The 12 turbines being removed occur across the length of the Indicative Development Footprints (north, central and south). • These design modifications **avoid approximately 47.64 hectares** of native vegetation of PCT351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion.
Reduction in number of operation and maintenance facilities, from two to one (reduction of one)	• Removal of operational buildings along Flakney Creek Road **avoids** more than **1 hectare** of native vegetation which is likely to have aligned with the Box Gum Woodland TEC under the BC Act and/or EPBC Act. The removal of the Flakney Creek Road operational buildings also **avoids** more than **1 hectare** of known habitat for golden sun moth (*Synemon plana*), listed as endangered under the BC Act and critically endangered under the EPBC Act.

Measure	Outcome
Reduction in number of substations, from three to one (reduction of two)	• Removal of substation in the north of the Indicative Development Footprints, near Grassy Creek Road, **avoids** a small area (<1 hectare) of **suitable habitat for striped legless lizard**. • Removal of substation in the north of the Indicative Development Footprints, near High Rock Road, **avoids** a stretch of High Rock Road that is known to support stands of native woodland which is likely to have aligned with the Box Gum Woodland TEC under the BC Act and/or EPBC Act. Less than **1 hectare** of this vegetation has been **avoided**. This also comprises **hollow bearing trees** providing suitable habitat for **superb parrot**. • Removal of a substation along Flakney Creek Road **avoids** more than **1 hectare** of native vegetation which is likely to have aligned with the Box Gum Woodland TEC under the BC Act and/or EPBC Act. • The removal of the Flakney Creek Road substation also **avoids** more than **1 hectare** of known habitat for golden sun moth (*Synemon plana*), listed as endangered under the BC Act and critically endangered under the EPBC Act.
Changes to the internal access track and cabling network • The detailed design for the Project has resulted in numerous changes to the internal network of access tracks and cabling (underground and aboveground).	• Decrease in total length of internal access tracks (89,060 m compared with 103,400 m). • Decrease in total length of underground cabling length (60,324 m compared with 82,350 m). • A significant component of this modification includes the re-design of a large section of internal access tracks, cabling network and transmission line route along approximately 4 km of a ridgeline north of Blakney Creek South Road. • This redesign **avoids** a new fragmentation corridor within remnant forest along approximately **4 km**, along a ridgeline north of Blakney Creek Road. • This **avoids** approximately **260 hectares** of PCT351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion. • Detailed design of the transmission line route has **avoided** a stretch of High Rock Road that is known to support stands of native woodland which is likely to have aligned with the Box Gum Woodland TEC under the BC Act and/or EPBC Act. Approximately **4.5 hectares** of this vegetation has been **avoided**. This also comprises approximately **9 hollow bearing trees** providing suitable habitat for **superb parrot**. These ecological values are avoided through RPRE moving the transmission line easement into non-native vegetation (pasture) of the adjoining private property. • Approximately **11 hectares** of native woodland which is likely to have aligned with the **Box Gum Woodland TEC** under the BC Act and/or EPBC Act is being avoided by an internal access track south of Turbine 69.
Selection of Preferred Transport Route	• RPRE discontinued a southern transport route, which extended north from the Hume Highway, through the township of Jerrawa before entering the southern tip of the Indicative Development Footprints. Preliminary mapping of this section of the transport route indicates this **avoids** approximately **10 hectares** of native vegetation, of which approximately **5 hectares** is likely to have aligned with the Box Gum Woodland TEC under the BC Act and/or EPBC Act. • The removal of the southern transport route also **avoids** a known population of hoary sunray (*Leucochrysum albicans* var. *tricolor*), an endangered species under the EPBC Act.

Measure	Outcome
	• The removal of the southern transport route also **avoids** approximately **2 hectares** of known habitat for golden sun moth (*Synemon plana*), listed as endangered under the BC Act and critically endangered under the EPBC Act. • RPRE discontinued a central transport route option, which extended east from Dalton Road, along Flakney Creek Road. Preliminary mapping of this section of the transport route indicates this **avoids** more than **1 hectare** of native vegetation which is likely to have aligned with the Box Gum Woodland TEC under the BC Act and/or EPBC Act. • The removal of the central transport route also **avoids** more than **1 hectare** of known habitat for golden sun moth (*Synemon plana*), listed as endangered under the BC Act and critically endangered under the EPBC Act. • Through consultation with BCD and Hilltops Council LGA, RPRE have successfully modified their preliminary design for the external transport routes. This results in a reduction in the width of the road upgrades that are required, this in turn reduces the impacts to native vegetation within the road reserves. • The detailed design also removed the need to upgrade approximately 12 km of Dalton Road, Rye Park Road and Blakney Creek South Road. This avoidance measure **avoids** approximately **14 hectares** of Box Gum Woodland TEC under the BC Act and/or EPBC Act, **14 hectares** of superb parrot habitat (breeding and foraging) including **223 hollow bearing trees** suitable for superb parrot, and **30 hectares** of habitat for squirrel glider

4.2 Avoidance of Prescribed Impacts

The following impacts are considered 'prescribed impacts' under the BC Regulation:

- impacts on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other geological features of significance, rocks, human-made structures or non-native vegetation
- impacts on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range
- impacts on movement of threatened species that maintains their life cycle
- impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities
- impacts of wind turbine strikes on protected animals
- impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

As outlined in **Section 4.1** above, RPRE sought to avoid and minimise the potential impacts on a variety of ecological values of the Project primarily through the careful selection of the disturbance area and detailed design of the Project. RPRE have sought to locate and design the Indicative Development Footprints within existing disturbed areas wherever possible. However, it is acknowledged that substantial areas of the ridgeline where the Project is located supports remnant patches of forest, while the lower slopes and valley floor supports TEC and threatened species habitat.

Further detail on the assessment of prescribed impacts is presented in **Section 5.3**.

4.3 Mitigation Measures

Indicative Development Footprints will be finalised once turbine and contractor(s) are selected by RPRE. In doing so, RPRE will seek to further minimise impacts to biodiversity values. Furthermore, a comprehensive biodiversity mitigation strategy to mitigate the unavoidable impacts of the Project will be prepared and implemented. These measures will be designed and described within the Biodiversity Management Plan (BMP), Bird and Bat Adaptive Management Plan (BBAMP) and Roadside Vegetation Management Plan (RVMP) that will be prepared as per the existing Consent Conditions (**Sections 1.1.2**) for the Project.

While these management plans have not yet been finalised, the following control measures are considered integral to the mitigation of impacts on the biodiversity features of the Indicative Development Footprints and surrounds and are likely to form part of the final management plans. Remaining consistent with the Biodiversity Assessment and Biodiversity Assessment Addendum (NGH Environmental 2014 and 2016a) mitigation measures will include:

- demarcation of approved clearance boundaries
- avoid removal of hollow-bearing trees and termite mounds wherever possible
- implementation of pre-clearance surveys for key fauna habitat (i.e. hollow-bearing trees, termite mounds, large hollow locks, rock piles, large stick nests) to limit impacts to fauna species
- where possible, salvage key fauna habitat from within the Indicative Development Footprints
- rehabilitation and revegetating temporary disturbance areas, include collecting and propagating seeds from the disturbance areas where possible
- scavenger trials and carcass surveys beneath turbine locations
- prioritisation of lopping tree branches that do not contain hollows or nests
- installation of artificial nest boxes (where relevant)
- weed management
- farm animal control
- pest animal control
- fencing and access control
- bushfire management.

Where relevant, the above mitigation measures will be implemented as per the state and federal development consent conditions (DPE 2017 and DoEE 2017). This is particularly applicable for avoiding the removal of hollow bearing trees and termite mounds.

Appropriate environmental management measures will be undertaken as part of the operations to minimise the potential for indirect impacts, including:

- water management systems that seek to minimise the potential for damage to flora and fauna habitats from erosion and unnatural flooding events
- erosion and sedimentation control
- noise control systems
- traffic control and speed limits
- dust control measures
- lighting controls, including the use of red lights atop the turbines to avoid attracting insects, birds and bats.

Each of these control measures will contribute to the maintenance of habitat quality adjacent to the final Development Footprint.

Table 4.2 below summarises the preliminary mitigation measures proposed for the Project including the timing, action, outcome and responsibility of these measures. It is noted that these are preliminary measures at this point in time and will be finalised through the preparation and approval of the Biodiversity Management Plan (BMP), Roadside Vegetation Management Plan (RVMP), as well as the Bird and Bat Adaptive Management Plans (BBAMP) required as part of the existing approval (refer to **Section 1.1.2**). As per the relevant approval conditions, all plans will be prepared to the satisfaction of the Secretary, and where required will be prepared in consultation with BCD.

Table 4.2 Preliminary Mitigation Measures

Measure	Timing	Proposed Techniques	Outcome	Responsibility
Demarcation of approved clearance boundaries	Prior to clearance and during clearance activities	• Establish construction fencing or nightline around areas not proposed for clearance.	• Minimisation of unnecessary and accidental impacts to surrounding vegetation and habitats.	• Site Supervisor
Development of a works schedule	Prior to clearance activities	• Document key breeding and/or nursing periods for threatened species known or with high potential to occur in clearing areas. Avoid works causing high disturbance (i.e. vegetation clearing) during these periods where possible.	• Minimisation of impacts to threatened species during critical life cycle events.	• Project Manager • Site Environmental Officer
Installation of Safe Fish Passageway	Prior, during and following clearance activities	• Ensure any construction within or adjacent to Blakney Creek includes detailed design to avoid impacts to Southern Pygmy Perch. • As per Section 3.2.2 of DPI's policy and guidelines for fish habitat conservation and management, Blakney Creek is likely to meet the definition of Class 1 or Class 2 (DPI 2013). • As per Section 4.2 of DPI's policy and guidelines for fish habitat conservation and management, the access track crossing Blakney Creek require a bridge, arch structure, tunnel, culvert or ford to avoid impacts to the Southern Pygmy Perch (DPI 2013).	• Avoidance of impacts to Southern Pygmy Perch.	• Site Environmental Officer • Site Supervisor

Measure	Timing	Proposed Techniques	Outcome	Responsibility
Pre-clearance surveys for key fauna habitat	Prior to clearance and during clearance activities	• Inspect remnant patches of vegetation (woodland and forests) within final development footprint prior to clearance. • Mark up key fauna habitat (e.g. hollow-bearing trees, hollow logs), to be cleared under the supervision of an ecologist of site environmental officer to capture and release fauna	• Minimise additional impacts to fauna species	• Site Environmental Officer
Salvage key fauna habitat	During clearance activities	• Where key fauna habitat (e.g. hollow bearing trees, hollow logs) occurs in the final Development Footprint but is not required to be impacted through construction work, if possible leave as is • If it needs to be cleared, move into adjacent vegetation	• Minimise additional impacts to fauna species • Minimise the clearance of fauna habitat	• Site Environmental Officer
Salvage key fauna habitat – transmission line easements	During clearance activities	• Where key fauna habitat (e.g. hollow bearing trees, hollow logs) occurs in the final Development Footprint but is not required to be impacted through construction work, if possible leave as is • If it needs to be cleared, move into adjacent vegetation • Allow regeneration of canopy and mid-storey flora species to a height permissible underneath the transmission line • Avoid the mulching of fallen vegetation to avoid smothering of ground-layer flora species	• Minimise additional impacts to fauna species • Minimise the clearance of fauna habitat • Facilitate the maintenance of biodiversity values within the easements	• Site Environmental Officer

Measure	Timing	Proposed Techniques	Outcome	Responsibility
Rehabilitation and revegetating temporary disturbance areas	Proceeding clearance activities	• Revegetate areas of temporary disturbance with previously collected native grasses, prioritising the use of wallaby grasses (*Rytidosperma* spp.) and spear grasses (*Austrostipa* spp.).	• Speeds up the recovery of the land • Secures the stability of the site • Reduces risk of erosion • Reduces risk of weed species taking control • Facilitates future use of the areas by the golden sun moth	• Project Manager
Weed management	Construction and operation	• Chemical and physical removal of invasive weed species in accordance with the *New South Wales Control Handbook* (DPI 2018) • Appropriate vehicle and machinery washing • Avoid inadvertent damage or impacts to native species be ensuring all personnel are competent and experienced in the identification of native flora species	• Minimisation of environmental and noxious weeds in the final Development Footprint • Minimisation of weed spread from and into the wider locality	• Project Manager • Site Environmental Officer

Measure	Timing	Proposed Techniques	Outcome	Responsibility
Weed management – Transmission Line Easements	Construction and operation of the transmission line easements	• Chemical and physical removal of invasive weed species in accordance with the *New South Wales Control Handbook* (DPI 2018) • Appropriate vehicle and machinery washing • Avoid inadvertent damage or impacts to native species be ensuring all personnel are competent and experienced in the identification of native flora species	• Minimisation of environmental and noxious weeds in the transmission line easements • Facilitate the maintenance of biodiversity values within the easements • Prevent out competition of native flora species by introduced flora species • Minimisation of weed spread from and into the wider locality	• Project Manager • Site Environmental Officer
Pest animal control	Operation	• Regular passive monitoring to be undertaken to assess the level of impact by feral animals. This may include incidental observations by RPRE employees, contractors as well as existing landholders. • If an increase in existing species of feral animals, or new species of feral animals are observed within the Project, control works should be undertaken as required to provide for the suppression of feral animals.	• Minimise potential for pest animals in the final Development Footprint and the locality. • Minimise potential impacts to native fauna species from out-competition and/or preying of pest or feral animal species.	• Project Manager

Measure	Timing	Proposed Techniques	Outcome	Responsibility
Fencing and access control	Construction and operation	• Where possible, fencing will not include barbed wire on the top line of the fence.	• Provides for access control to avoid unwanted human interference and disturbance to non-operational areas. • Minimisation of impacts to native fauna species from the use of barbed-wire fences.	• Project Manager • Site Supervisor
Bushfire management	Construction and operation	• Bushfire management will consider asset protections and the consideration of the sensitivities of threatened species and threatened ecological communities.	• Protect life and property, while supporting appropriate conditions for the existing ecological features.	• Project Manager • Site Environmental Officer

It is not considered likely that any of these measures have a risk of failure if implemented correctly during the periods specified, or that significant residual impacts are likely to occur. The consequences of potential residual impacts (i.e. minor changes to habitat quality in surrounding areas) are considered to be low, due to the existing disturbed nature of the Development Corridors through historic and current land management practices.

Further detail on the management strategies which are proposed for the BMP and BBAMP is provided in **Table 4.3.** Umwelt note that these methods and measures are preliminary in nature, and the final BMP and BBAMP will be subject to potential changes in the information provided below.

Table 4.3 Preliminary Methods and Actions for BMP and BBAMP

Feature	BMP	BBAMP
Baseline data	The BMP will utilise the following data: • Key findings of initial Biodiversity Assessment (NGH Environmental 2014) • Baseline flora and fauna surveys conducted by Umwelt between 2017 -2019.	The BBAMP will utilise the following data: • Key findings of the pre-approval (NGH Environmental 2013) • Baseline bird and bat surveys conducted by Umwelt during 2018/19.
Seasonal changes	The timing of monitoring and management components will be defined in the BMP based on known appropriate seasonal conditions specified by the BAM for the flora and fauna entities being addressed.	The timing of monitoring and management components will be defined in the BBAMP, with increased occurrence of some components to coincide with known seasonal peaks in numbers of key species covered by the BBAMP.
Monitoring methods	Ecological monitoring program to be developed which identifies at a minimum: • site vegetation condition • presence of threatened species • evidence of erosion • occurrences of weeds and feral fauna • human disturbance. Monitoring will inform further requirements for corrective actions to be undertaken.	• Post-construction bird and bat survey programs must match the timing, location and effort of the baseline conducted by Umwelt during 2018/19 (**Section 2.3.3**). These will allow before and after analysis of data. • Carcass searches will be undertaken in a manner which accounts for variables which affect detectability of carcasses. They will be conducted regularly, with increase in searches to coincide with peak numbers of key species known to occur in the area. The design of these searches will consider: o Frequency of searches o Number of turbines to be searched o Radius around turbines to be searched o Influence of vegetation structure within searched areas on carcass detectability o Effectiveness of human observers and dogs o Carcass removal rates by scavengers.
Trigger values	Trigger values will be defined in the BMP, and will be generated for the threatened (and significant) ecological communities, populations and species identified in **Sections 3.2** and **3.3**.	Trigger values will be defined in the BBAMP, and will be generated for the following species: • large-eared pied bat (*Chalinolobus dwyeri*)

Feature	BMP	BBAMP
		• large bent-winged bat (*Miniopterus orianae oceanensis*) • southern myotis (*Myotis macropus*) • white-striped free-tailed bat (*Tadarida australis*) • wedge-tailed eagle (*Aquila audax*) • little eagle (*Hieraaetus morphnoides*) • black falcon (*Falco subniger*) • white-throated needletail (*Hirundapus caudacutus*) • brown treecreeper (*Climacteris picumnus victoriae*) • varied sittella (*Daphoenositta chrysoptera*) • painted honeyeater (*Grantiella picta*).
Management actions	The BMP will provide detailed management actions incorporating those in **Table 4.2** and including actions specifically addressing: • disruption to connections between suitable habitat for fauna foraging • installing predator-proof fencing around remnant squirrel glider habitat • implementing an integrated feral animal monitoring and control program targeting cats and foxes. These management actions will be prepared in consultation with BCD.	Management actions will include: • carcass removal program to reduce the likelihood of raptors accessing carrion on the ground below • pest animal control • raptor perch management. These management actions will be prepared in consultation with BCD.
Measurement of impacts	The information collected during monitoring events conducted under the BMP will be used to analyse condition trends over time, to assess initial and ongoing impacts of the Project. These may be used to inform further action to be undertaken during ongoing operations to reduce the extent of indirect impacts.	The information collected during monitoring events conducted under the BBAMP will be used to analyse condition trends over time, to assess initial and ongoing impacts of the Project. These may be used to inform further action to be talking during ongoing operations to reduce the extent of indirect impacts.

5 Assessment of Impacts

5.1 Impacts on Native Vegetation and Habitat

5.1.1 Direct Impacts

The development of the Project will result in direct impacts on biodiversity values. Direct impacts include the loss of vegetation and fauna habitats as a result of clearance works and subsequent operation of the wind farm. The Development Corridors contains a range of habitat features (such as hollow-bearing trees, fallen logs and threatened flora species habitat) and species-credit species have been identified to occur within the Development Corridors.

Table 5.1 below outlines the direct impacts on native vegetation, which totals approximately 392.32 hectares. This does not include a further 103.17 hectares of impact on Non-native Vegetation (Vegetation Zone 10) The Indicative Development Footprints are shown in **Figure 1.4**. Avoidance and minimisation measures associated with minimising the impacts of these direct impacts are discussed in **Section 4.0** above.

Table 5.1 Direct Impacts of the Proposed Modification on Biodiversity Features

Ecosystem/ Species	Area within the Development Corridor – Wind Farm (ha)			Area within the Development Corridor – Permanent Met Masts (ha)			Total Area within the Development Corridors (ha)			Area within the Indicative Development Footprint – Wind Farms (ha)			Area within the Indicative Development Footprint – Permanent Met Masts (ha)			Area within the Indicative Development Footprint – External Roads (ha)			Area within the Indicative Development Footprints (ha)		
	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total
Plant Community Type																					
VZ 1 - 289 Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good*	0.05	-	0.05	-	-	-	**0.05**	-	**0.05**	0.05	-	0.05	-	-	-	0.73	-	0.73	**0.78**	-	**0.78**
VZ 2 - 335 Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good*	12.78	1.80	14.58	-	-	-	**12.78**	**1.80**	**14.58**	4.77	0.73	5.50	-	-	-	-	-	-	**4.77**	**0.73**	**5.50**

Ecosystem/ Species	Area within the Development Corridor – Wind Farm (ha)			Area within the Development Corridor – Permanent Met Masts (ha)			Total Area within the Development Corridors (ha)			Area within the Indicative Development Footprint – Wind Farms (ha)			Area within the Indicative Development Footprint – Permanent Met Masts (ha)			Area within the Indicative Development Footprint – External Roads (ha)			Area within the Indicative Development Footprints (ha)		
	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total
VZ 3 - 350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Moderate to Good*	14.36	21.97	36.33	-	-	-	**14.36**	**21.97**	**36.33**	8.60	10.15	18.75	-	-	-	1.33	-	1.33	**9.93**	**10.15**	**20.08**
VZ 4 - 350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Derived Native Grassland*	22.36	10.35	32.71	-	-	-	**22.36**	**10.35**	**32.71**	11.22	5.63	16.85	-	-	-	0.67	-	0.67	**11.89**	**5.63**	**17.52**

Ecosystem/ Species	Area within the Development Corridor – Wind Farm (ha)			Area within the Development Corridor – Permanent Met Masts (ha)			Total Area within the Development Corridors (ha)			Area within the Indicative Development Footprint – Wind Farms (ha)			Area within the Indicative Development Footprint – Permanent Met Masts (ha)			Area within the Indicative Development Footprint – External Roads (ha)			Area within the Indicative Development Footprints (ha)		
	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total
VZ 5 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Moderate to Good*	129.11	88.15	217.26	10.17	2.23	12.40	**139.28**	**90.38**	**229.66**	52.39	31.20	83.59	0.42	0.05	0.47	0.75	-	0.75	**53.56**	**31.25**	**84.81**
VZ 6 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Derived Native Grassland*	315.02	134.73	449.75	14.78	3.15	17.93	**329.80**	**137.88**	**467.68**	125.39	43.69	169.08	3.16	1.60	4.76	0.15	-	0.15	**128.70**	**45.29**	**173.99**

Ecosystem/ Species	Area within the Development Corridor – Wind Farm (ha)			Area within the Development Corridor – Permanent Met Masts (ha)			Total Area within the Development Corridors (ha)			Area within the Indicative Development Footprint – Wind Farms (ha)			Area within the Indicative Development Footprint – Permanent Met Masts (ha)			Area within the Indicative Development Footprint – External Roads (ha)			Area within the Indicative Development Footprints (ha)		
	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total
VZ 7 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Acacia Shrubland*	6.11	15.88	21.99	2.80	3.88	6.68	**8.91**	**19.76**	**28.67**	2.40	4.85	7.25	0.55	0.70	1.25	0.03	-	0.03	**2.98**	**5.55**	**8.53**
VZ 8 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Sifton Bush Shrubland*	194.97	54.16	249.13	9.07	0.87	9.94	**204.04**	**55.03**	**259.07**	64.79	18.01	82.80	1.10	0.02	1.12	0.26	-	0.26	**66.15**	**18.03**	**84.18**

Ecosystem/ Species	Area within the Development Corridor – Wind Farm (ha)			Area within the Development Corridor – Permanent Met Masts (ha)			Total Area within the Development Corridors (ha)			Area within the Indicative Development Footprint – Wind Farms (ha)			Area within the Indicative Development Footprint – Permanent Met Masts (ha)			Area within the Indicative Development Footprint – External Roads (ha)			Area within the Indicative Development Footprints (ha)		
	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total
VZ 9 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Argyle Apple Forest*	3.79	-	3.79	-	-	-	3.79	-	3.79	0.61	-	0.61	-	-	-	0.01	-	0.01	0.62	-	0.62
VZ 10 - Non-Native Vegetation	141.84	87.87	229.71	0.37	3.70	4.07	142.21	91.57	233.78	56.23	34.00	90.23	0.73	0.62	1.35	13.60	-	13.60	70.56	34.62	105.18
Species-credit Species Habitats																					
striped legless lizard *Delma impar*	13.97	-	**13.97**	-	-	-	13.97	-	13.97	3.58	-	**3.58**	-	-	-	-	-	-	3.58	-	3.58
southern myotis *Myotis macropus*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	-	**0.03**	0.03	-	0.03
squirrel glider *Petaurus norfolcensis*	138.17	108.23	**246.40**	10.00	2.23	12.23	148.17	110.46	258.63	59.42	40.75	**100.17**	0.35	0.05	**0.40**	**2.40**	-	**2.40**	62.17	40.80	102.97
superb parrot (breeding habitat) *Polytelis swainsonii*	14.36	21.97	**36.33**	-	-	-	14.36	21.97	36.33	8.60	10.15	**18.76**	-	-	-	**1.33**	-	**1.33**	9.93	10.15	20.08

Ecosystem/ Species	Area within the Development Corridor – Wind Farm (ha)			Area within the Development Corridor – Permanent Met Masts (ha)			Total Area within the Development Corridors (ha)			Area within the Indicative Development Footprint – Wind Farms (ha)			Area within the Indicative Development Footprint – Permanent Met Masts (ha)			Area within the Indicative Development Footprint – External Roads (ha)			Area within the Indicative Development Footprints (ha)		
	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total	SWS IBRA	SEH IBRA	Total
golden sun moth *Synemon plana*	56.82	56.97	**113.79**	0.01	0.09	0.10	**56.83**	**57.06**	**113.89**	21.45	20.84	**42.29**	0.18	0.73	**0.91**	-	-	-	**21.63**	**21.57**	**43.20**

The summary of change in direct impacts associated with the modified project compared with the approved project is presented below in **Table 5.2**.

Table 5.2 Summary of Change Between Approved and Modified Project

PCT / Species	Original Area of Impact (ha)	Area of Indicative Development Footprint – Wind Farm	Area of Indicative Development Footprint – Permanent Met Masts	Area of Indicative Development Footprint – External Roads	Total Area of Indicative Development Footprints	Order of Change
Ecosystem						
VZ 1 - 289 Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good*	Not previously assessed	0.05	-	0.73	0.78	Vegetation not previously identified or assessed.
VZ 2 - 335 Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good*	Not previously assessed	5.50	-	-	5.50	Vegetation not previously identified or assessed.

PCT / Species	Original Area of Impact (ha)	Area of Indicative Development Footprint – Wind Farm	Area of Indicative Development Footprint – Permanent Met Masts	Area of Indicative Development Footprint – External Roads	Total Area of Indicative Development Footprints	Order of Change
VZ 3 - 350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Moderate to Good*	24.9	18.75	-	1.33	20.08	Avoidance of 4.82 hectares
VZ 4 - 350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Derived Native Grassland*	25.3	16.85	-	0.67	17.52	Avoidance of 7.78 hectares
VZ 5 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Moderate to Good*	87.7	83.59	0.47	0.75	84.81	Avoidance of 2.89 hectares

PCT / Species	Original Area of Impact (ha)	Area of Indicative Development Footprint – Wind Farm	Area of Indicative Development Footprint – Permanent Met Masts	Area of Indicative Development Footprint – External Roads	Total Area of Indicative Development Footprints	Order of Change
VZ 6 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Derived Native Grassland*	71.6	169.08	4.76	0.15	173.99	Increase of 102.39 hectares
VZ 7 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Acacia Shrubland*	1.3	7.25	1.25	0.03	8.53	Increase of 7.23 hectares
VZ 8 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Sifton Bush Shrubland*	29.6	82.80	1.12	0.26	84.18	Increase of 54.58 hectares

PCT / Species	Original Area of Impact (ha)	Area of Indicative Development Footprint – Wind Farm	Area of Indicative Development Footprint – Permanent Met Masts	Area of Indicative Development Footprint – External Roads	Total Area of Indicative Development Footprints	Order of Change
VZ 9 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Argyle Apple Forest*	0.4	0.61	-	0.01	0.62	Increase of 0.22 hectares
VZ 10 - Non-native Vegetation	20.0	90.23	1.35	13.60	105.18	Increase of 85.18 hectares
Species						
striped legless lizard *Delma impar*	49.5	3.58	-	-	3.58	Avoidance of 45.92 ha
southern myotis *Myotis macropus*	Not previously recorded	-	-	0.03	0.03	Species not previously identified or assessed.
squirrel glider *Petaurus norfolcensis*	Not previously recorded	100.17	0.40	2.40	102.97	Species not previously identified or assessed.
superb parrot (breeding habitat) *Polytelis swainsonii*	24.9	18.76	-	1.32	20.08	Avoidance of 4.82 ha
golden sun moth *Synemon plana*	66.94	42.29	0.91	-	43.20	Avoidance of 23.74 ha

5.1.1.1 Direct Removal of Hollow Bearing Trees

As per Section 9.1.2.6 of the BAM (OEH 2017) **Table 5.3** presents the number of hollow bearing trees in each vegetation zone that are directly impacted by the Project. As per Section 5.3.4.29 of the BAM (OEH 2017), the number of trees with hollows that are visible from the ground were calculated in the 20 x 50 metre plot as part of the BAM Vegetation Integrity Plot. However, as detailed in **Section 5.5.4**, additional hollow bearing tree surveys were completed specifically for the superb parrot. While **Table 5.3** presents the number of hollow bearing trees recorded for Vegetation Zone 3 within the BAM Vegetation Integrity Plots, the average number of HBTs per hectare and total number of HBTs to be removed is based on the outcomes presented in **Section 5.5.4**.

Table 5.3 Hollow Bearing Trees Recorded per Vegetation Zone

Vegetation Zone / PCT / Condition	BAM Vegetation Integrity Plots	Total No. HBTs Recorded	Average No. HBTs per ha[1]	Total HBTs to be Removed[1, 2]
VZ 1 - 289 Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good*	1	1	10	8
VZ 2 - 335 Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good*	3	0	0	0
VZ 3 - 350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Moderate to Good*	n/a	n/a	10.7[3]	215
VZ 4 - 350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Derived Native Grassland*	5	0	1[#]	18
VZ 5 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Moderate to Good*	8	29	36.25	3,063
VZ 6 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Derived Native Grassland*	10	1	0.1	17

Vegetation Zone / PCT / Condition	BAM Vegetation Integrity Plots	Total No. HBTs Recorded	Average No. HBTs per ha[1]	Total HBTs to be Removed[1, 2]
VZ 7 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Acacia Shrubland*	4	3	10	85
VZ 8 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Sifton Bush Shrubland*	5	0	0	0
VZ 9 - 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Argyle Apple Forest*	2	6	30	19
Non-native Vegetation	7	0	0	0

[1] Averages are rounded up or down to the nearest whole number.

[2] Averages are calculated based on the total area of the vegetation zone in the Indicative Development Footprints (Wind Farm and External Roads).

[3] average number of HBTs per hectare and total number of HBTs to be removed is based on the outcomes presented in **Section 5.5.4.**

[#] Consistent with the Biodiversity Assessment Addendum (NGH Environmental 2016a), despite not recording any Hollow Bearing Trees in the BAM Vegetation Integrity Plots for Vegetation Zone 4, 1 hollow bearing tree per hectare has been assumed in recognition of scattered trees occurring throughout.

5.1.1.2 Direct Partial Impacts

RPRE confirmed through Transgrid the easement specifications required for the project for the future operation of the proposed transmission lines, including 132kV and 33kV. Transgrid is the operator of the grid in this part of NSW, however it has not been confirmed that they will be building the transmission line for the Project.

Transgrid confirmed that a 40 m wide easement would be required for 132kV and a 20 m wide easement would be required for 30kV within vegetation that is currently, or can grow equal to or greater than, 4 metres tall. For vegetation zones that meet these characteristics, partial direct impacts have been calculated within the 40 m wide or 20 m wide easement (excluding the pole and string locations) as per Section 9.1.2.3 of the BAM [OEH 2017]). This means that the future vegetation integrity score for these applicable areas are not reduced to the default score of 0 (no biodiversity value).

Within these easements, a proportion of biodiversity values will remain within select vegetation zones. Canopy species, understorey and ground stratum flora species persist in these environments and also provide substantial cover. The following vegetation zones were assessed against partial impact parameters where they occurred within the transmission lines:

- 9.04 hectares of VZ 3, comprising 4.27 hectares in SWS IBRA and 4.77 hectares in SEH IBRA.
- 17.81 hectares of VZ 5, comprising 9.63 hectares in SWS IBRA and 8.18 hectares in SEH IBRA.

- 2.81 hectares of VZ 7, comprising 2.81 hectares in SEH IBRA.

Vegetation Zones 1 and 9 were also considered for the application of Direct Partial Impacts, however they do not intersect with any sections of the proposed transmission lines.

For vegetation zones < 4 metres tall, direct impacts have been calculated for the transmission line poles and string lines specifically (i.e. not the easement) and the future vegetation integrity score has been reduced to the default of 0.

The values used for partial impacts are presented below in **Table 5.4**.

Table 5.4 Partial Impact Values

Attribute	CCS	SCS	FCS
Tree	Same as original	5 per cent of original	
Shrub	Same as original	25 per cent of original	
Grass and Grass Like	50 per cent of original	50 per cent of original	
Forb	50 per cent of original	5 per cent of original	
Fern	50 per cent of original	5 per cent of original	
Other	50 per cent of original	5 per cent of original	
Number of Large Trees			Default
Litter Cover			Same as original
Coarse Woody Debris			Same as original
Stem Size Class			1
Regeneration stems <5cm DBH			Present
High Threat Weed Cover			Same as original

Full detail of the partial assessment for each of the applicable vegetation zones is presented below, initially for those that occur within the NSW Southern West Slopes IBRA Region (**Table 5.5**) and then for those that occur within the South East Highlands IBRA Region (**Table 5.6**).

Table 5.5 Current and Future Score for Partial Impacts in Transmission (SWS IBRA)

	VZ 3		VZ 5	
	Current Score	Future Score	Current Score	Future Score
CCS				
Tree	2.4	2.4	3.4	3.4
Shrub	1	1	4.6	4.6
Grass and Grass Like	6.9	3.5	6.3	3.2
Forb	4	2.0	4.5	2.3
Fern	0	0	0.1	0
Other	0.4	0.2	0.8	0.4

	VZ 3		VZ 5	
	Current Score	Future Score	Current Score	Future Score
SCS				
Tree	35.3	1.8	43.4	2.2
Shrub	5.3	1.3	14.5	3.6
Grass and Grass Like	29.6	14.8	25.3	12.7
Forb	2.4	0.1	3.6	0.2
Fern	0	0	0.1	0
Other	1	0	1.3	0
FCS				
Number of Large Trees	2	0	1.9	0
Litter Cover	59.1	59.1	54.1	54.1
Coarse Woody Debris	48.1	48.1	125.7	125.7
Stem Size Class	3.1	1	3.5	1
Regeneration stems <5cm DBH	1	1	0.9	1
High Threat Weed Cover	1.7	1.7	0.1	0.1

Table 5.6 Current and Future Score for Partial Impacts in Transmission (SEH IBRA)

	VZ 3		VZ 5		VZ 7	
	Current Score	Future Score	Current Score	Future Score	Current Score	Future Score
CCS						
Tree	2.4	2.4	3.4	3.4	1	1
Shrub	1	1	4.6	4.6	4.5	4.5
Grass and Grass Like	6.9	3.5	6.3	3.2	6.5	3.3
Forb	4.0	2	4.5	2.3	4	2
Fern	0	0	0.1	0	1	0.5
Other	0.4	0.2	0.8	0.4	0.8	0.4
SCS						
Tree	35.3	1.8	43.4	2.2	24	1.2
Shrub	5.3	1.3	14.5	3.6	13.1	3.3
Grass and Grass Like	29.6	14.8	25.3	12.6	58.3	29.2
Forb	2.4	0.1	3.6	0.2	1	0
Fern	0	0	0.1	0	0.3	0
Other	1	0	1.3	0	0.2	0

	VZ 3		VZ 5		VZ 7	
	Current Score	Future Score	Current Score	Future Score	Current Score	Future Score
FCS						
Number of Large Trees	2	0	1.9	0	0.3	0
Litter Cover	59.1	59.1	54.1	54.1	30.7	30.7
Coarse Woody Debris	48.1	48.1	125.7	125.7	18.5	18.5
Stem Size Class	3.1	1	3.5	1	2.5	1
Regeneration stems <5cm DBH	1	1	0.9	1	1	1
High Threat Weed Cover	1.7	1.7	0.1	0.1	0.1	0.1

5.1.2 Indirect Impacts

The Project is likely to result in additional indirect impacts on biodiversity values of surrounding lands. In particular:

- erosion
- dust pollution
- noise, vibration and activity during construction works
- pollution risks associated with use of concrete, fuels and lubricants and construction chemicals
- weed and feral animal encroachment.

These potential impacts on biodiversity will vary depending on the type of impact, the duration and frequency of the impact and the ability of the biodiversity features to respond to these changes. However, these indirect impacts are considered to be manageable with appropriate management and mitigation measures that would be formalised through the required management plans, many of which are described above in **Section 4.0**.

Given the extensive spread of the project design (some 36 kilometres in length from the northern to southern tip) the indirect impacts listed above are likely to be of low magnitude temporally and spatially.

This position remains consistent with the original assessment of indirect and peripheral impacts considered as part of the original Biodiversity Assessment (NGH Environmental 2014) and Biodiversity Assessment Addendum (NGH Environmental 2016a). Despite the Project undergoing a modification, the components of indirect and peripheral impacts remain unchanged in nature and extent.

Further detail on the indirect impacts is provided below, and in the Modification Application Report where relevant.

5.1.2.1 Erosion

The extent of works proposed as part of the Project has the potential to result in indirect impacts to biodiversity values through erosion. Such indirect impacts can be adequately managed through the implementation of a detailed Biodiversity Management Plan that will be required prior to construction. The proposed changes to the Project as part of the modification do not present an increased risk of these indirect impacts.

The extent and risk of indirect impacts from erosion associated with the Project is considered to be consistent with those presented, discussed and assessed as part of the original approval, including Biodiversity Assessment (NGH Environmental 2014) and Biodiversity Assessment Addendum (NGH Environmental 2016a).

5.1.2.2 Dust Pollution

The extent of works proposed as part of the Project has the potential to result in indirect impacts from dust pollution. Such indirect impacts can be adequately managed through the implementation of a detailed Biodiversity Management Plan that will be required prior to construction. The proposed changes to the Project as part of the modification do not present an increased risk to biodiversity values from dust pollution.

The extent and risk of indirect impacts from the dust pollution associated with the Project is considered to be consistent with those presented, discussed and assessed as part of the original approval, including Biodiversity Assessment (NGH Environmental 2014) and Biodiversity Assessment Addendum (NGH Environmental 2016a).

5.1.2.3 Noise, Vibration and Activity During Construction

The extent of works proposed as part of the Project has the potential to result in indirectly impact fauna that may be nesting, foraging or migrating through noise, vibration and activity during construction. Such indirect impacts can be adequately managed through the implementation of a detailed Biodiversity Management Plan that will be required prior to construction. The proposed changes to the Project as part of the modification do not present an increased risk of such indirect impacts.

The extent and risk of indirect impacts from the noise, vibration and activity during construction associated with the Project is considered to be consistent with those presented, discussed and assessed as part of the original approval, including Biodiversity Assessment (NGH Environmental 2014) and Biodiversity Assessment Addendum (NGH Environmental 2016a).

5.1.2.4 Pollution

The extent of works proposed as part of the Project has the potential to result in indirect impacts to biodiversity values through the inadvertent or accidental pollution of concrete, fuels, lubricants and other construction chemicals and materials. Such indirect impacts can be adequately managed through the implementation of a detailed Biodiversity Management Plan that will be required prior to construction. The proposed changes to the Project as part of the modification do not present an increased risk of indirect impacts from pollution.

The extent and risk of indirect impacts from pollutions of chemicals and materials associated with the Project is considered to be consistent with those presented, discussed and assessed as part of the original approval, including Biodiversity Assessment (NGH Environmental 2014) and Biodiversity Assessment Addendum (NGH Environmental 2016a).

5.1.2.5 Weed and Feral Animal Encroachment

New weed species could be inadvertently brought into the Indicative Development Footprints on construction vehicles and machinery, within imported materials, or could invade naturally through removal of native vegetation. The presence of weed species within the Indicative Development Footprints has the potential to decrease the value of extant vegetation to native species, however we note a large number of pasture weeds (including forbs and grasses) already occur throughout the Indicative Development Footprints as a result of the historical land use. Mitigation measures outlined in **Section 4.0** will be implemented to minimise the potential for weed encroachment into areas surrounding the Indicative Development Footprints.

Populations of feral fauna species such as foxes, rabbits and cats can increase and quickly populate new areas as a result of disturbance. Clearing, thinning of vegetation and the creation of tracks have the ability to assist the establishment and spread of feral fauna species. However, foxes, rabbits and wild dogs already occur throughout the Indicative Development Footprints as a result of the historical land use. Mitigation measures outlined in **Section 4.0** will minimise the potential for feral animal spread and impacts into surrounding areas around the Indicative Development Footprints.

There will be no substantial change to impacts from weeds or feral animals, given that the Project is located within, and adjacent to, a landscape exposed to historical and current agricultural land uses. Any additional impacts resulting from weeds or feral animals are not expected to be of any level of significance in relation to threatened species, populations and communities.

In conclusion, the indirect impacts to weed and feral animal encroachment that will result from the Project are not considered to be different to those that were presented, discussed and assessed as part of the original approval, including Biodiversity Assessment (NGH Environmental 2014) and Biodiversity Assessment Addendum (NGH Environmental 2016a).

5.2 Impacts on Threatened Ecological Communities

Despite a range of avoidance and minimisation measures (refer to **Section 4.0**) the Project will impact a total of 37.50 hectares of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act within Vegetation Zones 3 (20.08 hectares) and 4 (17.42 hectares); and 35.73hectares of *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC* under the EPBC Act within Vegetation Zones 3 (19.38 hectares) and 4 (16.35 hectares). See **Figure 3.4**. **Table 5.7** presents a summary of these impacts in relation to the applicable vegetation zones, which IBRA region it occurs in (necessary for offsetting purposes) and proportion of TECs within the Development Corridors and Indicative Development Footprints (Wind Farm, Permanent Met Masts and External Roads).

Impact to the CEEC under the BC Act is less (**12.70 hectares**) than the impact threshold of 50.2 hectares for this TEC as identified in Consent Condition 19(a) of the existing State Approval. While the Project does impact on the CEEC, it has successfully avoided 12.70 hectares of CEEC threshold. Approximately 69.04 hectares of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act was identified within the wider Development Corridors. Therefore, 31.54 hectares of the CEEC (BC Act) in the Development Corridors has been avoided by the Project and considerable amounts of the CEEC (BC Act) occur beyond the Development Corridors in the local region.

Impacts to the CEEC under the EPBC Act is 26.23 hectares more than the impact threshold of 9.5 hectares for this TEC as identified in Condition 3 of the existing Federal Approval (EPBC 2014/7163). It is noted that 67.64 hectares of *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC* under the EPBC Act was identified within the Development Corridors. Therefore, 31.91 hectares of the CEEC (EPBC Act) has been avoided by the Project and will persist within the wider Development Corridors,

and considerable amounts of the CEEC (EPBC Act) occur beyond the Development Corridors in the local region.

Table 5.7 Summary of Threatened Ecological Communities

	Area of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC – BC Act (ha)	Area of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC – EPBC Act (ha)
SWS IBRA		
Vegetation Zone 3		
Development Corridor – Wind Farm	14.36	14.36
Development Corridor – Permanent Met Masts	-	-
Indicative Development Footprint – Wind Farm	8.60	8.60
Indicative Development Footprint – Permanent Met Masts	-	-
Indicative Development Footprint – External Roads	1.33	0.64
Vegetation Zone 4		
Development Corridor – Wind Farm	22.36	21.86
Development Corridor – Permanent Met Masts	-	-
Indicative Development Footprint – Wind Farm	11.22	11.01
Indicative Development Footprint – Permanent Met Masts	-	-
Indicative Development Footprint –External Roads	0.57	0.10
SEH IBRA		
Vegetation Zone 3		
Development Corridor – Wind Farm	21.98	21.95
Development Corridor – Permanent Met Masts	-	-
Indicative Development Footprint – Wind Farm	10.15	10.14
Indicative Development Footprint – Permanent Met Masts	-	-
Indicative Development Footprint – External Roads	-	-

	Area of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC – BC Act (ha)	Area of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC – EPBC Act (ha)
Vegetation Zone 4		
Development Corridor – Wind Farm	10.35	9.48
Development Corridor – Permanent Met Masts	-	-
Indicative Development Footprint – Wind Farm	5.63	5.24
Indicative Development Footprint – Permanent Met Masts	-	-
Indicative Development Footprint –External Roads	-	-

5.3 Prescribed Impacts

Consistent with the Biodiversity Assessment and Biodiversity Assessment Addendum (NGH Environmental 2014 and 2016) no prescribed impacts are expected to occur to threatened ecological community habitat as none of those which occur within the Indicative Development Footprints are associated with karst, caves, crevices, cliffs and other geological features of significance, rocks or human-made structures. Furthermore, no prescribed impacts are expected to occur to threatened species associated with karsts, crevices, cliffs and other geological features of significance, rocks or human-made structures as these do not occur within the Indicative Development Footprints.

Consistent with the Biodiversity Assessment and Biodiversity Assessment Addendum (NGH Environmental 2014 and 2016) no impacts on water quality or hydrological processes that sustain threatened species and threatened ecological communities are likely to occur.

Consistent with the Biodiversity Assessment and Biodiversity Assessment Addendum (NGH Environmental 2014 and 2016) a number of prescribed impacts have been considered for the Project, being impacts of threatened microbat species associated with caves (**Section 5.3.1**), impacts from risk of vehicle strike (**Section 5.3.2**), impacts of turbine strikes (**Section 5.3.3**) and the interruption and fragmentation to connectivity of native vegetation and associated habitat corridors (**Section 5.3.4**).

5.3.1 Threatened Microbat Species Associated With Caves

Umwelt completed extensive surveys across the Development Corridor to facilitate the preparation of the Bird and Bat Adaptive Management Plan. This scope of works included the deployment of Anabat recorders across the Development Corridor, at ground level as well as at height (installed on the existing meteorological masts). These surveys were completed across the four seasons of the year, with the timing of one of the survey programs selected in consultation with BCD to capture the northern migration of the large bent-wing bat from their known breeding cave in Wee Jasper, NSW (approximately 70 km south-west of the Development Corridor).

Umwelt used this package of bird and bat survey work, along with the extensive surveys and associated results that were captured by NGH Environmental (2014 and 2016) as part of the existing approval process, and available literature to facilitate the preparation of Prescribed Impact Assessment for the Project in relation to turbine strike on bird and bats (refer to **Appendix E**).

This assessment addressed four species of microbat recorded either by Umwelt or previously by NGH Environmental (2014 and 2016), being large bent-wing bat (*Miniopterus orainae oceanensis*), eastern false pipistrelle (*Falsistrellus tasmaniensis*), yellow-bellied sheathtail bat (*Saccolaimus flaviventrus*) and southern myotis (*Myotis macropus*). Profiles for each of these species were reviewed on the TBDC (BCD 2020b), confirming that just one of these species is associated with caves, being the large bent-wing bat. The other three species are not considered further in this section of Prescribed Impacts, they are discussed further in **Section 5.3.3**.

No caves, or cave-like structures, were recorded within the Indicative Development Footprints. However, an old mine shaft was recorded in proximity to the Indicative Development Footprint – Wind Farm (see **Figure 2.1**). The project will have no impact on this old mine shaft. It is expected however to provide habitat consistent with a cave and therefore supports likely habitat for the large bent-wing bat.

Umwelt visited the old mine shaft on multiple occasions during our field surveys, there was no visible sign of recent or current usage by bats, based on bats or bat droppings being visible, or odour from bat droppings. Furthermore, Anabat detectors did not suggest the old mine shaft was being used for roosting or breeding purposes by any species. The entry/exit point to the old mine shaft was surveyed over five

nights with an Anabat detector in February 2018. The results of this analysis determined there was no roosting or breeding numbers of individuals for any species.

It is recognised that other threatened species of microbat in NSW use caves and cave like structures for breeding or roosting habitat. However, none of these species were recorded as part of the extensive surveys for the Bird and Bat Adaptive Management Plan, or previously through the extensive surveys completed by NGH Environmental (2014 and 2016). Thus, none of these species have been considered further.

In summary prescribed impacts associated with threatened microbat species associated with caves remains consistent with the Biodiversity Assessment and Biodiversity Assessment Addendum (NGH Environmental 2014 and 2016).

5.3.2 Impacts from Increased Risk of Vehicle Strike

The Project will result in an increase of vehicle activity within the Indicative Development Footprints through construction of a network of internal access tracks, predominantly between turbine locations but also within transmission lines for servicing purposes. These internal access tracks will not be open for public use as they are restricted to the private properties of landholders involved with the Project. Use of these access tracks will be restricted to landholders, wind farm employees and associated contractors. Internal access tracks will have enforced speed restrictions to adequately reduce the risk of interaction between animals and vehicles.

No new public roads will be constructed for the Project, however multiple sections of public roads will be upgraded for the Project. The upgrade works will be the responsibility of RPRE but have been designed in consultation with BCD and relevant LGAs.

Due to the disturbed condition of the Indicative Development Footprints, it is unlikely that any threatened species or animals that are part of a TEC would be adversely impacted by the increase in vehicle movement in the Indicative Development Footprints.

In summary prescribed impacts associated with impacts from increased risk of vehicle strike remains consistent with the Biodiversity Assessment and Biodiversity Assessment Addendum (NGH Environmental 2014 and 2016).

5.3.3 Impacts from Turbine Strikes

Umwelt has prepared detailed Prescribed Impact Assessments to consider the potential impacts from turbine strikes on significant avifauna species. These assessments have been prepared in accordance with Section 9.2.1.8 of the BAM (OEH 2017a) and through careful and detailed consultation with BCD . They are provided in full in **Appendix E**.

Species considered to be the most aerial threatened species and therefore the most likely to be impacted by the Project were selected for inclusion in this assessment based on the results of bird utilisation surveys conducted in the survey area by NGH in 2012/13 and Umwelt in 2018/19. One non-threatened species, the wedge-tailed eagle was also assessed due to its known susceptibility to blade strike. At the request of the BCD, 14 species were considered in this assessment comprising 13 threatened species (nine bird and four bat species) and one non-threatened bird species (wedge-tailed eagle). Threatened species assessed include:

- little eagle (*Hieraaetus morphnoides*)
- black falcon (*Falco subniger*)

- superb parrot (*Polytelis swainsonii*)
- white-throated needletail (*Hirundapus caudacutus*)
- white-fronted chat (*Epthianura albifrons*)
- brown treecreeper (*Climacteris picumnus victoriae*)
- varied sittella (*Daphoenositta chrysoptera*)
- painted honeyeater (*Grantiella picta*)
- dusky woodswallow (*Artamus cyanopterus*)
- large bent-winged bat (*Miniopterus schreibersii oceanensis*)
- yellow-bellied sheathtail bat (*Saccolaimus flaviventris*)
- southern myotis (*Myotis macropus*) and
- eastern false pipistrelle (*Falsistrellus tasmaniensis*).

5.3.4 Connectivity of Native Vegetation and Habitat Corridors

As described in **Section 1.1.1**, the Development Corridors are located in a region of NSW that has been extensively modified and disturbed as a result of a long history of agricultural land uses. Specifically, the Development Corridor is occupied by agricultural landscapes on the valley floors and low slopes, with substantial areas of intact vegetation associated with the network of public reserves, upper slopes and ridgetops.

Broadly speaking, much of the Indicative Development Footprints occur where the connectivity of native vegetation and habitat corridors has been previously compromised by historical agricultural land uses. However, there are specific locations of the Indicative Development Footprints where it is considered likely that the Project will interrupt the connectivity of native vegetation and fauna habitat. These are summarised below in **Table 5.8** and presented in **Figure 3.2**.

Table 5.8 Interruption of Native Vegetation and Fauna Habitat Connectivity

Location within Indicative Development Footprints	Summary of Interruption
• Turbines 17 and 20 • Associated access tracks	• Despite there being an existing farm track here, as it is very thin and used infrequently it does not currently interrupt the connectivity of native vegetation or fauna habitat. • A large patch of Vegetation Zone 5 will be intersected. • A patch of Vegetation Zone 9 will be intersected. **Note that this is a previously disturbed vegetation community.** • The Project will interrupt the connectivity of native vegetation and fauna habitat to a width of between 30 and 70 m.

Location within Indicative Development Footprints	Summary of Interruption
• Turbines 34, 37, 39, 41, 42, 48, 49, 50, 51, 56, 58, 61, 62, 63, 67, 139 and 141 • Associated access tracks • Transmission line	• There are some existing farm tracks in this location of the Indicative Development Footprints, however as they are very thin and used infrequently, they do not currently interrupt the connectivity of native vegetation or fauna habitat. • Large patches of Vegetation Zone 5 will be intersected. • Large patches of Vegetation Zone 8 will be intersected. **Note that this is a previously disturbed vegetation community.** • A small patch of Vegetation Zone 9 will be intersected. • The Project will interrupt the connectivity of native vegetation and fauna habitat to a width of between 30 and 200 m.
• Turbines 65, 68, 146, 147 and 148 • Access tracks	• Despite there being an existing farm track here, as it is very thin and used infrequently it does not currently interrupt the connectivity of native vegetation or fauna habitat. • Large patches of Vegetation Zone 5 will be intersected. • Large patches of Vegetation Zone 8 will be intersected. **Note that this is a previously disturbed vegetation community.** • The Project will interrupt the connectivity of native vegetation and fauna habitat to a width of between 30 and 130 m.
• Turbines 150 • Access tracks • Transmission line	• Despite there being an existing farm track here, as it is very thin and used infrequently it does not currently interrupt the connectivity of native vegetation or fauna habitat. • Large patches of Vegetation Zone 5 will be intersected. • Large patches of Vegetation Zone 7 will be intersected. **Note that this is a previously disturbed vegetation community.** • The Project will interrupt the connectivity of native vegetation and fauna habitat to a width of between 20 and 100 m.
• Turbines 84, 85, 86, 87, 143 • Transmission line	• There is a reasonably sized access track along the ridgeline that is being utilised. However, there will be particular sections that will require redesign for construction works. This track upgrade is not considered to modify the existing interruption of connectivity of native vegetation or fauna habitat beyond the current level. • Large patches of Vegetation Zone 5 will be intersected. • Large patches of Vegetation Zone 3 will be intersected. • The Project will interrupt the connectivity of native vegetation and fauna habitat to a width of between 10 and 130 m.

Location within Indicative Development Footprints	Summary of Interruption
• Access tracks and transmission line north of Turbine 145	• There are existing farm tracks in this location of the Indicative Development Footprints, however as they are very thin and used infrequently, they do not currently interrupt the connectivity of native vegetation or fauna habitat. • Large patches of Vegetation Zone 5 will be intersected. • Large patches of Vegetation Zone 8 will be intersected. **Note that this is a previously disturbed vegetation community.** • Large patches of Vegetation Zone 3 will be intersected. • The Project will interrupt the connectivity of native vegetation and fauna habitat to a width of between 10 and 30 m.
• Turbines 125, 127 and 142 • Access tracks	• There is an existing farm track in this location of the Indicative Development Footprints, however as it is very thin and used infrequently it does not currently interrupt the connectivity of native vegetation or fauna habitat. • Large patches of Vegetation Zone 5 will be intersected. • Large patches of Vegetation Zone 7 will be intersected. **Note that this is a previously disturbed vegetation community.** • The Project will interrupt the connectivity of native vegetation and fauna habitat to a width of between 20 and 150 m.

The overall indirect impacts on connectivity of native vegetation and habitat corridors described above are not considered to be significant. While the Project will enhance levels of fragmentation within the region, it will occur to the extent where species or communities are significantly impacted.

The most substantial impacts to connectivity of native vegetation and habitat corridors will occur during the construction phase of the Project. During this time the movement of species will be discouraged from travelling across the Indicative Development Footprints as a result of the substantial works being undertaken. However following completion of the construction, it is expected that native vegetation will recover to the edge of the permanent above ground infrastructure naturally as well as through rehabilitation efforts committed to by RPRE. Full extent of this will be detailed in the future BMP required for the Project and implemented by RPRE.

The turbine hardstands contain the necessary clearing between adjacent native vegetation and the turbine as a mechanism to deter fauna species (i.e. birds and bats) from being impacted by blade strike, they will persist as permanent disruptions to the connectivity. Over time, native vegetation and fauna habitat will return to the access tracks, underground cabling and transmission line disturbance areas and adjoining land. In such circumstances the indirect impacts on connectivity and habitat corridors is considered to be reduced.

Umwelt have experience on multiple major projects that have involved access tracks, underground cabling and transmission lines where over time native flora and fauna species return to the previously disturbed landscapes. We acknowledge that the vegetation will never return to its original state, however we believe it is important to acknowledge that some form of habitat does persist.

The following threatened species, threatened ecological communities and habitats are those considered likely to be affected by the aforementioned indirect impacts.

- White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland, CEEC (BC Act)
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, CEEC (EPBC Act)
- Squirrel glider (*Petaurus norfolcensis*), Vulnerable (BC Act).

In conclusion, the indirect impacts to connectivity and fragmentation that will result from the Project are not considered to be different to those that were presented, discussed and assessed as part of the original approval, including Biodiversity Assessment (NGH Environmental 2014) and Biodiversity Assessment Addendum (NGH Environmental 2016a).

5.3.5 Prescribed Impacts from Removal of Non-native Vegetation Supporting Golden Sun Moth

Non-native Vegetation makes up 105.18 hectares within the Indicative Development Footprints and is described in **Section 3.2.2**. An assessment of prescribed impacts has been conducted for the removal of non-native vegetation within the Indicative Development Footprints with potential to support the golden sun moth (*Synemon plana*). Umwelt have completed a careful and detailed analysis in assigning the GSM species polygon as part of this BDAR, this is described in **Section 3.3.3.** A total of 19.68 hectares of Non-native Vegetation occurs within the GSM Species Polygon.

This is presented below in Table 5.9. This assessment has been undertaken in accordance with Section 9.2.1.4 of the BAM.

Table 5.9 Prescribed Impact Assessment of Non-native Vegetation Supporting Golden Sun Moth

Criteria	Response
The assessment of the impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation must:	
a) identify the species and ecological communities likely to use the habitat	The golden sun moth has been recorded at several locations within the Indicative Development Footprints during surveys conducted by NGH and Umwelt. Consistent with the impact assessment for this species in the Biodiversity Assessment and Biodiversity Assessment Addendum (NGH Environmental 2014 and 2016), species habitat polygons were developed based on the extent of Vegetation Zones 4 and 6 (i.e. recorded DNGs) that intersect with 200 m buffers of known records for the species. As a result, 19.68 hectares of non-native vegetation fall within the habitat buffers for the species. This non-native vegetation comprises grassland areas have been extensively cleared of native flora species through intensive and historic agricultural land use. They predominantly support exotic grasses and herbs, the most abundant including squirrel tail fescue (*Vulpia bromoides*), soft brome (*Bromus hordeaceus*), silvery hairgrass (*Aira cupaniana*), prairie grass (*Bromus catharticus*), red brome (*Bromus rubens*) and paspalum (*Paspalum dilatatum*). A full description of this mapping unit is provided in **Section 3.2.2**. While these areas occur within the habitat buffers for the golden sun moth, it is noted that the presence of native grass species utilised by the golden sun moth (i.e. *Rytidosperma* spp. and *Austrostipa* spp.) in these areas generally occur in close proximity to the mapped PCT 350 and PCT 351 DNGs. As distances from these PCTs increase, it is likely that so do occurrences of exotic pasture weeds that

Criteria	Response
	do not facilitate foraging or breeding for the species. Currently, the species is only known to occur in degraded grasslands when they are dominated by the exotic Chilean needlegrass (*Nassella nessiana*) (DEWHA 2009, which has not been recorded within any of the areas of Non-native Vegetation occurring in the Indicative Development Footprints. Therefore, while this assessment includes the total 19.67 hectares of Non-native Vegetation which occurs within the golden sun moth habitat buffers, it is likely that the area of Non-native Vegetation with potential to be utilised by the species is considerably lower. Those areas of Non-native Vegetation used by the species would be based on the sporadic presence of native grass species, and are considered sub-optimal habitat.
b) describe the nature, extent and duration of short and long-term impacts	The Project will result in direct and indirect impacts, which are described in full in **Section 5.1**. Short-term indirect impacts will include Non-native Vegetation within and surrounding golden sun moth habitat buffers being subject to potential increase in erosion, dust pollution, noise and vibration during construction works. These will occur across the Indicative Development Footprints for approximately two years. Much of the Development Corridor is exposed to historical and ongoing disturbances from grazing and other agricultural pressures. The extent and risk of indirect impacts from construction activities associated with the Project is considered to be consistent with those presented, discussed and assessed as part of the original approval, including Biodiversity Assessment (NGH Environmental 2014) and Biodiversity Assessment Addendum (NGH Environmental 2016a). Long-term impacts will include the removal of up to 19.68 hectares of Non-native Vegetation which occurs in areas where the Indicative Development Footprints intersect with golden sun moth habitat buffers. This may result in initial species decline due to mortality of adults and larvae during the clearing process. The removal of vegetation may also lead to (additional) feral weed encroachment to adjacent areas over time. Given the occurrence of existing weeds in habitat areas, the Project is unlikely to introduce invasive species such as weeds that are harmful to the golden sun moth or its habitat. Despite the Project undergoing a modification, the components of indirect and peripheral impacts remain unchanged in nature and extent.
c) describe, with reference to relevant literature and other reliable published sources of information, the importance within the bioregion of the habitat to these species or ecological communities	The Saving Our Species (SOS) report for the golden sun moth (OEH 2020) identifies two key management sites for the species: Site 1 – Upper Lachlan and Site 2 – Gundaroo/Queanbeyan. Areas within the Development Corridor occur in the Upper Lachlan Management Site, which encompasses Rye Park, the town of Kangiara and stretches across to Blakney Creek in the east. This covers a total area of approximately 140, 664 hectares where objectives for minimising the impacts of commercial activities and maintaining low weed densities are in place. The areas of Non-native Vegetation forming potential golden sun moth habitat which will be removed by the Project comprise sub-optimal habitat which is not currently being managed in a way that is consistent with the SOS management objectives (i.e. reducing and maintaining weed densities through active weed control at priority sites). Therefore, although some patches of the Development Corridor fall within the Upper Lachlan Priority Site, it is considered unlikely that the removal of Non-native Vegetation within these areas will significantly affect the SOS objective to secure the species in the long term within this region. The *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana)* (DEWHA 2009) specify that the species is only known to occur in degraded grasslands when they are dominated by the exotic Chilean needlegrass (*Nassella nessiana*). This species was not recorded within any of the Non-native Vegetation areas to be cleared during surveys, and it is likely that these areas

Criteria	Response
	would only be used by the species based on the sporadic presence of native grasses. Furthermore, this species has not been recorded through any ecological surveys completed for the Project. There are extensive areas (i.e. several thousand hectares) of suitable habitat for the golden sun moth mapped as Yellow Box-Apple Box Grassy Woodlands in the NSW – South Western Slopes and South Eastern Highlands IBRA bioregions (Gellie 2005). These have groundcovers dominated by the species' preferred native grasses, including wallaby grass (*Rytidosperma racemosum* var. *racemosum*), kangaroo grass (*Themeda australis*), weeping grass (*Microlaena stipoides* var. *stipoides*) and speargrass (*Austrostipa scabra*), and are likely to be similar to golden sun moth habitat areas found in the Development Corridor. These grasses are essential in the maintenance of important life cycle processes for the species, as golden sun moth larvae feed exclusively on the roots of wallaby grasses (DPIE 2019b). With this abundance of higher quality foraging and breeding habitat for the species in the wider region, areas of Non-native Vegetation would likely be utilised only by very small proportion of the species within the local area, and thus a negligible proportion of the species within the wider region. Additionally, there are several areas where the species is found or considered likely to occur within the relevant bioregions which are protected. These include Goorooyarroo Nature Reserve, Bango Nature Reserve, McLeod's Creek Nature Reserve, Oakdale Nature Reserve (OEH 2015) and the Yass River Gorge Council reserve (Yass Valley Council 2017). Taking into account the above information, it is considered that the Non-native Vegetation to be impacted by the Project may potentially be utilised by local populations of the golden sun moth, but is unlikely to constitute important habitat for the species within the relevant bioregions.
d) predict the consequences of the impacts for the local and bioregional persistence of the suite of threatened species and communities likely to use these areas as habitat, with reference to relevant literature and other published sources of information	The removal of 19.68 ha of Non-native Vegetation will potentially have impacts on local populations occurring in these areas due to their limited dispersal ability. Clearing works may lead to mortality of both adults and larvae utilising sporadic native grasses within Non-native Vegetation, as females of the species are generally reluctant to fly and males will not fly greater than 100 m (DPIE 2019). However, the number of individuals utilising Non-native Vegetation is expected to be a small proportion of the local population due to the species' preference for intact native grasslands (Kutt *et.al.* 2014; DEWHA 2009). Currently, the species is only known to occur in degraded grasslands when they are dominated by the exotic Chilean needlegrass (*Nassella nessiana*) (DEWHA 2009), which has not been recorded within any of the areas of Non-native Vegetation occurring in the Indicative Development Footprints or the Project as a whole. It is recognised that one of the major threats to the golden sun moth is the loss of their preferred habitat by vigorous exotic pasture grasses introduced for livestock grazing, nutrient enrichment and pasture cultivation (O'Dwyer & Attiwill 2000; DEWHA 2009). As such, the Non-native Vegetation to be removed provides sub-optimal habitat for the species, and the impacts are not expected to affect the persistence of the golden sun moth in the local area. With regards to the wider ACT/NSW population, the areas of Non-native Vegetation are surrounded by vast amounts of higher quality native grassland habitat in the NSW – South Western Slopes, and South Eastern Highlands IBRA bioregions (Gellie 2005). These areas have groundcovers dominated by native grasses which are essential in the maintenance of important life cycle processes for the species, as golden sun moth larvae feed exclusively on the roots of wallaby grasses (DPIE 2019b). Therefore these areas would constitute habitat important to the persistence of the species, and are likely the ones where minimising impacts and actively managing weeds would be of the most value. Additionally, the area of Non-native Vegetation to be removed is negligible when viewed in the regional context. Generally larger areas of connected habitat are considered the priority for

Criteria	Response
	protection of golden sun moth over the long-term (DEHWA 2009). As populations separated by distances of greater than 200 m can be considered effectively isolated (DPIE 2019), regional populations are not expected to be affected by the Project. It is not considered likely that the removal of Non-native Vegetation occurring in golden sun moth habitat buffers will affect any populations in such a way that they will become extinct or have their movement restricted so that existing dispersal patterns are significantly affected. Consequences of the removal of 19.68 hectares of Non-native Vegetation are considered to be minor on both a local and regional scale.

5.4 Serious and Irreversible Impacts

Under the BC Act, a determination of whether an impact is serious and irreversible must be made in accordance with the principles prescribed in the BC Regulation. The principles have been designed to capture those impacts which are likely to contribute significantly to the risk of extinction of a threatened species or ecological community in New South Wales. These are impacts that:

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

A number of species-credit species, predicted species and threatened ecological communities generating biodiversity credits for the Project are nominated as candidate SAII entities in the *Guidance to Assist a Decision-Maker to Determine a Serious and Irreversible Impact* (OEH 2017b). These are presented below in **Table 5.10**, as well as an indication as to whether or not they were recorded within Development Corridors.

Table 5.10 Species and Threatened Ecological Communities at risk of SAIIs

Nominated SAIIs	Recorded within Development Corridor
Threatened Ecological Communities	
White Box Yellow Box Blakely's Red Gum Woodland	✓
Threatened Species	
Acacia meiantha	×
regent honeyeater *Anthochaera phrygia*	×
crimson spider orchid *Caladenia concolor*	×

Nominated SAIIs	Recorded within Development Corridor
large-eared pied bat *Chalinolobus dwyeri*	×
Eucalyptus alligatrix subsp. *alligatrix*	×
Euphrasia arguta	×
swift parrot *Lathamus discolor*	×
yellow-spotted tree frog *Litoria castanea*	×
large bent-winged bat *Miniopterus orianae oceanensis*	✓
brush-tailed rock-wallaby *Petrogale penicillata*	×
golden sun moth *Synemon plana*	✓
Zieria obcordata	×

Assessments have been conducted in accordance with Subsections 10.2.2 and 10.2.3 of the BAM for the three SAII entities recorded within the Indicative Development Footprints, and are provided in **Appendix F**. These assessments provide an outline of the nature and extent of the Project impacts and measures taken to avoid SAII.

5.5 Matters of National Environmental Significance

While not a requirement of the BDAR, this section summarises impacts identified for the project on MNES. Relevant to the project these include:

- White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC, EPBC Act
- Striped legless lizard
- Superb parrot
- Golden sun moth

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

Through the Biodiversity Assessment (NGH Environmental 2014) and the Biodiversity Assessment Addendum (NGH Environmental 2016a) the Federal approval for the project allows up to 9.5 hectares of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC listed under the EPBC Act.

As per **Section 5.2** above, the project will result in impacts to 35.73 hectares of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (see **Figure 3.4**). This presents an impact increase of 26.23 hectares for the CEEC (EPBC Act) when compared to the current impact threshold previously mentioned. It is noted that 67.64 hectares of *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC* under the EPBC Act was identified within the Development Corridors. Therefore, 31.91 hectares of the CEEC (EPBC Act) has been avoided by the Project and will persist within the wider Development Corridors, and considerable amounts of the CEEC (EPBC Act) occur beyond the Development Corridors in the local region.

5.5.2 Striped legless lizard

Through the Biodiversity Assessment (NGH Environmental 2014) and the Biodiversity Assessment Addendum (NGH Environmental 2016a) the Federal approval for the project allows up to 49.5 hectares of habitat for the striped legless lizard.

As per **Section 5.1.1** above, the project will result in impacts to 3.58 hectares of striped legless lizard habitat (see **Figure 3.5**). This presents an impact reduction of 45.92 hectares for the striped legless lizard. Additional habitat will persist for this species beyond the extent of the Indicative Development Footprints. With 13.97 hectares of striped legless lizard habitat identified within the Development Corridors, 10.39 hectares will persist beyond the extent of the Indicative Development Footprints.

5.5.3 Golden sun moth

Through the Biodiversity Assessment (NGH Environmental 2014) and the Biodiversity Assessment Addendum (NGH Environmental 2016a) the Federal approval for the project allows up to 66.94 hectares of habitat for the golden sun moth.

As per **Section 5.1.1** above, the project will result in impacts to 43.20 hectares of golden sun moth habitat (see **Figure 3.5**). This presents an impact reduction of 23.74 hectares for the golden sun moth. With 113.89 hectares of golden sun moth habitat identified within the Development Corridors, 70.69 hectares will persist beyond the extent of the Indicative Development Footprints.

5.5.4 Superb parrot

Through the Biodiversity Assessment (NGH Environmental 2014) and the Biodiversity Assessment Addendum (NGH Environmental 2016a) the Federal approval for the project allows up to 24.9 hectares of foraging habitat for the superb parrot. Importantly, this 24.9 hectares aligns with the Box Gum Woodland, not including the Derived Native Grasslands.

As per **Section 5.1.1** above, the project will result in impacts to 20.08 hectares of superb parrot habitat (see **Figure 3.5**). This presents an impact reduction of 4.82 hectares for the superb parrot. With 36.33 hectares of superb parrot habitat identified within the Development Corridors, 16.25 hectares will persist beyond the extent of the Indicative Development Footprints.

5.5.4.1 Hollow Bearing Tree Impacts

In addition to those Direct Impacts presented above that generate credits under BAM, documented here is a revised assessment of direct impacts to hollow bearing trees (HBTs) by the Project. The original Biodiversity Assessment (NGH Environmental 2014) estimated that 1,029 hollow bearing trees would be cleared. Through the response to submission phase of the existing approval, a more accurate quantitative assessment of hollow bearing trees was completed in the Biodiversity Assessment Addendum (NGH Environmental 2016a). This estimated that 893 hollow bearing trees would be impacted by the project.

The Biodiversity Assessment Addendum (NGH Environmental 2016a) concluded that impacts to 893 hollow bearing trees would be unlikely to result in an unacceptably high loss of habitat, loss of habitat function for native fauna or loss of stand structural complexity. Furthermore, the impacts were considered unlikely to have a population scale impact on common birds that are widely distributed and abundant (NGH Environmental 2016a).

There are no impact thresholds applicable to the removal of hollow bearing trees within the State Development Consent (DPE 2017). However, the EPBC Approval conditions limit the clearing of up to 170 hollow bearing trees within Box Gum Woodland. This assessment of hollow bearing trees being impacted has been limited entirely to those impacts on Vegetation Zones 3 and 4 as these are the only two vegetation zones applicable for the superb parrot.

The Biodiversity Assessment (NGH Environmental 2014) and Biodiversity Assessment Addendum (NGH Environmental 2016) did not discuss the average number of hollow bearing trees per hectare of each vegetation zone. As such, Umwelt has interpreted what information was provided to determine this.

The Biodiversity Assessment Addendum (NGH Environmental 2016a), presents a combined total of 50.2 hectares of Box Gum Woodland and associated derived grasslands were to be impacted by the Project. This includes 24.9 hectares of Box Gum Woodland and 25.3 hectares of Box Gum Woodland Derived Native Grasslands. A total of 170 hollow bearing trees for the superb parrot were to be impacted by the project within these vegetation communities. NGH Environmental (2016) noted that 1 hollow bearing tree had been calculated for each hectare of impact on Box Gum Woodland Derived Native Grasslands, equating to 25 hollow bearing trees (rounded) per hectare of this vegetation community. This therefore leaves 145 hollow bearing trees being impacted within the Box Gum Woodland, equating to 5.8 hollow bearing trees per hectare.

In addition to the hollow bearing tree impacts presented above in **Section 5.1.1.1**, following Umwelt's additional ecological surveys, an updated hollow bearing tree assessment has been prepared for the Project to provide added rigour around the extrapolation of hollow bearing tree impacts within Box Gum Woodland and associated Derived Native Grasslands being calculated for the project.

Umwelt completed numerous hollow bearing tree assessments within Vegetation Zones 3 and 4. These are detailed in **Table 5.11** below. It is important to note that although no hollow bearing trees were recorded in the sampling of Vegetation Zone 3, it is acknowledged that this community does comprise scattered trees and some of these will be hollow bearing trees. Consistent with the Biodiversity Assessment Addendum (NGH Environmental 2016a) Umwelt assumed 1 hollow bearing tree per hectare of Vegetation Zone 4.

Table 5.11 Umwelt Hollow Bearing Tree Assessments

Vegetation Zone	Area of Assessment	Number of HBT	Number of HBT/ha	Average Number of HBT/ha
3	0.1	4	40.0	15.7
3	0.25	2	8.0	
3	0.1	2	20.0	
3	0.1	3	30.0	
3	6.5	9	1.4	
3	0.1	1	10.0	
3	0.1	1	10.0	
3	0.1	4	40.0	
3	0.1	0	0.0	

Vegetation Zone	Area of Assessment	Number of HBT	Number of HBT/ha	Average Number of HBT/ha
3	1.6	26	16.3	
3	1.5	12	8.0	
3	1.8	28	15.6	
3	1.5	33	22.0	
3	1.13	14	12.4	
3	1.78	28	15.7	
3	1.12	1	0.9	
3	0.06	1	16.7	
4	0.1	0	0	1
4	0.1	0	0	
4	0.1	0	0	
4	0.1	0	0	
4	0.1	0	0	

Table 5.12 Box Gum Woodland Hollow Bearing Tree Updated Assessment

PCT and Condition	Vegetation Community[1]	Previous Impact Ratio (HBT/hectare)	Current Impact Ratio (HBT/hectare)	Average Impact Ratio (HBT/hectare)	Area of Impact				Extrapolated Hollow Bearing Tree Impacts [2]				
					DC	IDF - WF	IDF - PMM	IDF - ER	DC	IDF - WF	IDF - PMM	IDF - ER	Total of Indicative Development Footprints
350 *Moderate to Good Condition*	Box Gum Woodland	5.8	15.7	**10.7**	36.33	18.75	-	1.33	389	201	-	14	215
350 *Derived Native Grassland*	Box Gum Woodland Derived Native Grassland	1	1	**1**	32.71	16.85	-	0.67	33	17	-	1	18
Total									**422**	**218**	**-**	**15**	**233**

[1]Biodiversity Assessment Addendum (NGH Environmental 2016a)

[2] Averages are rounded up or down to the nearest whole number.

DC: Development Corridors; **IDF – WF**: Indicative Development Footprint – Wind Farm; **IDF – PMM**: Indicative Development Footprint – Permanent Met Masts; **IDF – ER**: Indicative Development Footprint – External Roads

As per **Table 5.12**, the Project will impact directly on a total of 233 hollow bearing trees, comprising 215 from Vegetation Zone 3 and comprising 18 from Vegetation Zone 4. Compared with the approved 170 hollow bearing trees within consistent vegetation communities, this is an increase of 63 HBTs suitable for superb parrot.

With 422 HBTs suitable for superb parrot calculated within the Development Corridor, 189 of these will be avoided by the Project. Of the 233 hollow bearing trees suitable for superb parrot being impacted by the Project, 15 have been calculated to occur within the Indicative Development Footprint – External Roads. Furthermore, as discussed in **Section 4**, approximately 232 HBTs suitable for the superb parrot identified along High Rock Road, Dalton Road, Rye Park Road and Blakney Creek South Road have been avoided by the modified project.

Offsets associated with these impacts are included within the credit requirement for these vegetation zones as described below in **Section 6.3.** As per Consent Condition 14 of the Federal approval (DoEE 2017), these impacts will need to be offset at a ratio of 10:1. This would total 2,330 hollow bearing trees.

6 Biodiversity Credit Impact Summary

6.1 Impacts Not Requiring Assessment

Under the BAM, impacts to areas of land without native vegetation do not require further assessment. The Indicative Development Footprints contains approximately 105.18 hectares of Non-native Vegetation, and 15.72 hectares of access track/roads, planted vegetation and waterbodies that will be removed as a result of the Project and does not require further assessment as they do not contain native vegetation. All Non-native Vegetation presented in **Figure 3.3** does not require further assessment in accordance with Section 10.4 of the BAM.

As discussed in **Section 3.2.2** and **Section 3.2.4** the extent of Non-native Vegetation within the Indicative Development Footprints was assessed within the South West Slopes and South East Highlands BAMCC cases. This assessment of Non-native Vegetation confirmed a Vegetation Integrity Score of 14.0 for South West Slopes and 11.9 for the South East Highlands, both lower than the threshold at which offsets are required.

6.2 Impacts Not Requiring Offset

Impacts on native vegetation not requiring offsets under the BAM include native vegetation that has a vegetation integrity score of less than 20 (where it is not associated with ecosystem-credit species habitat or a TEC), less than 17 (where it is associated with ecosystem-credit habitat or a VEC) or less than 15 (where it is representative of a EEC or CEEC).

As all native vegetation recorded within the Indicative Development Footprints has a higher vegetation integrity score than the required threshold, there are no areas of native vegetation impact not requiring offset.

6.3 Impacts Requiring Offset

Four PCTs and five species-credit species are considered to require offsetting in accordance with the BAM (OEH 2017a). **Table 6.1** summarises this outcome.

In relation to impacts of the Indicative Development Footprints, associated with Vegetation Zones 3 and 4, it is important to note that a majority of these impacts include TECs (refer to **Table 5.7**). Therefore, particular offset rules will apply. This alignment with TECs does not result in additional credits to those presented below.

For Vegetation Zone 3, 20.08 hectares aligns with White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act (9.93 hectares within SWS IBRA and 10.15 hectares within SEH IBRA) and 19.38 hectares aligns with *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC* under the EPBC Act (9.24 hectares within SWS IBRA and 10.14 hectares within SEH IBRA).

For Vegetation Zone 4, 17.42 hectares aligns with White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act (11.79 hectares within SWS IBRA and 5.63 hectares within SEH IBRA) and 16.35 hectares aligns with *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC* under the EPBC Act (11.11 hectares within SWS IBRA and 5.24 hectares within SEH IBRA).

Table 6.1 Impacts Requiring Offset

Veg Zone	PCT/Species-credit	Vegetation Integrity Score			Area (ha) [1]	Credits Required
		Current	Future[1]	Change [1]		
Ecosystem Credits						
NSW – South Western Slopes IBRA Bioregion						
1	289 Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good*	74.9	0	-74.9	0.78	**26**
2	335 Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good*	47.9	0	47.9	4.77	**114**
3	350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Moderate to Good*	76.2	0 (32.9)	-76.2 (-43.3)	5.66 (4.27)	**308**
4	350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Derived Native Grassland*	34.3	0	-34.3	11.89	**204**
5	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Moderate to Good*	81.7	0 (36.9)	-81.7 (-44.7)	43.93 (9.63)	**1,758**
6	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Derived Native Grassland*	20.2	0	-20.2	128.70	**1,137**

Veg Zone	PCT/Species-credit	Vegetation Integrity Score			Area (ha) [1]	Credits Required
		Current	Future[1]	Change [1]		
7	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Acacia Shrubland*	46.7	0	-46.7	2.98	**61**
8	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Sifton Bush Shrubland*	23.4	0	-23.4	66.15	**678**
9	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Argyle Apple Forest*	68.6	0	-68.6	0.62	**19**
South Eastern Highlands IBRA Bioregion						
1	289 Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good*	-	-	-	-	**-**
2	335 Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion *Moderate to Good*	30.4	0	-30.4	0.73	**11**
3	350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Moderate to Good*	65.0	0 (24.8)	-65.0 (-40.2)	5.38 (4.77)	**271**

Veg Zone	PCT/Species-credit	Vegetation Integrity Score			Area (ha) [1]	Credits Required
		Current	Future[1]	Change [1]		
4	350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion *Derived Native Grassland*	35.5	0	-35.5	5.63	**100**
5	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Moderate to Good*	79.6	0 (31.4)	-79.6 (-48.2)	23.07 (8.18)	**976**
6	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Derived Native Grassland*	22.0	0	-22.0	45.29	**436**
7	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Acacia Shrubland*	50.9	0 (28.1)	-50.9 (-22.9)	2.74 (2.81)	**89**
8	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Sifton Bush Shrubland*	25.3	0	-25.3	18.03	**199**
9	351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion *Argyle Apple Forest*	-	-	-	-	**-**

Veg Zone	PCT/Species-credit	Vegetation Integrity Score			Area (ha) [1]	Credits Required
		Current	Future[1]	Change [1]		
Species Credits						
NSW – South Western Slopes IBRA Bioregion						
-	striped legless lizard (*Delma impar*)	-	-	-	3.58	**27**
-	southern myotis (*Myotis macropus*)	-	-	-	0.03	**1**
-	squirrel glider (*Petaurus norfolcensis*)	-	-	-	62.17	**2,270**
-	superb parrot (breeding habitat) (*Polytelis swainsonii*)	-	-	-	9.93	**308**
-	golden sun moth (*Synemon plana*)	-	-	-	21.63	**335**
South Eastern Highlands IBRA Bioregion						
-	squirrel glider (*Petaurus norfolcensis*)	-	-	-	40.80	**1,365**
-	superb parrot (breeding habitat) (*Polytelis swainsonii*)	-	-	-	10.15	**271**
-	golden sun moth (*Synemon plana*)	-	-	-	21.57	**381**

[1] Values in parentheses indicate those assessed as partial impacts within the Transmission Line Corridors refer to **Section 5.1.1**.

7 Biodiversity Credit Report

A full Biodiversity Credit Report is included in **Appendix G**.

8 Biodiversity Offset Strategy

RPRE is committed to delivering a biodiversity offset strategy that appropriately compensates for the unavoidable loss of ecological values as a result of the Project.

As discussed in **Section 4.0**, RPRE has, where possible, optimised the Project (including the Development Corridors and Indicative Development Footprints) to avoid and minimise ecological impacts in the Project planning stage.

Additionally, the Indicative Development Footprints will be finalised once turbine and contractor(s) are selected by RPRE. In doing so, RPRE will seek to further minimise impacts to biodiversity values. Additionally, a range of impact mitigation strategies are proposed through the future BMP to mitigate the impact on ecological values prior to the consideration of offsetting requirements. The offset requirements for the Project, as calculated in accordance with the BAM are identified in **Section 6.0**.

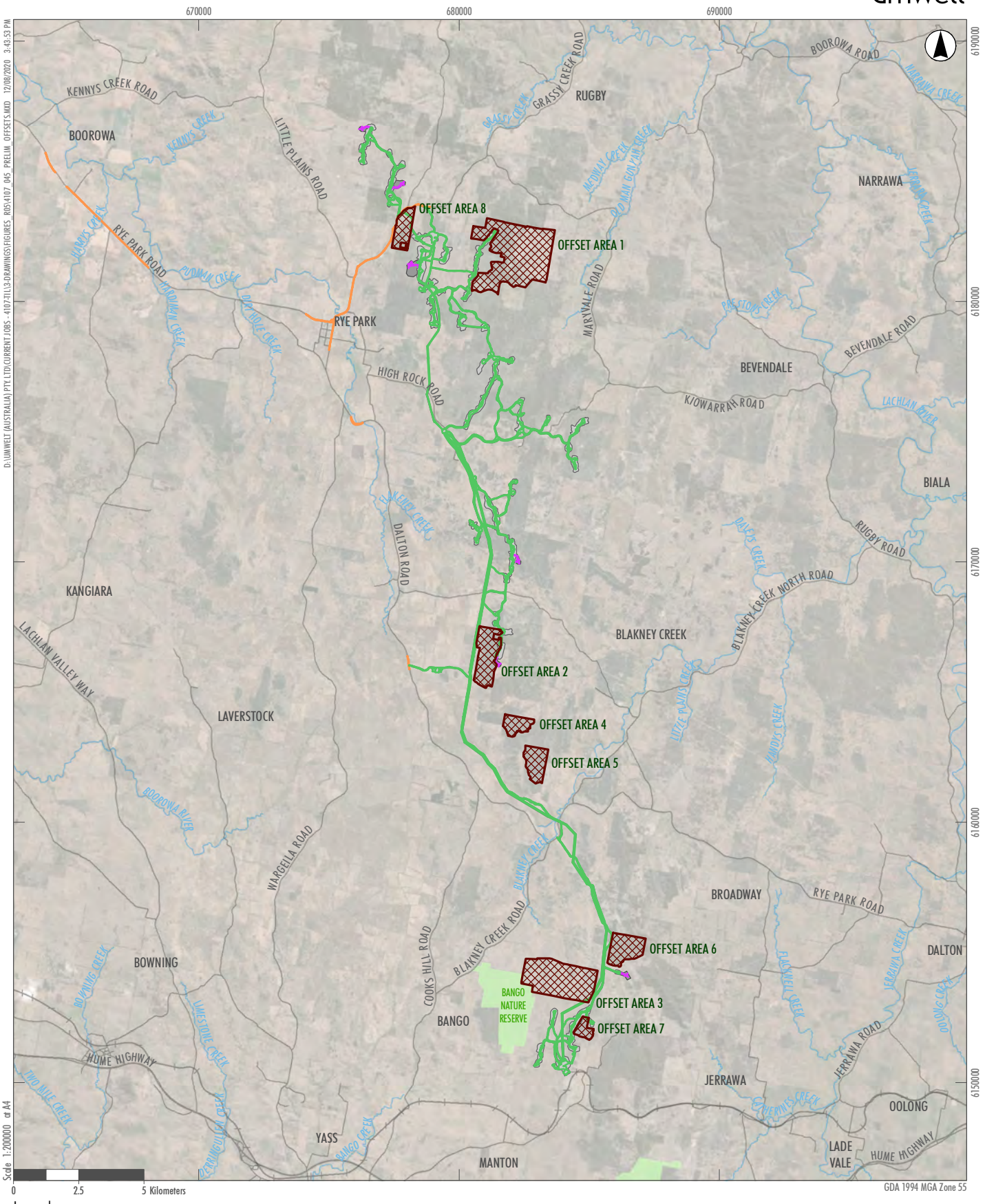
The offset strategy will be implemented in consideration of the process outlined in the BC Act and the final composition of the offset strategy may evolve as the Project progresses.

The biodiversity offset strategy will be developed during the assessment process in consultation with the BCD and DPIE and based on the credits required to be retired to offset the impacts of the Project as specified in **Section 6.3** and the offset options available under the BC Act and BC Regulation including:

- Land based offsets through the establishment of new Stewardship Sites (and subsequent retirement of credits) or by retiring credits from existing Stewardship Sites. RPRE would retire the required number and class of credits determined in accordance with the BDAR and the offset rules in the BC Regulation.
- Securing (purchasing) credits through the open credit market, and/or
- Paying into to the Biodiversity Conservation Fund (BCF).

Eight potential offset sites have been identified within parcels of land adjacent to the Project. These sites have had varying degrees of ecological surveys completed on them to consider their offset suitability for the Project. Through consideration of their size and potential credit generation, there are five potential offset sites likely to be further investigated for offset purposes. These are currently the priority sites of consideration for land-based offsets for the Project. In addition to these, RPRE have engaged Umwelt to complete a strategic investigation of potentially suitable land-based offset sites at a regional scale that may be suitable for this Project as well as another one of their proposed wind farm projects.

The five potential offset sites (**Figure 8.1**) have, based on a range of preliminary surveys, the potential to generate ecosystem and species credits consistent with those impacted by the Project. This includes PCTs 298, 335, 350 and 351 ecosystem credits. Species credits species likely to generate credits on the five potential offset sites are golden sun moth (*Synemon plana*), superb parrot (*Polytelis swainsonii*) and squirrel glider (*Petaurus norfolcensis*).



Legend

- Development Corridor - Wind Farm
- Development Corridor - Permanent Met Masts
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - Permanent Met Masts
- Indicative Development Footprint - External Roads
- Preliminary Offset Investigation Sites
- Nature Reserves
- Watercourses

FIGURE 8.1

Preliminary Offset Investigation Sites

Image Source: ESRI Basemap (2020) Data source: Geoscience Australia; Australian Government Department of the Environment (2012); OEH (2008); Umwelt (2020); Rye Park Renewable Energy Pty Ltd (2020)

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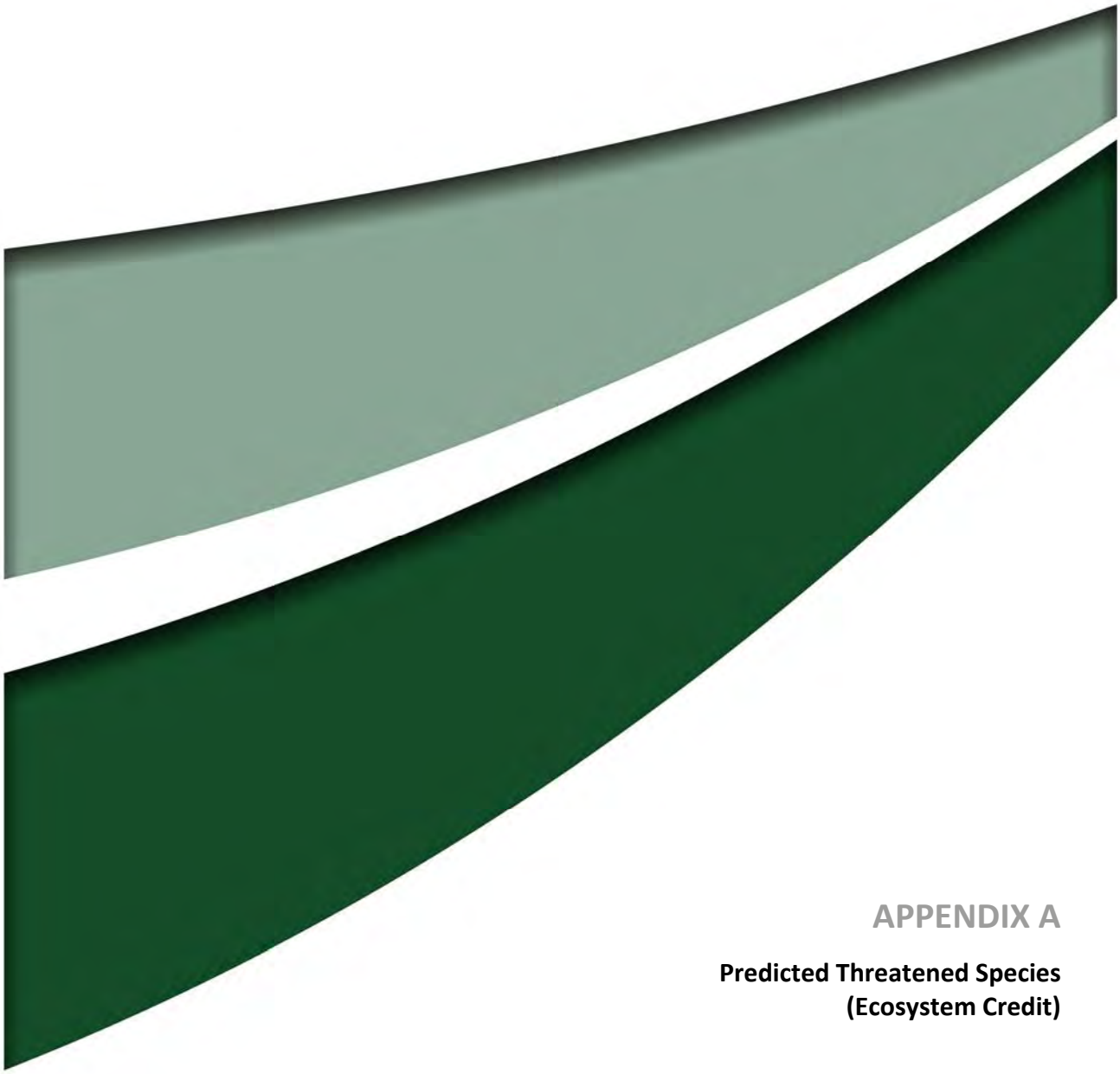


APPENDIX A

Predicted Threatened Species (Ecosystem Credit)

Predicted Threatened Species (Ecosystem Credit)

Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint	IBRA Region/Subregion	Vegetation Zone Prediction
Regent Honeyeater (foraging) *Anthochaera phrygia*	CE	CE	High	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
Dusky Woodswallow *Artamus cyanopterus*	V	-	Moderate	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						335-Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Gang-gang Cockatoo (foraging) *Callocephalon fimbriatum*	V	V	Moderate	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion

Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint	IBRA Region/Subregion	Vegetation Zone Prediction
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Speckled Warbler *Chthonicola sagittata*	V	-	High	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Spotted Harrier *Circus assimilis*	V	-	Moderate	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	335-Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion
Brown Treecreeper (eastern subspecies) *Climacteris picumnus victoriae*	V	-	High	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion

Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint	IBRA Region/Subregion	Vegetation Zone Prediction
Varied Sittella *Daphoenositta chrysoptera*	V	-	Moderate	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Spotted-tailed Quoll *Dasyurus maculatus*	V	E	High	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Black-necked Stork *Ephippiorhynchus asiaticus*	E	-	Moderate	-	NSW South Western Slopes/Inland Slopes	335-Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion
Eastern False Pipistrelle *Falsistrellus tasmaniensis*	V	-	High	-	NSW South Western Slopes/Inland Slopes	350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion

Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint	IBRA Region/Subregion	Vegetation Zone Prediction
Little Lorikeet *Glossopsitta pusilla*	V	-	High	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
Painted Honeyeater *Grantiella picta*	V	V	Moderate	Other; Mistletoes present at a density of greater than five mistletoes per hectare	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
White-bellied Sea-Eagle (foraging) *Haliaeetus leucogaster*	V	-	High	Waterbodies; Within 1 km of a river, lake, large dam or creek, wetland and coastline.	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						335-Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
Little Eagle (foraging) *Hieraaetus morphnoides*	V	-	Moderate	-	South Eastern Highlands/Murrumbateman NSW South Western	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion

Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint	IBRA Region/Subregion	Vegetation Zone Prediction
					Slopes/Inland Slopes	335-Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Swift Parrot (foraging) ***Lathamus discolor***	E	CE	Moderate	-	NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
Square-tailed Kite (foraging) ***Lophoictinia isura***	V	-	Moderate	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
Hooded Robin (south-eastern form) ***Melanodryas cucullata***	V	-	Moderate	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion

Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint	IBRA Region/Subregion	Vegetation Zone Prediction
Black-chinned Honeyeater (eastern subspecies) ***Melithreptus gularis***	V	-	Moderate	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
Large Bent-winged Bat (foraging) ***Miniopterus orianae oceanensis***	V	-	High	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Turquoise Parrot ***Neophema pulchella***	V	-	High	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Barking Owl (foraging) ***Ninox connivens***	V	-	High	-	NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern

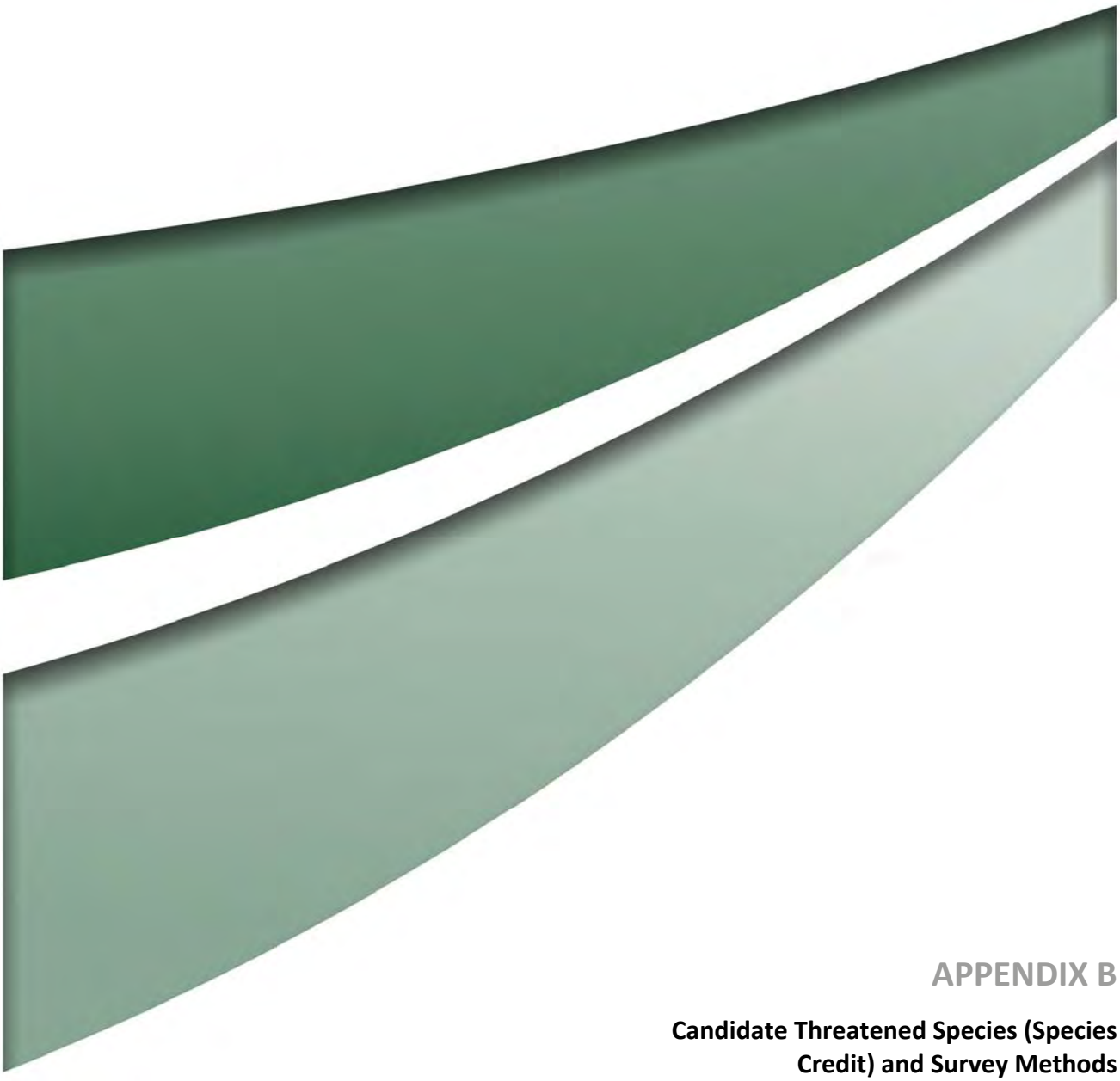
Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint	IBRA Region/Subregion	Vegetation Zone Prediction
						Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Powerful Owl (foraging) ***Ninox strenua***	V	-	High	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Blue-billed Duck ***Oxyura australis***	V	-	Moderate	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	335-Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion
Yellow-bellied Glider ***Petaurus australis***	V	-	High	Hollow bearing trees; Hollows > 25 cm diameter	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Scarlet Robin ***Petroica boodang***	V	-	Moderate	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion

Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint	IBRA Region/Subregion	Vegetation Zone Prediction
Flame Robin *Petroica phoenicea*	V	-	Moderate	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Koala (foraging) *Phascolarctos cinereus*	V	V	High	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Superb Parrot (foraging) *Polytelis swainsonii*	V	V	Moderate	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
Grey-crowned Babbler (eastern subspecies) *Pomatostomus temporalis*	V	-	Moderate	-	NSW South Western Slopes/Inland Slopes	350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion

Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint	IBRA Region/Subregion	Vegetation Zone Prediction
Grey-headed Flying-fox (foraging) ***Pteropus poliocephalus***	V	V	High	-	NSW South Western Slopes/Inland Slopes	351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Yellow-bellied Sheathtail-bat ***Saccolaimus flaviventris***	V	-	High	-	NSW South Western Slopes/Inland Slopes	350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Greater Broad-nosed Bat ***Scoteanax rueppellii***	V	-	High	-	South Eastern Highlands/Murrumbateman	350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
Diamond Firetail ***Stagonopleura guttata***	V	-	Moderate	-	South Eastern Highlands/Murrumbateman NSW South Western Slopes/Inland Slopes	289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion
						350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion
						351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Masked Owl (foraging) ***Tyto novaehollandiae***	V	-	High	-	NSW South Western Slopes/Inland Slopes	351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion
Rosenberg's Goanna ***Varanus rosenbergi***	V	-	High	East of Holbrook area; eastern third of	South Eastern Highlands/Murrumbateman	350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern

Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint	IBRA Region/Subregion	Vegetation Zone Prediction
				subregion, south-east of a line that runs between Tarcutta and Galong	NSW South Western Slopes/Inland Slopes	Highland Bioregion
Australasian Bittern^ ***Botaurus poiciloptilus***	E	E	Moderate	-	-	Nil
Eastern Curlew^ ***Numenius madagascariensis***	-	CE	High	-	-	Nil
Australian Painted Snipe^ ***Rostratula australis***	E	E	Moderate	-	-	Nil
Corben's Long-eared Bat^ ***Nyctophilus corbeni***	V	V	High	-	-	Nil

^Predicted by literature review and therefore do not have an IBRA Region/Subregion or Vegetation Zone Prediction applicable to the BAM Calculator.



APPENDIX B

Candidate Threatened Species (Species Credit) and Survey Methods

Predicted Threatened Species (Species Credit) and Survey Methods

Species	BC Act	EPBC Act	Survey Period	IBRA Region/Subregion	Habitat Constraint / Geographic Constraint	SAII Entity	Survey Method and Justification
Flora Species							
Acacia meiantha ***Acacia meiantha***	E	E	Jul-Oct	NSW South Western Slopes - Inland Slopes		Yes	**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Meandering Transects were undertaken across the Development Corridor and Indicative Development Footprint – External Roads in September 2017, October 2017, July 2019, August 2019 and September 2019 (Umwelt) and a combination of meandering and targeted parallel searches were undertaken in October 2011, October 2014 (NGH Environmental 2014 and 2016a). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Yass Daisy ***Ammobium craspedioides***	V	V	Sep-Nov	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes	West of Federal Highway; South of Cowra		**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Meandering and targeted parallel transects were undertaken across the Development Corridor and Indicative Development Footprint – External Roads in September 2017, October 2017, December 2017, September 2019 and November 2019 (Umwelt); and a combination of meandering and targeted parallel searches were undertaken in October 2011, November 2011 and November 2013 (NGH Environmental 2014 and 2016a). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Crimson Spider Orchid ***Caladenia concolor***	E	V	Sep	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes	West of Jingellic	Yes	**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Parallel transects were walked between 10 m apart across suitable habitat during survey periods across September and October 2017 (Umwelt); and October 2014, November 2013 and November 2011 (NGH Environmental 2014 and 2016a). Meandering transects were also undertaken within potential habitat for the species across the Development Corridor and Indicative Development Footprint – External Roads in September 2017, November 2017 and September 2019, providing opportunistic observations. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Black Gum ***Eucalyptus aggregata***	V	V	All year	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes	The far eastern sub-region (in ranges)		**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Meandering transects were undertaken in September, October and December 2017, January and March 2018, April, September, November and December 2019, January and February 2020 (Umwelt). Surveys completed by NGH Environmental included meandering transects in October and November 2011, November 2013 and June 2015 (2014 and 2016a). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Robertson's Peppermint ***Eucalyptus robertsonii* subsp. *hemisphaerica***	V	V	All year	NSW South Western Slopes - Inland Slopes			**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Meandering transects were undertaken in September, October and December 2017, January and March 2018, April, September, November and December 2019, January and February 2020 (Umwelt). Surveys completed by NGH Environmental included meandering transects in October and November 2011, November 2013 and June 2015 (2014 and 2016a). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).

Species	BC Act	EPBC Act	Survey Period	IBRA Region/Subregion	Habitat Constraint / Geographic Constraint	SAII Entity	Survey Method and Justification
Tarengo Leek Orchid ***Prasophyllum petilum***	E	E	Sep-Dec	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes	East of Binalong, south and east of Boorowa		**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Parallel and meandering transects were undertaken in September, October and December 2017, while meandering transects were undertaken in September, November and December 2019, and January 2020 (Umwelt). Surveys completed by NGH Environmental included targeted and meandering transects in October and November 2011 and November 2013 (2014 and 2016a). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Small Purple-pea ***Swainsona recta***	E	E	Sep-Nov	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes			**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Meandering Transects were undertaken across the Development Corridor and Indicative Development Footprint – External Roads in September 2017, October 2017 and September, November and December 2019 (Umwelt). Meandering searches were undertaken in October and November 2011, and November 2013 (NGH). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Silky Swainson-pea ***Swainsona sericea***	V	-	Sep-Nov	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes	The southern half of subregion		**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Meandering Transects were undertaken across the Development Corridor and Indicative Development Footprint – External Roads in September 2017, October 2017 and September, November and December 2019 (Umwelt). Meandering searches were undertaken in October and November 2011, and November 2013 (NGH Environmental 2014 and 2016a). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Floating Swamp Wallaby-grass^ ***Amphibromus fluitans***	V	V	Dec-March	-	Semi-permanent/ephemeral wet areas		**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Closest record is in Crookwell, NSW, approximately 50km north east of the Project. Meandering Transects were undertaken across the Development Corridor and Indicative Development Footprint – External Roads in December 2017, January 2018, February 2018, November 2019, December 2019, January 2020 and February 2020 (Umwelt). Meandering searches were undertaken in November 2011, and November 2013 (NGH). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Button Wrinklewort^ ***Rutidosis leptorrhyncoides***	E	E	All year	-			**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Closest record is Goulburn, NSW, approximately 70km east of the Project. Meandering transects were undertaken in September, October and December 2017, January and March 2018, April, September, November and December 2019, and January 2020 (Umwelt). Surveys completed by NGH included meandering transects in October and November 2011, November 2013 and June 2015. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).

Species	BC Act	EPBC Act	Survey Period	IBRA Region/Subregion	Habitat Constraint / Geographic Constraint	SAII Entity	Survey Method and Justification
Austral Toadflax^ ***Thesium australe***	V	V	Nov-Feb	-			**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Closest record is south of Canberra, NSW, approximately 80km south of the Project. Meandering Transects were undertaken across the Development Corridor and Indicative Development Footprint – External Roads in December 2017, January 2018, February 2018, November 2019, December 2019, January 2020 and February 2020 (Umwelt). Meandering searches were undertaken in November 2011, and November 2013 (NGH). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Fauna Species							
Regent Honeyeater (Breeding) ***Anthochaera phrygia***	CE	CE	None provided	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes		Yes	**Not present (surveyed). No species records occur within 10 km of the Indicative Development Footprints. The BAM Support Team confirmed on 20 February 2020 that the Indicative Development Footprints are not within an important area for this species.** Meandering transects were undertaken across the Development Corridor and Indicative Development Footprint – External Roads in September, October and December 2017; January, February and March 2018; April, September, November and December 2019; and January 2020 (Umwelt). Bird surveys were undertaken in October 2017, January 2018, February 2018 and March 2018 (Umwelt). Bird surveys involved undertaking a short meandering transect over a period of 30 minutes while recording any bird species observed or heard during this period. Call playback for the regent honeyeater was undertaken in October 2017 (Umwelt). This involved a period of quiet listening for five minutes, followed by playing the animal's calls over a 15 watt directional loud hailer for five minutes, followed by a ten-minute quiet listening period. Bird Utilisation surveys were undertaken in February, March, October and November 2018, as well as in January and February 2019 (Umwelt). Bird Utilisation surveys were also undertaken in November 2013 (NGH Environmental 2014 and 2016a). Bird utilisation and raptor vantage surveys involved a visual assessment of the species and habit (e.g. feeding, perching, flying) of all observed bird species from a high vantage point in the landscape. This also involved recording the height that each bird was observed at. Opportunistic observations were made over all Umwelt survey periods. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Pink-tailed Legless Lizard ***Aprasia parapulchella***	V	V	Sep-Nov	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes	West of Dalton; Rocky areas or within 50 metres of rocky areas		**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Diurnal reptile searches were undertaken in September and October 2017 (Umwelt). These searches involved turning logs and rocks in suitable habitat for a period of 30 minutes. Meandering transects were undertaken in November 2019 and logs and rocks were opportunistically turned to search for reptiles (Umwelt). Active reptile searches, including rolling of logs, rocks and branches was undertaken across 11 searches in November 2011 by NGH (NGH Environmental 2014 and 2016a). Tile grid arrays were also completed by NGH Environmental (2014 and 2016a). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).

Species	BC Act	EPBC Act	Survey Period	IBRA Region/Subregion	Habitat Constraint / Geographic Constraint	SAII Entity	Survey Method and Justification
Bush Stone-curlew *Burhinus grallarius*	E	-	All year	NSW South Western Slopes - Inland Slopes	Fallen/standing dead timber including logs		**Not present (surveyed). No species records occur within 10 km of the Indicative Development Footprints.** Meandering transects were undertaken across numerous survey periods in September, October and December 2017; January, February, and March 2018; April, September, November and December 2019; and January 2020 (Umwelt). Spotlighting transects and nocturnal surveys were undertaken in October 2017, January 2018, February and March 2018 (Umwelt). Suitable fallen logs were inspected. Bird utilisation surveys were undertaken in October and November 2018; and January and February 2019 (Umwelt). Spotlighting and nocturnal surveys were also undertaken in November 2013 (NGH Environmental 2014). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Gang-gang Cockatoo (Breeding) *Callocephalon fimbriatum*	V	V	Oct-Jan	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes			**Not present (surveyed).** Records occur within 10 km of the Indicative Development Footprints, however no individuals were observed across extensive survey periods. Meandering transects for opportunistic sightings were undertaken in October and December 2017; January 2018; November and December 2019; and January 2020 (Umwelt). General bird surveys were undertaken in October 2017 and January 2018 (Umwelt). Bird surveys involved a undertaking a short meandering transect over a period of 30 minutes while recording any bird species observed or heard during this period. Bird utilisation surveys were undertaken in October 2018, November 2018, January 2019 and February 2019 (Umwelt). Bird utilisation surveys involved a visual assessment of the species and habit (e.g. feeding, perching, flying) of all observed bird species from a high vantage point in the landscape. General bird surveys and bird utilisation surveys were also undertaken in November 2013 (NGH Environmental 2014). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Eastern Pygmy-possum *Cercartetus nanus*	V	-	Oct-Mar	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes			**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Spotlighting and nocturnal surveys were undertaken in October 2017, January 2018, February 2018 and March 2018. Spotlighting involved walking meandering transects in suitable habitat between sunset and midnight with a high powered headtorch to search for nocturnal animals. Spotlighting transects were surveyed over a period of 30 minutes or more per site. Remote cameras were installed across the Development Corridor and Indicative Development Footprint – External Roads in February and March 2018, April and November 2019. Bushnell Trophy Cam HD cameras were installed 1 metre above the ground pointing at a bait station containing honey, peanut butter and tuna. Cameras were set to take three photos in quick succession when movement was detected. Opportunistic observations were completed across all Umwelt survey periods. Cage-trapping surveys were also completed in April 2012 as well as spotlighting surveys in November 2011, April 2012 and November 2013 by NGH Environmental (NGH Environmental 2014 and 2016a). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Large-eared Pied Bat *Chalinolobus dwyeri*	V	V	Nov-Jan	NSW South Western Slopes - Inland Slopes		Yes	**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Echolocation surveys were conducted over 52 nights across the Development Corridor and Indicative Development Footprint – External Roads using a number of Titley Scientific Anabat Express detectors. Survey periods included November 2018; January and February 2019; March and April 2019; and January 2020. At each site, the Anabat was positioned one metre above the ground and positioned towards potential micro-bat flyaways along areas of

Species	BC Act	EPBC Act	Survey Period	IBRA Region/Subregion	Habitat Constraint / Geographic Constraint	SAII Entity	Survey Method and Justification
							suitable habitat. The Anabat detector was programmed to start recording from one hour before sunset to one hour after sunrise. Opportunistic observations were made during all nocturnal and spotlighting surveys (Umwelt). Spotlighting and nocturnal surveys conducted in November 2013 also targeted this species (NGH). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Striped Legless Lizard ***Delma impar***	V	V	Sep-Dec	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes			**Present (previously recorded).** This species was previously recorded by NGH Environmental. A single record was made at one location to the north of the Development Site. Derived Native Grassland is considered to be suitable habitat for the species only in close proximity to the record. Diurnal reptile searches were undertaken in September and October 2017 (Umwelt). These searches involved turning logs and rocks in suitable habitats or a period of 30 minutes. Meandering transects were undertaken in November and December 2019 and logs and rocks were opportunistically turned to search for reptiles (Umwelt). Active reptile searches, including rolling of logs, rocks and branches was undertaken across 11 searches in November 2011 by NGH (NGH Environmental 2014). Tile grids were installed by NGH in July 2013 and monitored in November and December 2013 for presence of striped legless lizard, and 24 targeted funnel trap surveys were monitored over four nights in November 2013. Habitat assessments were undertaken for this species in March 2014 (NGH Environmental 2014 and 2016a).
White-bellied Sea-Eagle (Breeding) ***Haliaeetus leucogaster***	V	-	Jul-Dec	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes			**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. A combination of meandering transects and opportunistic observations were made in September, October and December 2017, September, October and December 2019 and January 2010 to determine the presence of large stick nests (Umwelt). Bird Utilisation and Raptor Vantage surveys were undertaken in October and November 2018 and July 2019 (Umwelt). Bird surveys and Bird Utilisation surveys were also undertaken in November 2013 (NGH). Bird utilisation and raptor vantage surveys involved a visual assessment of the species and habit (e.g. feeding, perching, flying) of all observed bird species from a high vantage point in the landscape. This also involved recording the height at which each bird was observed. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Little Eagle (Breeding) ***Hieraaetus morphnoides***	V	-	Aug-Oct	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes			**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Habitat assessments were undertaken to determine whether suitable habitat for this species was present in September and October 2017. Opportunistic observations were undertaken across all Umwelt survey periods. Bird Utilisation and Raptor Vantage surveys were undertaken in October and November 2018 and July 2019 (Umwelt). Bird surveys and Bird Utilisation surveys were also undertaken in November 2013 (NGH). Bird utilisation and raptor vantage surveys involved a visual assessment of the species and habit (e.g. feeding, perching, flying) of all observed bird species from a high vantage point in the landscape. This also involved recording the height that each bird was observed at. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Swift Parrot (Breeding) ***Lathamus discolor***	E	CE	None provided	NSW South Western Slopes - Inland Slopes		Yes	**Not present (surveyed). The BAM Support Team confirmed on 20 February 2020 that the Indicative Development Footprints are not within an important area for this species.** No species records occur within 10km of the Indicative Development Footprints. Meandering transects for opportunistic sightings were undertaken in September,

Species	BC Act	EPBC Act	Survey Period	IBRA Region/Subregion	Habitat Constraint / Geographic Constraint	SAII Entity	Survey Method and Justification
							October and December 2017; January, February and March 2018; April, September, November and December 2019; and January 2020 (Umwelt). Bird utilisation surveys were undertaken in October 2018, November 2018, January 2019 and February 2019 (Umwelt). Bird utilisation surveys involved a visual assessment of the species and habit (e.g. feeding, perching, flying) of all observed bird species from a high vantage point in the landscape. Call playback and bird surveys were undertaken in October 2017 (Umwelt). Bird surveys involved a undertaking a short meandering transect over a period of 30 minutes while recording any bird species observed or heard during this period. Call playback involved a period of quiet listening for five minutes, followed by playing the animal's calls over a 15 watt directional loud hailer for five minutes, followed by a ten-minute quiet listening period. Point count (bird census) surveys were also undertaken by NGH in July 2013, targeting this species. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Green and Golden Bell Frog ***Litoria aurea***	E	V	Nov-Mar	South Eastern Highlands - Murrumbateman	Semi-permanent/ephemeral wet areas; within 1 kilometre of wet areas, swamps or waterbody		**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Diurnal amphibian searches were undertaken in January, February and March 2018. This involved active searches within suitable habitats. Nocturnal spotlighting searches were undertaken in suitable habitat areas between sunset and midnight using 30 watt Lightforce hand-held spotlights and head torches. These surveys occurred in January, February and March 2018; December 2019; and January 2020. Call playback for this species was undertaken in February and March 2018; December 2019; and January 2020. This involved a period of quiet listening for five minutes, followed by playing the animal's calls over a 15 watt directional loud hailer for five minutes, followed by a ten-minute quiet listening period. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Booroolong Frog ***Litoria booroolongensis***	E	E	Nov-Dec	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes			**Not present (surveyed).** No species records occur within 1 0km of the Indicative Development Footprints. Diurnal amphibian searches were undertaken in October 2017; and January, February and March 2018. This involved active searches within suitable habitats. Nocturnal spotlighting searches were undertaken in suitable habitat areas between sunset and midnight using 30 watt Lightforce hand-held spotlights and head torches. These surveys occurred in October 2017; January, February and March 2018; December 2019; and January 2020. Call playback for this species was undertaken in October 2017; January February and March 2018; December 2019; and January 2020. This involved a period of quiet listening for five minutes, followed by playing the animal's calls over a 15 watt directional loud hailer for five minutes, followed by a ten-minute quiet listening period. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Yellow-spotted Tree Frog ***Litoria castanea***	CE	E	Nov-Dec	South Eastern Highlands - Murrumbateman		Yes	**Not present (surveyed).** Records occur within 10 km of the Indicative Development Footprints, however no individuals were observed across any Umwelt survey periods. Nocturnal spotlighting searches were undertaken in suitable habitat areas between sunset and midnight using 30 watt Lightforce hand-held spotlights and head torches. These surveys occurred in December 2019 and January 2020. Call playback for this species was undertaken in December 2019 and January 2020. This involved a period of quiet listening for five minutes, followed by playing the animal's calls over a 15 watt directional loud hailer for five minutes, followed by a ten-minute quiet listening period. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).

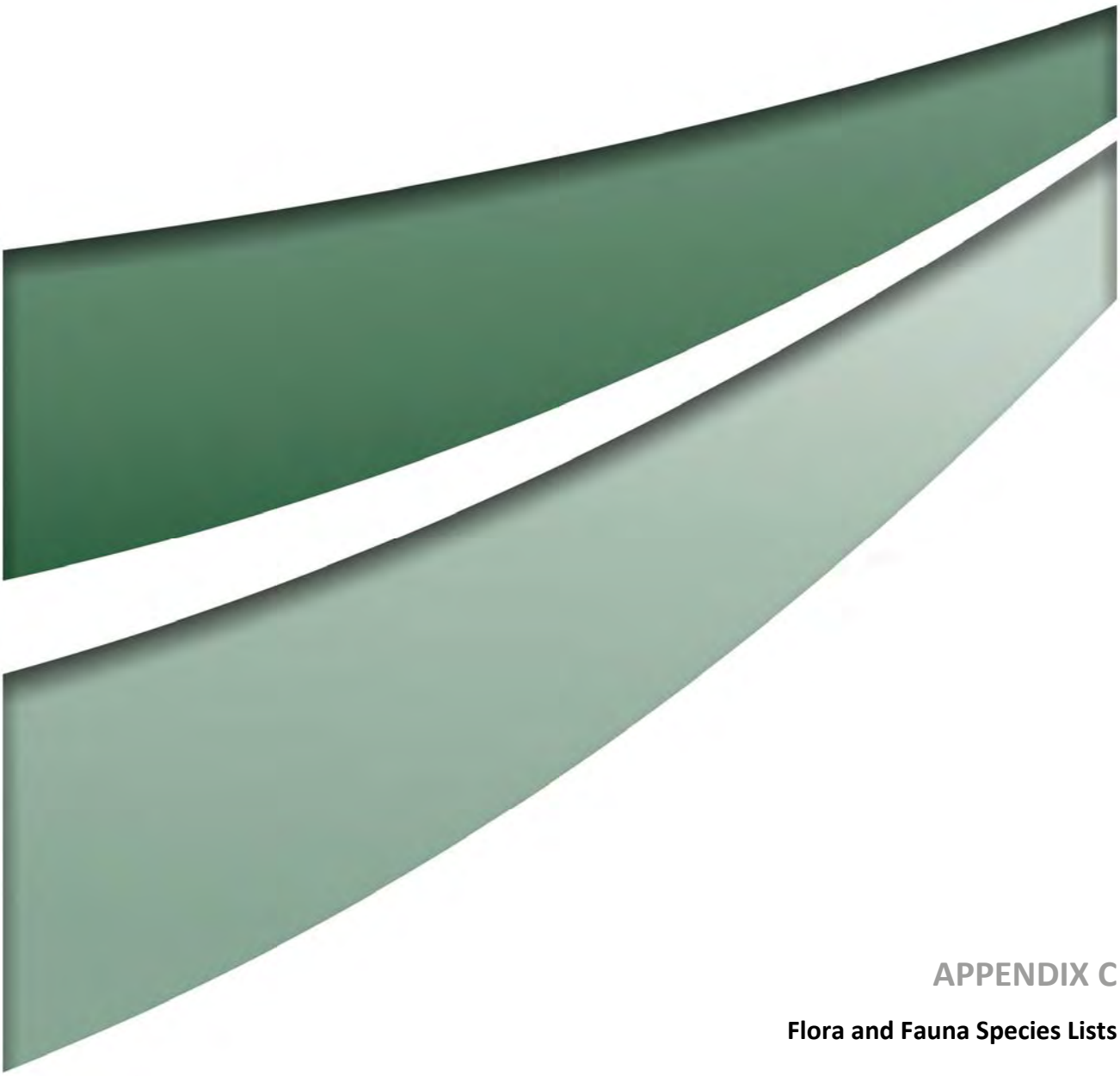
Species	BC Act	EPBC Act	Survey Period	IBRA Region/Subregion	Habitat Constraint / Geographic Constraint	SAII Entity	Survey Method and Justification
Southern Bell Frog ***Litoria raniformis***	E	V	Oct-Jan	NSW South Western Slopes - Inland Slopes			**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Diurnal amphibian searches were undertaken in October 2017; and January, February and March 2018. This involved active searches within suitable habitats. Nocturnal spotlighting searches were undertaken in suitable habitat areas between sunset and midnight using 30 watt Lightforce hand-held spotlights and head torches. These surveys occurred in October 2017; January, February and March 2018; December 2019; and January 2020. Call playback for this species was undertaken in October 2017; February and March 2018; December 2019; and January 2020. This involved a period of quiet listening for five minutes, followed by playing the animal's calls over a 15 watt directional loud hailer for five minutes, followed by a ten-minute quiet listening period. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Square-tailed Kite (Breeding) ***Lophoictinia isura***	V	-	Sep-Jan	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes			**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. A combination of meandering transects and opportunistic observations were made in September, October and December 2017; January 2018; September, October and December 2019; and January 2010 to determine the presence of large stick nests (Umwelt). Bird Utilisation and Raptor Vantage surveys were undertaken in October and November 2018; and January, February and July 2019 (Umwelt). Bird surveys and Bird Utilisation surveys were also undertaken in November 2013 (NGH). Bird utilisation and raptor vantage surveys involved a visual assessment of the species and habit (e.g. feeding, perching, flying) of all observed bird species from a high vantage point in the landscape. This also involved recording the height that each bird was observed at. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Large Bent-winged Bat (Breeding) ***Miniopterus orianae oceanensis***	V	-	Dec-Feb	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes		Yes	**Species recorded within the Indicative Development Footprints, but no breeding habitat is present (surveyed).** Echolocation surveys were conducted over 52 nights across the Indicative Development Footprints using a number of Titley Scientific Anabat Express detectors. Survey periods included November 2018; January and February 2019; March and April 2019; and January 2020. At each site, the Anabat was positioned one metre above the and positioned towards potential micro-bat flyaways along areas of suitable habitat. The Anabat detector was programmed to start recording from one hour before sunset to one hour after sunrise. Opportunistic observations were made during all nocturnal and spotlighting surveys (Umwelt). Spotlighting and nocturnal surveys conducted in November 2013 also targeted this species (NGH).
Southern Myotis ***Myotis macropus***	CE	E	Oct-Mar	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes			**Assumed present (surveyed).** Breeding habitat for this species was calculated within the Indicative Development Footprints. All woodland and forest habitat in the Indicative Development Footprints within 200m of a suitably sized waterway is considered to be suitable habitat for the species. In relation to the Indicative Development Footprints, only patches of remnant vegetation within 200 metres of Pudman Creek at Grassy Creek Road supports habitat for this species. Echolocation surveys were conducted over 52 nights across the Indicative Development Footprints using a number of Titley Scientific Anabat Express detectors. Survey periods included November 2018; January and February 2019; March and April 2019; and January 2020. At each site, the Anabat was positioned one metre above the and positioned towards potential micro-bat flyaways along areas of suitable habitat. The Anabat detector was programmed to start recording from one hour before sunset to one hour after sunrise. Opportunistic observations were made during all nocturnal and spotlighting surveys (Umwelt). Spotlighting and nocturnal surveys conducted in November 2013 also targeted this species

Species	BC Act	EPBC Act	Survey Period	IBRA Region/Subregion	Habitat Constraint / Geographic Constraint	SAII Entity	Survey Method and Justification
							(NGH). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Barking Owl (Breeding) ***Ninox connivens***	V	-	May-Dec	NSW South Western Slopes - Inland Slopes			**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Hollow bearing tree assessments were undertaken in September 2017 (Umwelt); October and November 2011 (NGH); April 2012 (NGH); November 2013 (NGH); and June 2015 (NGH) (NGH Environmental 2014). Nocturnal spotlighting searches were undertaken in suitable habitat areas between sunset and midnight using 30 watt Lightforce hand-held spotlights and head torches. These surveys occurred in September 2017; November 2018; February, April, July and August 2019 (Umwelt). Spotlighting searches were also undertaken in October and November 2011; April 2012; and November 2013 (NGH). Call playback for this species was undertaken in November 2018; and February, April, July and August 2019 (Umwelt). Call playback was also undertaken in October and November 2011; April 2012; and November 2013 (NGH Environmental). This involved a period of quiet listening for five minutes, followed by playing the animal's calls over a 15 watt directional loud hailer for five minutes, followed by a ten-minute quiet listening period. Stag watches, which involved watching hollow-bearing trees following the period immediately after sunset for forest owl activity, was undertaken in October and November 2011; and in April 2012. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Powerful Owl (Breeding) ***Ninox strenua***	V	-	May-Aug	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes			**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Hollow bearing tree assessments were undertaken in October and November 2011; April 2012; November 2013; and June 2015 (NGH). Nocturnal spotlighting searches were undertaken in suitable habitat areas between sunset and midnight using 30 watt Lightforce hand-held spotlights and head torches. These surveys occurred in November 2018; February, April, July and August 2019 (Umwelt). Spotlighting searches were also undertaken in October and November 2011; April 2012; and November 2013 (NGH). Call playback for this species was undertaken in November 2018; and February, April, July and August 2019 (Umwelt). Call playback was also undertaken in October and November 2011; April 2012; and November 2013 (NGH). This involved a period of quiet listening for five minutes, followed by playing the animal's calls over a 15 watt directional loud hailer for five minutes, followed by a ten-minute quiet listening period. Stag watches, which involved watching hollow-bearing trees following the period immediately after sunset for forest owl activity, was undertaken in October and November 2011; and in April 2012. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Squirrel Glider ***Petaurus norfolcensis***	V	-	All year	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes			**Present (surveyed). This species was recorded at multiple locations within and adjacent to the Indicative Development Footprints. Suitable woodland and forest in the Indicative Development Footprints in proximity to the species records is considered suitable habitat for this species.** Cage-trapping surveys were also completed in April 2012 as well as spotlighting surveys in November 2011, April 2012 and November 2013 by NGH Environmental (NGH Environmental 2014 and 2016a). These surveys did not record the species.
Brush-tailed Rock-wallaby ***Petrogale pencillata***	E	V	All year	NSW South Western Slopes - Inland Slopes	Rocky outcrops/cliffs	Yes	**Not present (surveyed).** No records occur within 10 km of the Indicative Development Footprints and no suitable habitat occurs within the Indicative Development Footprints. Meandering transects were undertaken in September, October and December 2017; and January, February and March 2018 (Umwelt).

Species	BC Act	EPBC Act	Survey Period	IBRA Region/Subregion	Habitat Constraint / Geographic Constraint	SAII Entity	Survey Method and Justification
							Fauna habitat assessments were taken across the Indicative Development Footprints in February and March 2018 to catalogue any suitable habitat for this species (Umwelt). Nocturnal spotlighting searches were undertaken in suitable habitat areas between sunset and midnight using 30 watt Lightforce hand-held spotlights and head torches. Spotlighting was undertaken across three survey periods in October 2017; January 2018; and February and March 2018. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Brush-tailed Phascogale ***Phascogale tapoatafa***	V	-	All year	NSW South Western Slopes - Inland Slopes	Hollow bearing trees		**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Fauna habitat assessments were taken across the Development Corridor and Indicative Development Footprint – External Roads in February and March 2018 to catalogue any suitable habitat for this species (Umwelt). Nocturnal spotlighting searches were undertaken in suitable habitat areas between sunset and midnight using 30 watt Lightforce hand-held spotlights and head torches. Spotlighting was undertaken across three survey periods in October 2017; January 2018; and February and March 2018 (Umwelt). Remote cameras were installed within the Development Corridor and Indicative Development Footprint – External Roads to target brush-tailed phascogales in April 2019 (Umwelt). Bushnell Trophy Cam HD cameras were installed 1 metre above the ground pointing at a bait station containing honey, peanut butter and tuna. Cameras were set to take three photos in quick succession when movement was detected. Opportunistic observations were completed across all Umwelt survey periods. NGH Environmental completed cage-trapping and nocturnal surveys, comprising 8 traps over four nights and 8 traps over three nights at two sites in April 2012. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Koala (Breeding) ***Phascolarctos cinereus***	V	V	All year	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes			**Not present (surveyed).** Historical records occur within 10 km (1970, 1980 and 1997) of the Indicative Development Footprints however no individuals were identified across extensive survey periods. Meandering transects searching for suitable habitat or opportunistic sightings were undertaken in September, October and December 2017; January, February and March 2018; and April 2019 (Umwelt). Spotlighting and call playback were undertaken in October 2017; January 2018; and February and March 2018 (Umwelt). Nocturnal spotlighting searches were undertaken in suitable habitat areas between sunset and midnight using 30 watt Lightforce hand-held spotlights and head torches. Call playback involved a period of quiet listening for five minutes, followed by playing the animal's calls over a 15 watt directional loud hailer for five minutes, followed by a ten-minute quiet listening period. Remote cameras were installed within the Development Corridor and Indicative Development Footprint – External Roads to target the koala in February and March 2018 (Umwelt). Bushnell Trophy Cam HD cameras were installed 1 metre above the ground pointing at a bait station containing honey, peanut butter and tuna. Cameras were set to take three photos in quick succession when movement was detected. Targeted scat searches were undertaken across the Development Corridor and Indicative Development Footprint – External Roads in accordance with the Spot Assessment Technique (SAT). Koala SAT searches had a focus on feed tree species (where applicable) and were undertaken in October 2017 (Umwelt) and November 2013 (NGH). Opportunistic observations were made across all Umwelt survey periods. Umwelt have considered the Draft Koala Habitat Protection Guideline (DPIE 2020). In the absence of current records of the species within the Development Corridor, but as PCTs 289, 350 and 351 generally support 15 per cent of regionally relevant eucalypt species for the koala, much of the habitat in the Development Corridor is

Species	BC Act	EPBC Act	Survey Period	IBRA Region/Subregion	Habitat Constraint / Geographic Constraint	SAII Entity	Survey Method and Justification
							likely to be deemed 'Highly Suitable Koala Habitat' (DPIE 2020). Further commentary and consideration of these guidelines and the SEPP is required within the Modification Document. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Superb Parrot (Breeding) ***Polytelis swainsonii***	V	V	Sep-Nov	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes			**Present (surveyed).** This species was recorded at several locations within the Indicative Development Footprints by both Umwelt and NGH Environmental (2014 and 2016). All PCT350 woodland and Derived Native Grasslands that support mature trees with hollows within the Development Corridor and Indicative Development Footprint – External Roads is considered suitable habitat. Bird surveys involved a undertaking a short meandering transect over a period of 30 minutes while recording any bird species observed or heard during this period. Hollow-bearing tree surveys and habitat mapping for this species occurred in September and December 2017 (Umwelt); October and November 2011 (NGH); April and November 2012 (NGH), November 2013 (NGH) and June 2015 (NGH). Bird utilisation surveys and Targeted Superb Parrot surveys were completed in October and November 2018 (Umwelt); January, February, April and July 2019 (Umwelt); and November 2013 (NGH). Bird utilisation surveys involved a visual assessment of the species and habit (e.g. feeding, perching, flying) of all observed bird species from a high vantage point in the landscape. Targeted surveys for superb parrot assessed flight paths and local use of the site during the breeding season. This involved walking transects in superb parrot habitat and mapping flight paths taken by sighted individuals.
Grey-headed Flying-fox (Breeding) ***Pteropus poliocephalus***	V	V	Oct-Dec	NSW South Western Slopes - Inland Slopes			**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Meandering transects to search for potential roosts or habitat were undertaken for the species during October and December 2017 (Umwelt). Spotlighting for this species was completed in December 2017. Nocturnal spotlighting searches were undertaken in suitable habitat areas between sunset and midnight using 30 watt Lightforce hand-held spotlights and head torches. Opportunistic observations were made during all Umwelt survey periods. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Golden Sun Moth ***Synemon plana***	E	CE	Oct-Dec	South Eastern Highlands - Murrumbateman NSW South Western Slopes - Inland Slopes	 A radius of 15 km west of Binalong and eastwards to the subregion's eastern-most boundary; and in a radius of 15 km from Tumut	Yes	**Present (surveyed).** This species was recorded at several locations within the Indicative Development Footprints by both Umwelt and NGH Environmental (2014 and 2016). All Derived Native Grasslands in PCT350 and PCT351 in proximity to the records are considered suitable habitat for the species. Meandering transects to search for potential individuals or habitat were undertaken for the species during October and December 2017; and November and December 2019 (Umwelt). Targeted Golden sun moth transects, walked approximately 10 metres apart in suitable habitat, were undertaken in December 2017 (Umwelt); October and November 2011 (NGH); November 2012 (NGH); and November and December 2013 (NGH). Golden sun moth meandering transects (i.e. not strict parallel transects) were completed in November 2018 (Umwelt) and golden sun moth habitat mapping completed in March 2014 (NGH). Opportunistic observations were made throughout all Umwelt survey periods.
Masked Owl (Breeding) ***Tyto novaehollandiae***	V	-	May-Aug	NSW South Western Slopes - Inland Slopes			**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Nocturnal spotlighting searches were undertaken in suitable habitat areas between sunset and midnight using 30 watt Lightforce hand-held spotlights and head torches. These surveys occurred in February, April, July and August 2019 (Umwelt). Call playback for this species was concurrently undertaken in February, April, July and August 2019 (Umwelt). This involved a

Species	BC Act	EPBC Act	Survey Period	IBRA Region/Subregion	Habitat Constraint / Geographic Constraint	SAII Entity	Survey Method and Justification
							period of quiet listening for five minutes, followed by playing the animal's calls over a 15 watt directional loud hailer for five minutes, followed by a ten-minute quiet listening period. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).
Greater Glider^ *Petauroides volans*	-	V	All year	-	Hollow bearing trees		**Not present (surveyed).** No species records occur within 10 km of the Indicative Development Footprints. Closest record is Binda, NSW, approximately 50km north east of the Project. Fauna habitat assessments were taken across the Development Corridor and Indicative Development Footprint – External Roads in February and March 2018 to catalogue any suitable habitat for this species (Umwelt). Nocturnal spotlighting searches were undertaken in suitable habitat areas between sunset and midnight using 30 watt Lightforce hand-held spotlights and head torches. Spotlighting was undertaken across three survey periods in October 2017; January 2018; and February and March 2018 (Umwelt). Remote cameras were installed within the Development Corridor and Indicative Development Footprint – External Roads to target brush-tailed phascogales in April 2019 (Umwelt). Bushnell Trophy Cam HD cameras were installed 1 metre above the ground pointing at a bait station containing honey, peanut butter and tuna. Cameras were set to take three photos in quick succession when movement was detected. Opportunistic observations were completed across all Umwelt survey periods. NGH Environmental completed spotlighting transects. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016a).



APPENDIX C

Flora and Fauna Species Lists

Flora Species List

The following list was developed from the floristic plot rapid transect surveys of the Development Corridor. It includes all species of vascular plants observed during these surveys.

Names of classes and families follow a modified Cronquist (1981) System.

Any species that could not be identified to the lowest taxonomic level are denoted in the following manner:

sp.	specimens that are identified to genus level only.

The following abbreviations or symbols are used in the list:

AA	denotes abundance rating according to BAM
PC	cover measure according to BAM
asterisk (*)	denotes species non-native species
double asterisk (**)	denotes High Threat Weed species under the BAM
subsp.	subspecies and
var.	variety.

All vascular plants recorded or collected were identified using keys and nomenclature in Harden (1992, 1993, 2000 and 2002). Where known, changes to nomenclature and classification have been incorporated into the results, as derived from PlantNET (Botanic Gardens Trust 2020), the on-line plant name database maintained by the National Herbarium of New South Wales.

Common names used follow Harden (1992, 1993, 2000 and 2002) where available, and draw on other sources such as local names where these references do not provide a common name.

Table C1 Vegetation Zones 1 to 5

Family Name	Scientific Name	Common Name	VZ1 – PCT289 – MG		VZ2 – PCT335 – MG						VZ3 – PCT350 – MG												VZ4 – PCT350 – DNG										VZ5 – PCT351 – MG													
			4107Jan03		Q33		Q35		4107Feb02		Q1		Q15		Q6		Q31		Q43		DMRP1		P03		Q11		Q32		DMRP3		4107Jan02		4107Feb03		Q16		Q20		Q23		Q26		Q8		Q13		Q42		J3	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
Filicopsida																																																
Adiantaceae	*Cheilanthes sieberi*	rock fern																											100	1																	300	0.5
Magnoliopsida – Liliidae (Monocots)																																															
Anthericaceae	*Thysanotus patersonii*	twining fringe-lily									4																																			
Cyperaceae	*Carex appressa*	tall sedge			100	30	500	50	50	3							20	4			30	0.5																										
Cyperaceae	*Carex* sp.						3	0.4																																							
Cyperaceae	**Cyperus eragrostis*	umbrella sedge																			20	0.1																										
Cyperaceae	*Lepidosperma laterale*	variable sword-sedge																																												200	2
Cyperaceae	*Schoenoplectus validus*								20	0.1																																				
Cyperaceae	*Schoenus apogon*	fluke bogrush																			100	0.4							100	0.1																
Iridaceae	*Patersonia sericea*	silky purple-flag																																											100	1		
Iridaceae	***Romulea rosea* var. *australis*																												1000	3																
Juncaceae	*Juncus australis*	rush																			5	0.1																										
Juncaceae	*Juncus filicaulis*										10	4			2	0.1																														
Juncaceae	*Juncus* sp.	a rush			20	10	100	25	30	0.1											40	0.3			20	1			20	0.2					2	0.4										
Juncaceae	*Juncus usitatus*																10	2	50	2							5	0.7																		
Juncaceae	*Luzula densiflora*	woodrush									50	10																																		
Liliaceae	*Liliaceae indeterminate*	lilies																			10	0.1																								
Lomandraceae	*Lomandra filiformis*	wattle matt-rush																					50	1					20	0.7											200	0.1				
Lomandraceae	*Lomandra filiformis* subsp. *coriacea*	wattle matt-rush	50	10	10	0.4					20	10	50	4			100	15	10	0.7									50	0.1					100	5	100	3					20	1	100	5	120	2	2000	10
Lomandraceae	*Lomandra filiformis* subsp. *filiformis*																																		20	0.8	2	0.4	50	5							
Lomandraceae	*Lomandra longifolia*	spiny-headed mat-rush																			50	1.5																										
Lomandraceae	*Lomandra*	many-																									2	0.4			10	1														

Family Name	Scientific Name	Common Name	VZ1 – PCT289 – MG		VZ2 – PCT335 – MG						VZ3 – PCT350 – MG												VZ4 – PCT350 – DNG										VZ5 – PCT351 – MG													
			4107Jan03		Q33		Q35		4107Feb02		Q1		Q15		Q6		Q31		Q43		DMRP1		P03		Q11		Q32		DMRP3		4107Jan02		4107Feb03		Q16		Q20		Q23		Q26		Q8		Q13		Q42		J3	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
	multiflora subsp. *multiflora*	flowered mat-rush																																													
Orchidaceae	*Eriochilus cucullatus*	parson's bands																									15	0.1																			5	0.1
Orchidaceae	*Microtis* sp.										5	0.1																																		
Orchidaceae	*Pterostylis sp.*	Greenhood																																												20	0.1
Orchidaceae	*Thelymitra* sp.																																												5	0.1
Phormiaceae	*Dianella revoluta*	blueberry lily																																	50	4			20	3	100	1						
Phormiaceae	*Stypandra glauca*	Nodding Blue Lily																																												15	0.3orchid
Poaceae	**Aira caryophyllea*	silvery hairgrass																					5	0.4																						
Poaceae	**Aira cupaniana*	silvery hairgrass									10	0.1																	20	0.01																
Poaceae	*Aristida ramosa*	purple wiregrass	50	10							10	5			1	0.1	50	5	50	0.1							50	1	20	1			20	3	20	3							50	10	50	1		
Poaceae	*Aristida vagans*	threeawn speargrass											10	2																															500	1
Poaceae	**Arrhenatherum elatius*	oatgrass							1000	50																																				
Poaceae	*Austrodanthonia caespitosa*	ringed wallaby grass	30	2																																									
Poaceae	*Austrodanthonia carphoides*	short wallaby grass											50	2									1000	15									20	1	20	1							5	0.4				
Poaceae	*Austrodanthonia eriantha*	wallaby grass																				20	1																								
Poaceae	*Austrodanthonia fulva*	wallaby grass			10	0.4																																								
Poaceae	*Austrodanthonia monticola*	mountain wallaby grass															100	10					50	3																			500	2				
Poaceae	*Austrodanthonia racemosa*	wallaby grass																													50	0.1									500	10				
Poaceae	*Austrodanthonia setacea*	small-flowered wallaby-grass																							10	0.5																				
Poaceae	*Austrostipa densiflora*	speargrass																																												50	0.5
Poaceae	*Austrostipa scabra*	speargrass																											6	0.1	5	0.1									100	10				
Poaceae	*Austrostipa scabra* subsp. *falcata*	rough speargrass			10	0.4							4	0.5			50	10					500	15	100	3							20	1					300	1						
Poaceae	**Avena fatua*	wild oats			20	0.8																			20	1			30	1																
Poaceae	*Bothriochloa macra*	red grass							5	0.1							5	0.4					50	2			100	0.5																		

Family Name	Scientific Name	Common Name	VZ1 – PCT289 – MG		VZ2 – PCT335 – MG						VZ3 – PCT350 – MG														VZ4 – PCT350 – DNG								VZ5 – PCT351 – MG													
			4107Jan03		Q33		Q35		4107Feb02		Q1		Q15		Q6		Q31		Q43		DMRP1		P03		Q11		Q32		DMRP3		4107Jan02		4107Feb03		Q16		Q20		Q23		Q26		Q8		Q13		Q42		J3	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
Poaceae	*Briza maxima*	quaking grass	5	0.01																			50	1							5	0.01																		
Poaceae	*Briza minor*	shivery grass							50	0.1																					5	0.01																		
Poaceae	*Bromus catharticus*	prairie grass			100	30																																										
Poaceae	**Bromus diandrus*	great brome													500	5							20	1																								
Poaceae	*Bromus hordeaceus*	soft brome							200	0.5					100	2									20	1							100	0.1														
Poaceae	*Bromus molliformis*	soft brome																							100	2															100	5						
Poaceae	*Bromus rubens*	red brome																													10	0.01									1000	25						
Poaceae	*Chloris truncata*	windmill grass															20	5																														
Poaceae	*Cynodon dactylon*	common couch			100	5	100	15									50	5			20	0.2			20	2																	10	1				
Poaceae	**Cynosurus echinatus*	rough dog's tail							50	0.5																																						
Poaceae	**Dactylis glomerata*	cocksfoot							100	1																	10	0.8			8	0.01																		
Poaceae	*Deyeuxia* sp.																																														20	0.1
Poaceae	*Dichanthium sericeum*	Queensland bluegrass																							100	5																								
Poaceae	*Elymus scaber*	common wheatgrass							20	0.1							10	0.4							50	2	10	0.4					1000	5														
Poaceae	*Echinopogon caespitosus*	Hedgehog-grass																																												5	0.1
Poaceae	*Enneapogon nigricans*	Black-head nineawn																															20	0.1														
Poaceae	**Holcus lanatus*	Yorkshire fog																					5	1																								
Poaceae	**Hordeum leporinum*	barley grass													1	0.1																														
Poaceae	**Hordeum marinum*	sea barley grass															100	3									500	5																				
Poaceae	**Hordeum* sp.	a barley grass									2	0.1																																		
Poaceae	*Joycea pallida*	silvertop wallaby grass	50	10							3	3					3	0.4															100	20	20	3	100	30	3000	25	1	0.1	20	10				
Poaceae	**Lolium perenne*	perennial ryegrass	3	0.01											100	2																									100	5						
Poaceae	**Lolium rigidum*	Wimmera ryegrass																					500	5																								
Poaceae	*Microlaena stipoides*	weeping grass													20	0.5					1000	2					50	0.5													100	5					200	0.5
Poaceae	*Microlaena stipoides* var. *stipoides*	weeping grass									500	15							1000	6					100	3																	50	1				

Family Name	Scientific Name	Common Name	VZ1 – PCT289 – MG		VZ2 – PCT335 – MG						VZ3 – PCT350 – MG														VZ4 – PCT350 – DNG								VZ5 – PCT351 – MG													
			4107Jan03		Q33		Q35		4107Feb02		Q1		Q15		Q6		Q31		Q43		DMRP1		P03		Q11		Q32		DMRP3		4107Jan02		4107Feb03		Q16		Q20		Q23		Q26		Q8		Q13		Q42		J3	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
Poaceae	**Nassella trichotoma*	serrated tussock					5	0.4																																								
Poaceae	*Panicum effusum*	hairy panic	20	1													50	20	20	0.5					20	1	20	1																	2	0.1		
Poaceae	*Panicum* sp.	panicum																													10	0.1																
Poaceae	**Paspalum dilatatum*	paspalum																							5	0.4	50	5																				
Poaceae	**Pennisetum setaceum*	fountain grass							50	1																																						
Poaceae	**Phalaris aquatica*	phalaris			50	5	50	1	50	0.5																	50	5			50	2																
Poaceae	*Poa labillardierei* var. *labillardierei*	tussock grass			10	2			1000	8							20	5																												
Poaceae	*Poa sieberiana*	snowgrass											2	0.5							40	0.2															50	10					100	5			10	0.1
Poaceae	*Poa sieberiana* var. *cyanophylla*																																						300	1								
Poaceae	*Rytidosperma pallidum*																																													200	3
Poaceae	*Rytidosperma* sp.										500	30			500	10			100	3	500	0.5					400	5	50	2	100	0.2									10	0.2			50	1	500	4
Poaceae	*Themeda australis*	kangaroo grass			2	0.4					20	2							5	0.2							1000	65	8000	65	1000	40													20	0.2
Poaceae	**Vulpia bromoides*	squirrel tail fesque					100	0.4							100	5	1000	3							500	1	500	3																		
Poaceae	**Vulpia myuros*	rat's tail fescue							1000	2			100	2									1000	1							1000	5														
Poaceae	**Vulpia* sp.	rat's-tail fescue									5	0.1																																		
Typhaceae	*Typha domingensis*	narrow-leaved cumbungi							100	5																																		
Magnoliopsida – Magnoliidae (Dicots)																																															
Acanthaceae	*Brunoniella australis*	blue trumpet																																	3	0.4										
Amaranthaceae	*Gomphrena* sp.																								20	1																				
Apiaceae	*Eryngium ovinum*	blue devil																											8	0.1																
Apiaceae	*Hydrocotyle laxiflora*	stinking pennywort									100	4									100	0.1																							250	0.1
Apiaceae	*Platysace ericoides*																																													5	0.1
Asteraceae	**Arctotheca calendula*	capeweed																							50	1																				

Family Name	Scientific Name	Common Name	VZ1 – PCT289 – MG		VZ2 – PCT335 – MG						VZ3 – PCT350 – MG														VZ4 – PCT350 – DNG								VZ5 – PCT351 – MG													
			4107Jan03		Q33		Q35		4107Feb02		Q1		Q15		Q6		Q31		Q43		DMRP1		P03		Q11		Q32		DMRP3		4107Jan02		4107Feb03		Q16		Q20		Q23		Q26		Q8		Q13		Q42		J3	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
Asteraceae	***Carthamus lanatus*	saffron thistle															10	0.4													10	0.01																		
Asteraceae	*Cassinia aculeata*	dolly bush	1	0.01																																										1000	35
Asteraceae	*Cassinia arcuata*	sifton bush	100	15																																			80	1							100	2
Asteraceae	*Cassinia quinquefaria*	Bill's beard																																					1	5								
Asteraceae	*Chrysocephalum apiculatum*	common everlasting																											4	0.5																		
Asteraceae	**Cirsium vulgare*	spear thistle			20	1	20	1									50	5																														
Asteraceae	**Conyza bonariensis*	flaxleaf fleabane																											7	0.1																		
Asteraceae	*Euchiton* sp.	a cudweed									2	0.1									50	0.1					20	0.1																		
Asteraceae	**Gamochaeta americana*	Cudweed																																												30	0.1
Asteraceae	**Hypochaeris glabra*	smooth catsear																			50	0.1	1	1					100	0.1	3	0.01																
Asteraceae	**Hypochaeris radicata*	catsear			20	0.8			200	0.5	100	7			1	0.1			100	1					50	5	10	0.6			4	0.01	20	0.1									10	0.2					50	0.1
Asteraceae	*Senecio tenuiflorus*	a fireweed																																										1	0.4				
Asteraceae	*Solenogyne dominii*																		3	0.1									300	0.2																		
Asteraceae	**Sonchus oleraceus*	common sowthistle			10	0.8																																									
Asteraceae	*Triptilodiscus pygmaeus*	common sunray									5	0.5																																				
Boraginaceae	**Echium plantagineum*	Paterson's curse																											20	0.1																		
Campanulaceae	*Wahlenbergia* sp.	bluebell									1	0.1																																				
Campanulaceae	*Wahlenbergia stricta*	tall bluebell											3	0.4																															5	0.4				
Caryophyllaceae	**Petrorhagia nanteuilii*	proliferous pink																									10	0.4																				
Caryophyllaceae	**Petrorhagia* sp.										2	0.1																																				
Chenopodiaceae	*Einadia hastata*	berry saltbush																							10	0.4																						
Clusiaceae	*Hypericum gramineum*	small st john's wort									5	0.5																	100	0.1															20	0.5				
Clusiaceae	*Hypericum japonicum*																				20	0.1																										
Convolvulaceae	*Convolvulus angustissimus*																												1	0.01																		

Family Name	Scientific Name	Common Name	VZ1 – PCT289 – MG		VZ2 – PCT335 – MG						VZ3 – PCT350 – MG														VZ4 – PCT350 – DNG								VZ5 – PCT351 – MG													
			4107Jan03		Q33		Q35		4107Feb02		Q1		Q15		Q6		Q31		Q43		DMRP1		P03		Q11		Q32		DMRP3		4107Jan02		4107Feb03		Q16		Q20		Q23		Q26		Q8		Q13		Q42		J3	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
Convolvulaceae	*Convolvulus erubescens*	pink bindweed																											20	0.1																		
Convolvulaceae	*Dichondra repens*	kidney weed																			20	0.1							20	0.1																		
Dilleniaceae	*Hibbertia obtusifolia*	hoary guinea flower									50	10																	8	0.2					10	0.4	20	5	20	2					20	2	3	0.1	20	0.2
Dilleniaceae	*Hibbertia* sp.																																												10	1				
Ericaceae	*Brachyloma daphnoides*	daphne heath																																	100	4	50	15									5	0.2
Ericaceae	*Leucopogon fletcheri*																																						50	2								
Ericaceae	*Leucopogon virgatus*																																		10	0.5												
Ericaceae	*Melichrus urceolatus*	urn heath									30	7																							100	5					50	2			20	5	7	0.6	30	0.5
Ericaceae	*Monotoca scoparia*																																		5	0.5			20	3								
Fabaceae (Faboideae)	*Daviesia genistifolia*	broom bitter pea	2	0.02																																												
Fabaceae (Faboideae)	*Daviesia leptophylla*																																		5	0.4	1	0.4			5	0.1						
Fabaceae (Faboideae)	*Daviesia ulicifolia*	gorse bitter pea											3	1																																		
Fabaceae (Faboideae)	*Desmodium varians*	slender tick-trefoil																											40	0.1	7	0.01																
Fabaceae (Faboideae)	*Dillwynia phylicoides*	parrot-pea																																										20	4				
Fabaceae (Faboideae)	*Dillwynia sericea*	egg and bacon peas; parrot peas									15	5																																				
Fabaceae (Faboideae)	*Glycine tabacina*	variable glycine																					20	1							1	0.01																
Fabaceae (Faboideae)	*Hardenbergia violacea*	false sarsaparilla	7	0.5																																	20	2	1	0.4					10	5				
Fabaceae (Faboideae)	*Hovea heterophylla*		1	0.01																															20	0.8	20	1	5	0.4					20	1				
Fabaceae (Faboideae)	*Indigofera australis*	Australian indigo									6	3																																				
Fabaceae (Faboideae)	*Platylobium formosum* subsp. *formosum*																																						20	1								
Fabaceae (Faboideae)	*Pultenaea* sp.		10	1																																											
Fabaceae (Faboideae)	*Pultenaea villosa*	hairy bush-pea																																							100	0.1								
Fabaceae (Faboideae)	**Trifolium arvense*	harefoot clover																							5	0.4					80	0.1																

Family Name	Scientific Name	Common Name	VZ1 – PCT289 – MG		VZ2 – PCT335 – MG						VZ3 – PCT350 – MG														VZ4 – PCT350 – DNG								VZ5 – PCT351 – MG													
			4107Jan03		Q33		Q35		4107Feb02		Q1		Q15		Q6		Q31		Q43		DMRP1		P03		Q11		Q32		DMRP3		4107Jan02		4107Feb03		Q16		Q20		Q23		Q26		Q8		Q13		Q42		J3	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
Fabaceae (Faboideae)	*Trifolium subterraneum*	subterranean clover																	7	0.1					20	1																							
Fabaceae (Mimosoideae)	*Acacia dealbata*	silver wattle									6	5			1	0.1													2	0.1					2	0.5	1	0.4	2	0.4								
Fabaceae (Mimosoideae)	*Acacia deanei*	green wattle																																					5	1								
Fabaceae (Mimosoideae)	*Acacia genistifolia*	early wattle	20	5																																											
Fabaceae (Mimosoideae)	*Acacia gunnii*	ploughshare wattle																											15	0.2					1	0.4												
Fabaceae (Mimosoideae)	*Acacia mearnsii*	black wattle																			4	0.8																										
Fabaceae (Mimosoideae)	*Acacia parramattensis*	Parramatta wattle	1	0.5																																							4	2				
Fabaceae (Mimosoideae)	*Acacia* sp. 1																																												50	2
Gentianaceae	*Centaurium erythraea*	common centaury																											10	0.1																		
Gentianaceae	*Centaurium* sp.										3	0.5																																				
Geraniaceae	*Geranium solanderi*	native geranium									2	0.1																																				
Goodeniaceae	*Goodenia hederacea*	ivy goodenia									50	2																											80	1					7	0.1	50	0.3
Goodeniaceae	*Goodenia hederacea* subsp. *hederacea*	ivy goodenia											1	0.4																					20	0.8	50	2					100	4				
Goodeniaceae	*Goodenia pinnatifida*	scrambles eggs																																			2	0.4										
Haloragaceae	*Gonocarpus tetragynus*	poverty raspwort									10	3	5	0.4															200	0.1							5	0.4			25	0.1			100	2	1	0.1	30	0.1
Haloragaceae	*Haloragis brownii*	swamp raspwort																			80	0.1																										
Lamiaceae	*Mentha satureioides*	native pennyroyal																							100	4																						
Lauraceae	*Cassytha glabella*																																				50	1									20	0.1
Lobeliaceae	*Pratia pedunculata*	matted pratia																			200	1																										
Loranthaceae	*Amyema miquelii*	box mistletoe	6	1									10	5					1	1															2	2												
Myrtaceae	*Eucalyptus blakelyi*	Blakely's red gum											2	5	2	10	3	20	20	30	100	65								1	1																	
Myrtaceae	*Eucalyptus bridgesiana*	apple box																					3	10																					10	15				
Myrtaceae	*Eucalyptus camaldulensis*	river red gum																					12	10																								

Family Name	Scientific Name	Common Name	VZ1 – PCT289 – MG		VZ2 – PCT335 – MG						VZ3 – PCT350 – MG														VZ4 – PCT350 – DNG										VZ5 – PCT351 – MG													
			4107Jan03		Q33		Q35		4107Feb02		Q1		Q15		Q6		Q31		Q43		DMRP1		P03		Q11		Q32		DMRP3		4107Jan02		4107Feb03		Q16		Q20		Q23		Q26		Q8		Q13		Q42		J3	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
Myrtaceae	*Eucalyptus dives*	broad-leaved peppermint																																	2	2			7	10										
Myrtaceae	*Eucalyptus goniocalyx*	bundy	7	20																																	8	25					1	5	20	20				
Myrtaceae	*Eucalyptus macrorhyncha*	red stringybark	10	15													1	2	4	5															1	2	3	15	2	5	17	25	5	10	3	5	50	20		
Myrtaceae	*Eucalyptus mannifera*	brittle gum																																	10	10			10	15										
Myrtaceae	*Eucalyptus melliodora*	yellow box									5	10	10	25	3	20	1	10	5	10			6	10																								
Myrtaceae	*Eucalyptus polyanthemos*	red box																																									2	5						
Myrtaceae	*Eucalyptus rossii*	inland scribbly gum																																	20	20	2	15	10	20	25	35	4	10			50	20	4	35
Myrtaceae	*Eucalyptus sideroxylon*	mugga ironbark	3	10																																													
Myrtaceae	*Leptospermum multicaule*	silver tea-tree									10	10																									50	15												
Oxalidaceae	*Oxalis perennans*				10	0.4					2	0.1							10	0.1	40	0.1			10	0.4			10	0.1											2	0.1	50	1			50	0.1
Oxalidaceae	**Oxalis pes-caprae*	soursob					10	0.4																																								
Phyllanthaceae	*Phyllanthus hirtellus*	Thyme Spurge																																												35	0.5
Phyllanthaceae	*Poranthera microphylla*	small poranthera									10	2																									5	0.4							100	1		
Plantaginaceae	*Plantago debilis*	shade plantain																									50	1																			
Plantaginaceae	**Plantago lanceolata*	lamb's tongues																									50	0.1			20	0.5															
Plantaginaceae	*Veronica plebeia*	trailing speedwell									5	0.5																																			
Polygonaceae	***Acetosella vulgaris*	sheep sorrel			20	0.7					20	2							100	1	500	0.2			50	4	10	0.4	500	0.2			10	0.1							50	0.5						
Polygonaceae	*Rumex brownii*	swamp dock			10	0.6									3	0.2									500	0.4																				
Polygonaceae	*Rumex* sp.	dock																	2	0.1																											
Rosaceae	*Acaena echinata*	sheep's burr																											60	2																	
Rosaceae	*Acaena ovina*	acaena																											5	0.1	15	0.8															
Rosaceae	***Rosa rubiginosa*	sweet briar							2	0.2													1	1																								
Rubiaceae	*Pomax umbellata*	pomax							10	0.1																									3	0.4			15	0.1								
Rutaceae	*Boronia* sp.																																						50	0.1								
Solanaceae	**Solanum nigrum*	black-berry nightshade			3	0.4											2	0.4																														

Family Name	Scientific Name	Common Name	VZ1 – PCT289 – MG		VZ2 – PCT335 – MG						VZ3 – PCT350 – MG														VZ4 – PCT350 – DNG										VZ5 – PCT351 – MG													
			4107Jan03		Q33		Q35		4107Feb02		Q1		Q15		Q6		Q31		Q43		DMRP1		P03		Q11		Q32		DMRP3		4107Jan02		4107Feb03		Q16		Q20		Q23		Q26		Q8		Q13		Q42		J3	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
Thymelaeaceae	*Pimelea curviflora*	rice flower																																			2	0.4												
Thymelaeaceae	*Pimelea curviflora* var. *curviflora*																																													10	0.4				
Violaceae	*Viola betonicifolia* subsp. *betonicifolia*	native violet																			200	0.1																														

Table C2 Vegetation Zones 6 to 9

Family Name	Scientific Name	Common Name	VZ6 – PCT351 – DNG																				VZ7 – PCT351 – Acacia								VZ8 – PCT351 – Sifton										VZ9 – PCT351 – Apple			
			Q21		Q30		Q12		Q14		DMRP2		4107Feb04		J1		J2		J7		J8		Q10		Q24		Q36		J4		Q18		Q28		Q29		Q34		4107Feb01		Q9		4107Jan01	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
Filicopsida																																															
Adiantaceae	*Cheilanthes sieberi*	rock fern													20	0.1	1000	1							15	0.4	6	0.4	100	0.2							100	3								
Adiantaceae	*Cheilanthes sieberi* subsp. *sieberi*	rock fern																					10	0.3																	1	0.1				
Magnoliopsida – Liliidae (Monocots)																																														
Cyperaceae	*Carex appressa*	tall sedge																																										5	0.1
Iridaceae	**Romulea rosea* var. *australis*																																						5	0.1				
Juncaceae	*Juncus planifolius*																																				5	0.4							
Juncaceae	*Juncus* sp.	a rush			3	1	20	1					50	0.1	20	0.5																											10	0.1
Lomandraceae	*Lomandra filiformis*	wattle matt-rush											1000	5							5	0.1											300	2	1000	5			200	0.5			100	8
Lomandraceae	*Lomandra filiformis* subsp. *coriacea*	wattle matt-rush	20	2	50	5	10	0.6	500	15	1000	15			30	1	200	2	100	0.7			20	0.3	10	2			10	0.2	20	1					50	5			100	1		
Lomandraceae	*Lomandra filiformis* subsp. *filiformis*								5	2																																		
Lomandraceae	*Lomandra glauca*	pale mat-rush																																										20	0.5
Lomandraceae	*Lomandra multiflora* subsp. *multiflora*	many-flowered mat-rush																					2	0.2																					5	0.6
Orchidaceae	*Microtis* sp.																																				20	0.4							
Poaceae	**Aira caryophyllea*	silvery hairgrass																					50	0.5																						
Poaceae	**Aira cupaniana*	silvery hairgrass	500	5	10	0.4			1000	10																	3	0.4			5	0.4			1000	3								
Poaceae	**Aira* sp.	a hairgrass											50	0.1																														
Poaceae	*Aristida ramosa*	purple wiregrass					500	10	100	10	400	5					15	0.2	200	0.5	1	0.01					50	3	5	0.1			250	1	1000	5	500	10	5	0.1			20	1
Poaceae	*Aristida* sp.	a wiregrass																							30	1																		
Poaceae	*Aristida vagans*	threeawn speargrass	20	4																																								
Poaceae	*Austrodanthonia*	short wallaby					1000	10	100	15															2000	10			100	1														

Family Name	Scientific Name	Common Name	VZ6 – PCT351 – DNG																				VZ7 – PCT351 – Acacia								VZ8 – PCT351 – Sifton										VZ9 – PCT351 – Apple			
			Q21		Q30		Q12		Q14		DMRP2		4107Feb04		J1		J2		J7		J8		Q10		Q24		Q36		J4		Q18		Q28		Q29		Q34		4107Feb01		Q9		4107Jan01	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
	carphoides	grass																																											
Poaceae	*Austrodanthonia caespitosa*	ringed wallaby grass															2000	25	2000	60																										
Poaceae	*Austrodanthonia duttoniana*	brown-back wallaby grass																					100	10																						
Poaceae	*Austrodanthonia eriantha*	wallaby grass																																					1	0.1						
Poaceae	*Austrodanthonia fulva*	wallaby grass															1000	3					100	10											200	1										
Poaceae	*Austrodanthonia monticola*	mountain wallaby grass	500	25	1000	20	1000	15																			500	10			500	15					1000	20					40	3
Poaceae	*Austrodanthonia racemosa*	wallaby grass											1000	15																														
Poaceae	*Austrodanthonia setacea*	small-flowered wallaby-grass																																			50	3					20	1
Poaceae	*Austrodanthonia sp.*	A wallaby-grass																			2000	45							1000	10														
Poaceae	*Austrostipa densiflora*	foxtail speargrass									20	0.1					2000	25																										
Poaceae	*Austrostipa scabra*	speargrass			20	0.3			50	3	200	0.5	100	0.5	100	1	1000	5	2000	20	1000	5	1000	30	2000	10					100	5							5	0.1				
Poaceae	*Austrostipa scabra* subsp. *falcata*	rough speargrass					500	15																			20	2																
Poaceae	*Austrostipa scabra* subsp. *scabra*	rough speargrass																															250	1	500	2								
Poaceae	**Avena fatua*	wild oats									200	0.1																																
Poaceae	*Bothriochloa macra*	red grass											5	0.1																														
Poaceae	**Briza maxima*	quaking grass																																									1000	10
Poaceae	**Briza minor*	shivery grass											25	0.1																									25	0.1				
Poaceae	**Bromus molliformis*	soft brome	100	5																																								
Poaceae	*Chloris truncata*	windmill grass			100	10	20	0.8			20	0.1							30	0.2																								
Poaceae	*Cynodon dactylon*	common couch											5	0.1											7	0.4							80	0.1	200	0.5						
Poaceae	*Elymus scaber*	common			10	0.5	50	0.4	50	5			200	0.5																									20	0.1				

Family Name	Scientific Name	Common Name	VZ6 – PCT351 – DNG																				VZ7 – PCT351 – Acacia								VZ8 – PCT351 – Sifton										VZ9 – PCT351 – Apple			
			Q21		Q30		Q12		Q14		DMRP2		4107Feb04		J1		J2		J7		J8		Q10		Q24		Q36		J4		Q18		Q28		Q29		Q34		4107Feb01		Q9		4107Jan01	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
		wheatgrass																																									
Poaceae	*Eragrostis cilianensis*	grey lovegrass																	30	0.1																								
Poaceae	*Eragrostis* sp.	a lovegrass																															100	0.1										
Poaceae	**Hordeum* sp.	a barley grass	50	5																																								
Poaceae	*Joycea pallida*	silvertop wallaby grass									200	10									1	0.1	4	0.3	3	1			2	0.2	2	0.4					4	0.4	1	0.1	100	30		
Poaceae	**Lolium perenne*	perennial ryegrass																	10	0.1																								
Poaceae	*Microlaena stipoides*	weeping grass									2000	15			2000	30	500	2	1000	8	1000	5	1000	30					2000	65											10	0.5		
Poaceae	*Microlaena stipoides* var. *stipoides*	weeping grass																									1000	20																
Poaceae	*Panicum effusum*	hairy panic					50	2			10	0.1	20	0.1					20	0.1													50	0.1					10	0.1				
Poaceae	***Paspalum dilatatum*	paspalum							50	10									5	0.1																								
Poaceae	*Poa afinis*														20	0.1																												
Poaceae	*Poa sieberiana*	snowgrass	3	0.4							20	0.2													1000	15			10	0.3									5	0.1	50	10		
Poaceae	*Poa* sp.														1000	5	200	0.2																										
Poaceae	*Rytidosperma* sp.										1000	15	2000	25	3000	40			100	0.5	1200	6			17	1							100	0.1	1000	5								
Poaceae	*Themeda australis*	kangaroo grass											500	2					20	0.1	10	0.1																						
Poaceae	**Vulpia bromoides*	squirrel tail fesque							1000	15																																		
Poaceae	**Vulpia myuros*	rat's tail fescue											50	0.1																									100	0.5				
Magnoliopsida – Magnoliidae (Dicots)																																											
Apiaceae	*Hydrocotyle laxiflora*	stinking pennywort																					20	0.2													5	0.4						
Asteraceae	**Arctotheca calendula*	capeweed													1000	5	1000	3	1000	3	50	0.5																						
Asteraceae	***Carthamus lanatus*	saffron thistle							5	0.4																																		
Asteraceae	*Cassinia aculeata*	dolly bush																							1	0.4											500	40						
Asteraceae	*Cassinia arcuata*	sifton bush															1	0.3			1	0.01	1	0.5					5	0.1			1000	65	1000	65	20	1	200	80				
Asteraceae	*Cassinia laevis*	cough bush																					50	10							500	30												

Family Name	Scientific Name	Common Name	VZ6 – PCT351 – DNG																				VZ7 – PCT351 – Acacia								VZ8 – PCT351 – Sifton										VZ9 – PCT351 – Apple			
			Q21		Q30		Q12		Q14		DMRP2		4107Feb04		J1		J2		J7		J8		Q10		Q24		Q36		J4		Q18		Q28		Q29		Q34		4107Feb01		Q9		4107Jan01	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
Asteraceae	*Chrysocephalum apiculatum*	common everlasting							5	0.4																																		
Asteraceae	**Cirsium vulgare*	spear thistle							5	0.4																					2	0.4												
Asteraceae	**Gamochaeta americana*	Cudweed													5	0.1																												
Asteraceae	**Hypochaeris glabra*	smooth catsear	50	10			50	5	20	2					50	0.5					5	0.1																						
Asteraceae	**Hypochaeris radicata*	catsear	10	2	20	1	100	10							50	0.5	1000	1	300	0.8	100	0.1	2	0.1	1	0.4			100	0.1	20	2			50	0.1								
Asteraceae	*Ozothamnus diosmifolius*	white dogwood																																			100	25						
Asteraceae	*Solenogyne dominii*																				50	0.1	100	0.2																				
Asteraceae	*Triptilodiscus pygmaeus*	common sunray																					20	0.2																				
Asteraceae	*Vittadinia gracilis*	Woolly New Holland Daisy															10	0.1																										
Asteraceae	*Vittadinia* sp.																				500	0.2																						
Campanulaceae	*Wahlenbergia gracilis*	sprawling bluebell																																							1	0.1		
Campanulaceae	*Wahlenbergia* sp.	bluebell																					2	0.1																				
Campanulaceae	*Wahlenbergia stricta*	tall bluebell					50	0.6																																				
Caryophyllaceae	**Petrorhagia nanteuilii*	proliferous pink					20	0.6	20	1																											3	0.4						
Chenopodiaceae	*Chenopodium pumilio*	small crumbweed									200	0.3																																
Chenopodiaceae	*Einadia nutans* subsp. *nutans*	climbing saltbush			2	0.4																																						
Clusiaceae	*Hypericum gramineum*	small St John's wort																											5	0.1									5	0.1				
Clusiaceae	***Hypericum perforatum*	St. Johns wort																													5	0.4					7	0.4						
Crassulaceae	*Crassula sieberiana*	Australian Stonecrop													2000	0.5	500	0.1	300	0.1	2000	0.2																						
Dilleniaceae	*Hibbertia obtusifolia*	hoary guinea flower			4	1	10	0.8													1	0.01	1	0.1	6	0.4	50	10	20	0.2					20	3			10	0.2	4	0.01
Dilleniaceae	*Hibbertia* sp.																																40	1	50	0.1					1	0.1		
Ericaceae	*Brachyloma*	daphne																					2	0.2	7	1			5	0.2														

Family Name	Scientific Name	Common Name	VZ6 – PCT351 – DNG																				VZ7 – PCT351 – Acacia								VZ8 – PCT351 – Sifton										VZ9 – PCT351 – Apple			
			Q21		Q30		Q12		Q14		DMRP2		4107Feb04		J1		J2		J7		J8		Q10		Q24		Q36		J4		Q18		Q28		Q29		Q34		4107Feb01		Q9		4107Jan01	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
	daphnoides	heath																																										
Ericaceae	*Leucopogon ericoides*	pink beard-heath																																			1	0.4							
Ericaceae	*Melichrus urceolatus*	urn heath																					5	0.3	3	1	5	0.4					50	2	10	0.5	20	3			5	0.5		
Euphorbiaceae	*Chamaesyce drummondii*								5	0.4																																			
Fabaceae (Faboideae)	*Daviesia genistifolia*	broom bitter pea																																									10	1
Fabaceae (Faboideae)	*Daviesia leptophylla*																																									50	4
Fabaceae (Faboideae)	*Dillwynia retorta*																																		10	0.1							
Fabaceae (Faboideae)	*Dillwynia sericea*	egg and bacon peas; parrot peas																																							20	0.5		
Fabaceae (Faboideae)	*Dillwynia* sp.																								2	0.5																	
Fabaceae (Faboideae)	*Hardenbergia violacea*	false sarsaparilla																																	10	0.1							3	0.8
Fabaceae (Faboideae)	*Hovea heterophylla*																								6	0.4																	3	0.01
Fabaceae (Faboideae)	**Medicago minima*	woolly burr medic											50	0.1																														
Fabaceae (Faboideae)	*Pultenaea microphylla*	a bush pea																																	5	0.1								
Fabaceae (Faboideae)	*Pultenaea* sp.																																				1	0.4					3	0.01
Fabaceae (Faboideae)	**Trifolium arvense*	haresfoot clover					50	0.4																																				
Fabaceae (Faboideae)	**Trifolium subterraneum*	subterranean clover									4000	15			2000	40	1000	2	2000	8	1000	2																						
Fabaceae (Mimosoideae)	*Acacia dealbata*	silver wattle	5	0.5																			20	20									15	10							1	0.1	100	15
Fabaceae (Mimosoideae)	*Acacia genistifolia*	early wattle									6	0.6																					1	1										
Fabaceae (Mimosoideae)	*Acacia parramattensis*	Parramatta wattle																							12	25	500	45	30	6			2	1										
Fabaceae	*Fabaceae* indeterminate														0.1	30																												
Gentianaceae	**Centaurium erythraea*	common centaury																															60	0.1	10	0.1	100	3						

Family Name	Scientific Name	Common Name	VZ6 – PCT351 – DNG																				VZ7 – PCT351 – Acacia								VZ8 – PCT351 – Sifton										VZ9 – PCT351 – Apple			
			Q21		Q30		Q12		Q14		DMRP2		4107Feb04		J1		J2		J7		J8		Q10		Q24		Q36		J4		Q18		Q28		Q29		Q34		4107Feb01		Q9		4107Jan01	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
Geraniaceae	*Erodium cicutarium*	common storksbill													10	0.1																												
Geraniaceae	*Erodium botrys*	long storksbill															1000	3																										
Goodeniaceae	*Goodenia hederacea*	ivy goodenia																					2	0.1									50	0.1	10	0.6						
Goodeniaceae	*Goodenia hederacea* subsp. *hederacea*	ivy goodenia					10	0.5																																	5	0.2		
Haloragaceae	*Gonocarpus tetragynus*	poverty raspwort	50	1																			20	0.2	30	1			250	0.3			25	0.1								4	0.01
Lamiaceae	*Mentha satureioides*	native pennyroyal					100	3	10	0.4																																		
Loranthaceae	*Amyema miquelii*	box mistletoe																							1	0.5																		
Loranthaceae	*Amyema pendulum*																						1	0.1																				
Loranthaceae	*Amyema* sp.	mistletoe																			2	0.3																			20	0.5		
Myrtaceae	*Eucalyptus blakelyi*	Blakely's red gum																																									2	5
Myrtaceae	*Eucalyptus cinerea*	argyle apple																																							7	20	4	5
Myrtaceae	*Eucalyptus dives*	broad-leaved peppermint																																									2	5
Myrtaceae	*Eucalyptus goniocalyx*	bundy																													1	1									1	5		
Myrtaceae	*Eucalyptus mannifera*	brittle gum																																									1	5
Myrtaceae	*Eucalyptus melliodora*	yellow box																																									2	2
Myrtaceae	*Leptospermum continentale*																		5	0.2									100	7														
Myrtaceae	*Leptospermum multicaule*	silver tea-tree																					5	5	40	15																		
Oxalidaceae	*Oxalis exilis*																						10	0.2																				
Oxalidaceae	*Oxalis perennans*				5	0.4	100	6	20	0.4			5	0.1																														
Oxalidaceae	*Oxalis* sp.																				1000	0.2			15	0.4			50	0.1														
Plantaginaceae	*Plantago lanceolata*	lamb's tongues					50	2																																		

Family Name	Scientific Name	Common Name	VZ6 – PCT351 – DNG																				VZ7 – PCT351 – Acacia								VZ8 – PCT351 – Sifton										VZ9 – PCT351 – Apple			
			Q21		Q30		Q12		Q14		DMRP2		4107Feb04		J1		J2		J7		J8		Q10		Q24		Q36		J4		Q18		Q28		Q29		Q34		4107Feb01		Q9		4107Jan01	
			A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C
Plantaginaceae	*Plantago* sp.	plantain																															5	0.1										
Plantaginaceae	*Veronica plebeia*	trailing speedwell																											10	0.1														
Polygonaceae	***Acetosella vulgaris*	sheep sorrel	1000	10			50	1	100	15	200	0.2			50	0.2	200	1	200	0.4	500	0.2							100	0.2	20	2					5	0.4	1	0.1				
Polygonaceae	*Rumex brownii*	swamp dock											10	0.1																			10	0.1										
Rosaceae	**Rubus anglocandicans*	blackberry																																							1	1
Rosaceae	**Rubus fruticosus* sp. agg.	blackberry																	1	0.1																								
Rubiaceae	*Galium gaudichaudii*	rough bedstraw																																					3	0.1		
Rubiaceae	*Pomax umbellata*	pomax											10	0.1											1	0.4																		
Violaceae	*Viola betonicifolia* subsp. *betonicifolia*	native violet																					1	0.1																				

Fauna Species List

The following list was developed from surveys undertaken across the Development Corridor. Details of the survey methodologies undertaken are provided in **Section 2** of the main report.

The following abbreviations or symbols are used in the list:

BC Act	*Biodiversity Conservation Act 2016*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
V	Vulnerable
E	Endangered
CE	Critically Endangered
MIG	Migratory
asterisk (*)	denotes species not indigenous to the Development Corridor.

Birds recorded use the scientific and common name nomenclature of BirdLife Australia. Reptiles recorded use the scientific and common name nomenclature of Cogger (2014). Amphibians recorded use the scientific and common name nomenclature of Cogger (2014), and mammals recorded use the scientific and common name nomenclature of Van Dyke and Strahan (2008).

Table C3 Fauna Species Identified in the Development Corridor

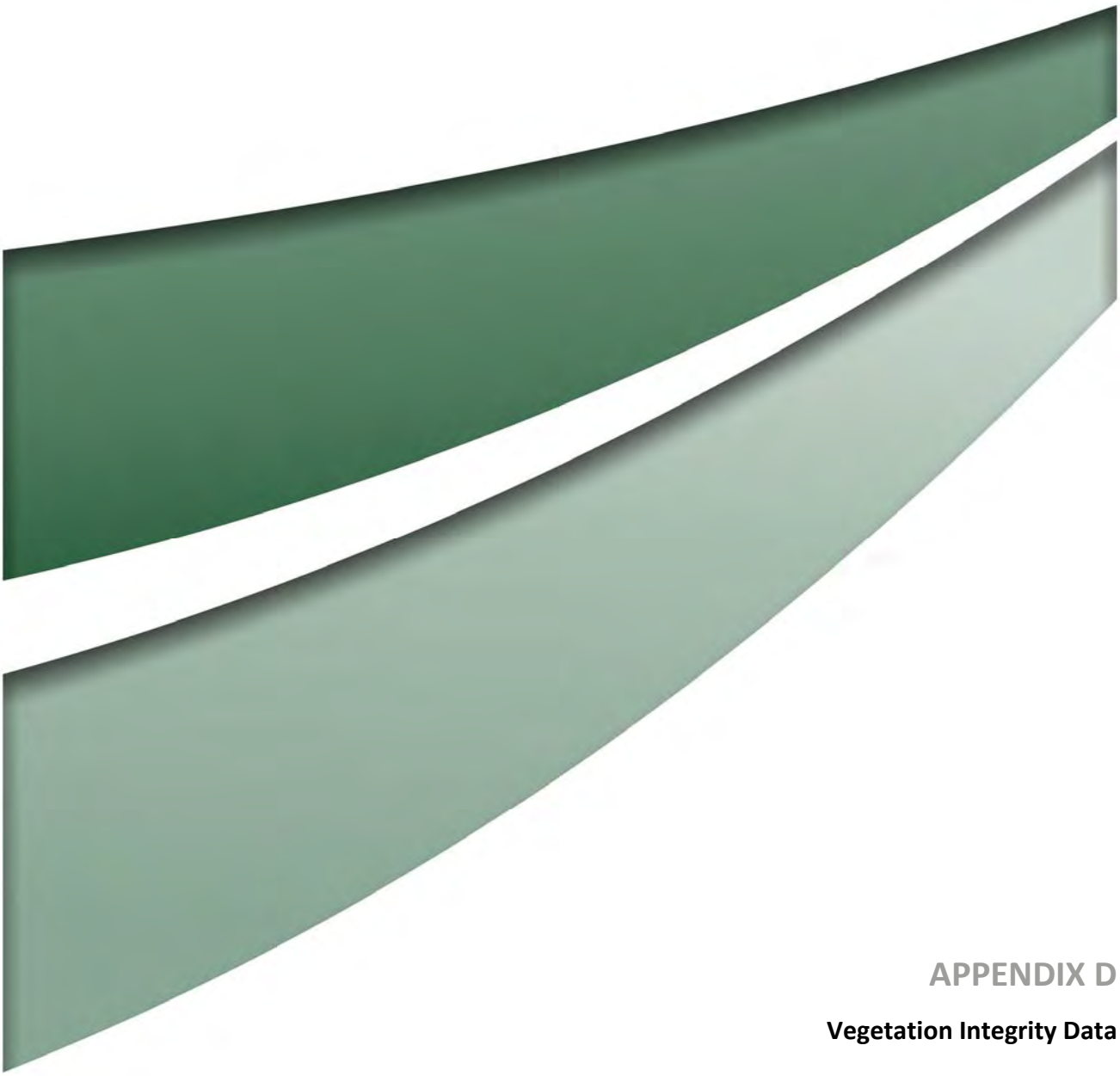
Family	Scientific Name	Common Name	BC Act	EPBC Act
AMPHIBIA				
HYLIDAE	*Litoria fallax*	eastern dwarf tree frog		
HYLIDAE	*Litoria* sp.	a tree frog		
MYOBATRACHIDAE	*Crinia parinsignifera*	eastern sign-bearing froglet		
MYOBATRACHIDAE	*Crinia signifera*	common froglet		
MYOBATRACHIDAE	*Limnodynastes peronii*	brown-striped frog		
MYOBATRACHIDAE	*Limnodynastes tasmaniensis*	spotted grass frog		
MYOBATRACHIDAE	*Uperoleia laevigata*	smooth toadlet		
AVES				
ACANTHIZIDAE	*Acanthiza chrysorrhoa*	yellow-rumped thornbill		
ACANTHIZIDAE	*Acanthiza lineata*	striated thornbill		
ACANTHIZIDAE	*Acanthiza nana*	yellow thornbill		
ACANTHIZIDAE	*Acanthiza pusilla*	brown thornbill		
ACANTHIZIDAE	*Acanthiza reguloides*	buff-rumped thornbill		
ACANTHIZIDAE	*Chthonicola sagittata*	speckled warbler	V	

Family	Scientific Name	Common Name	BC Act	EPBC Act
ACANTHIZIDAE	*Gerygone fusca*	western gerygone		
ACANTHIZIDAE	*Gerygone oliveacea*	white-throated gerygone		
ACANTHIZIDAE	*Hylacola pyrrhopygia*	chestnut-rumped heathwren		
ACANTHIZIDAE	*Sericornis frontalis*	white-browed scrubwren		
ACANTHIZIDAE	*Smicrornis brevirostris*	weebill		
ACCIPITRIDAE	*Aquila audax*	wedge-tailed eagle		
ACCIPITRIDAE	*Elanus axillaris*	black-shouldered kite		
ACROCEPHALIDAE	*Acrocephalus australis*	Australian reed-warbler		MIG
ALCEDINIDAE	*Dacelo novaeguineae*	laughing kookaburra		
ALCEDINIDAE	*Todiramphus macleayii*	forest kingfisher		
ALCEDINIDAE	*Todiramphus sanctus*	sacred kingfisher		
ANATIDAE	*Chenonetta jubata*	wood duck		
APODIDAE	*Hirundapus caudacutus*	white-throated needletail		V, MIG
ARDEIDAE	*Egretta novaehollandiae*	white-faced heron		
ARTAMIDAE	*Artamus cyanopterus*	dusky woodswallow	V	
ARTAMIDAE	*Artamus* sp.	a woodswallow		
ARTAMIDAE	*Cracticus nigrogularis*	pied butcherbird		
ARTAMIDAE	*Cracticus tibicen*	Australian magpie		
ARTAMIDAE	*Cracticus torquatus*	grey butcherbird		
ARTAMIDAE	*Strepera graculina*	pied currawong		
CACATUIDAE	*Cacatua galerita*	sulphur-crested cockatoo		
CACATUIDAE	*Eolophus roseicapillus*	galah		
CACATUIDAE	*Eolophus roseicapillus albiceps*	galah		
CAMPEPHAGIDAE	*Coracina novaehollandiae*	black-faced cuckoo-shrike		
CAMPEPHAGIDAE	*Lalage sueurii*	white-winged triller		
CHARADRIIDAE	*Vanellus miles*	masked lapwing		
CLIMACTERIDAE	*Cormobates leucophaea*	white-throated treecreeper		
COLUMBIDAE	*Ocyphaps lophotes*	crested pigeon		
COLUMBIDAE	*Phaps chalcoptera*	common bronzewing		
CORACIIDAE	*Eurystomus orientalis*	dollarbird		
CORCORACIDAE	*Corcorax melanorhamphos*	white-winged chough		
CORVIDAE	*Corvus coronoides*	Australian raven		

Family	Scientific Name	Common Name	BC Act	EPBC Act
CUCULIDAE	*Cacomantis pallidus*	pallid cuckoo		
ESTRILDIDAE	*Neochmia temporalis*	red-browed Finch		
ESTRILDIDAE	*Stagonopleura guttata*	diamond firetail	V	
FALCONIDAE	*Falco berigora*	brown falcon		
FALCONIDAE	*Falco cenchroides*	nankeen kestrel		
HIRUNDINIDAE	*Hirundo neoxena*	welcome swallow		
MALURIDAE	*Malurus cyaneus*	superb fairy-wren		
MALURIDAE	*Malurus cyaneus*	superb fairy-wren		
MELIPHAGIDAE	*Acanthorhynchus tenuirostris*	eastern spinebill		
MELIPHAGIDAE	*Anthochaera carunculata*	red wattlebird		
MELIPHAGIDAE	*Epthianura albifrons*	white-fronted chat	V	
MELIPHAGIDAE	*Lichenostomus chrysops*	yellow-faced honeyeater		
MELIPHAGIDAE	*Lichenostomus leucotis*	white-eared honeyeater		
MELIPHAGIDAE	*Lichenostomus penicillatus*	white-plumed honeyeater		
MELIPHAGIDAE	*Manorina melanocephala*	noisy miner		
MELIPHAGIDAE	*Meliphaga lewinii*	Lewin's honeyeater		
MELIPHAGIDAE	*Philemon corniculatus*	noisy friarbird		
MEROPIDAE	*Merops ornatus*	rainbow bee-eater		MAR
MONARCHIDAE	*Grallina cyanoleuca*	magpie-lark		
MONARCHIDAE	*Myiagra inquieta*	restless flycatcher		
MONARCHIDAE	*Myiagra rubecula*	leaden flycatcher		
MONARCHIDAE	*Myiagra rubecula concinna*	leaden flycatcher		
MOTACILLIDAE	*Anthus novaeseelandiae*	Australian pipit		
NECTARINIIDAE	*Dicaeum hirundinaceum*	mistletoebird		
NEOSITTIDAE	*Daphoenositta chrysoptera*	varied sittella	V	
ORIOLIDAE	*Oriolus sagittatus*	olive-backed oriole		
PACHYCEPHALIDAE	*Colluricincla harmonica*	grey shrike-thrush		
PACHYCEPHALIDAE	*Pachycephala pectoralis*	golden whistler		
PACHYCEPHALIDAE	*Pachycephala rufiventris*	rufous whistler		
PARDALOTIDAE	*Pardalotus punctatus*	spotted pardalote		
PARDALOTIDAE	*Pardalotus striatus*	striated pardalote		
PETROICIDAE	*Eopsaltria australis*	eastern yellow robin		
PETROICIDAE	*Petroica boodang*	scarlet robin	V	
PETROICIDAE	*Petroica goodenovii*	red-capped robin		

Family	Scientific Name	Common Name	BC Act	EPBC Act
PHALACROCORACIDAE	*Microcarbo melanoleucos*	little pied cormorant		
POMATOSTOMIDAE	*Pomatostomus superciliosus*	white-browed babbler		
PSITTACIDAE	*Alisterus scapularis*	Australian king-parrot		
PSITTACIDAE	*Platycercus elegans*	crimson rosella		
PSITTACIDAE	*Platycercus eximius*	eastern rosella		
PSITTACIDAE	*Polytelis swainsonii*	superb parrot	V	V
PSITTACIDAE	*Psephotus haematonotus*	red-rumped parrot		
RHIPIDURIDAE	*Rhipidura albiscapa*	grey fantail		
RHIPIDURIDAE	*Rhipidura leucophrys*	willie wagtail		
STURNIDAE	**Sturnus vulgaris*	common starling		
MAMMALIA				
BOVIDAE	**Capra hircus*	goat		
BOVIDAE	**Ovis aries*	sheep		
CANIDAE	**Vulpes*	red fox		
CERVIDAE	**Dama*	fallow deer		
DASYURIDAE	*Antechinus flavipes*	yellow-footed antechinus		
DASYURIDAE	*Antechinus* sp.	an antechinus		
EMBALLONURIDAE	*Saccolaimus flaviventris*	yellow-bellied sheathtail-bat	V	
LEPORIDAE	**Oryctolagus cuniculus*	rabbit		
MACROPODIDAE	*Macropus giganteus*	eastern grey kangaroo		
MACROPODIDAE	*Macropus robustus*	wallaroo		
MACROPODIDAE	*Macropus rufogriseus*	red-necked wallaby		
MACROPODIDAE	*Wallabia bicolor*	swamp wallaby		
MOLOSSIDAE	*Austronomus australis*	white-striped freetail-bat		
MOLOSSIDAE	*Mormopterus petersi*	inland free-tailed bat		
MOLOSSIDAE	*Mormopterus planiceps*	south-eastern freetail bat		
PETAURIDAE	*Petaurus norfolcensis*	squirrel glider	V	
PETAURIDAE	*Petaurus* sp.	a glider		
PHALANGERIDAE	*Trichosurus vulpecula*	common brushtail possum		
PSEUDOCHEIRIDAE	*Pseudocheirus peregrinus*	common ringtail possum		
TACHYGLOSSIDAE	*Tachyglossus aculeatus*	short-beaked echidna		
VESPERTILIONIDAE	*Chalinolobus gouldii*	Gould's wattled bat		

Family	Scientific Name	Common Name	BC Act	EPBC Act
VESPERTILIONIDAE	*Chalinolobus morio*	chocolate wattled bat		
VESPERTILIONIDAE	*Falsistrellus tasmaniensis*	eastern false pipistrelle	V	
VESPERTILIONIDAE	*Miniopterus orianae oceanensis*	large bent-winged bat	V	
VESPERTILIONIDAE	*Myotis macropus*	southern myotis	V	
VESPERTILIONIDAE	*Scotorepens balstoni*	inland Broad-nosed Bat		
VESPERTILIONIDAE	*Vespadelus vulturnus*	little forest bat		
REPTILIA				
AGAMIDAE	*Pogona barbata*	bearded dragon		
CHELIDAE	*Chelodina longicollis*	snake-necked turtle		
DIPLODACTYLIDAE	*Diplodactylus vittatus*	eastern stone gecko		
ELAPIDAE	*Pseudechis porphyriacus*	red-bellied black snake		
SCINCIDAE	*Ctenotus sp.*	a skink		
SCINCIDAE	*Egernia cunninghami*	Cunningham's skink		
SCINCIDAE	*Egernia striolata*	tree skink		
SCINCIDAE	*Lampropholis guichenoti*	pale-flecked garden sunskink		
SCINCIDAE	*Morethia boulengeri*	south-eastern morethia skink		
SCINCIDAE	*Saiphos equalis*	three-toed skink		
SCINCIDAE	*Tiliqua rugosa*	shingle-back		
VARANIDAE	*Varanus varius*	lace monitor		
LEPIDOPTERA				
CASTNIIDAE	*Synemon plana*	golden sun moth	E	CE



APPENDIX D

Vegetation Integrity Data

Vegetation Integrity Data

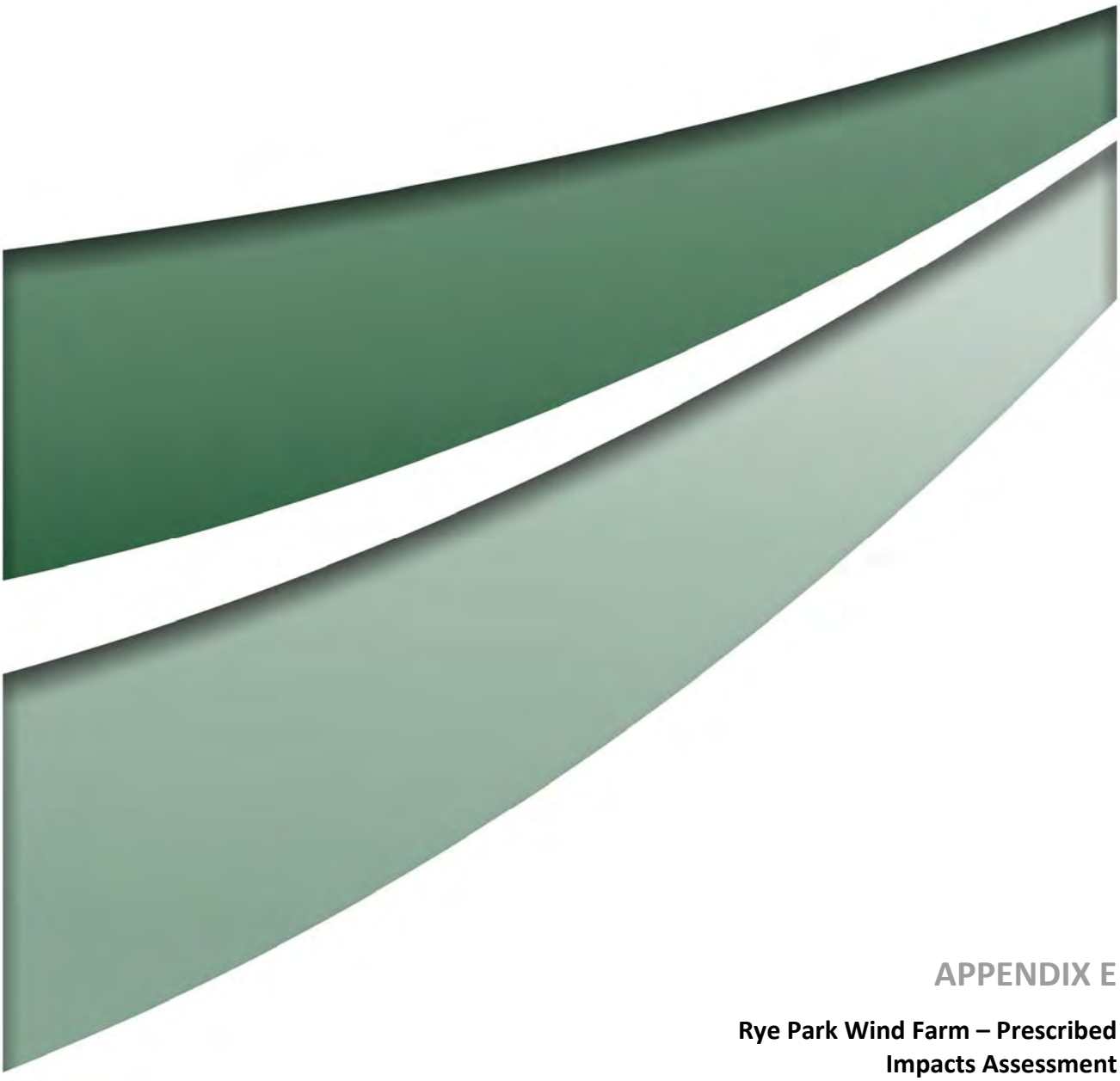
The following vegetation integrity data was collected from surveys of the Development Corridor. It includes the composition, structure and function attributes that are recorded in each BAM Vegetation Integrity Plot. This data is assessed against benchmark data for PCTs and entered into the BAM Calculator to assess the condition of each PCT in the Indicative Development Footprints.

The following abbreviations are used in the table below:

Tr	Tree (growth form)
Sh	Shrub (growth form)
Gr	Grass (growth form)
Fb	Forb (growth form)
Fn	Fern (growth form)
Ot	Other (growth form)

	COMPOSITION						STRUCTURE						FUNCTION										
	Tr	Sh	Gr	Fb	Fn	Ot	Tr	Sh	Gr	Fb	Fn	Ot	Regen	Stem Classes (cm)					No. Large Trees	No. Hollow Trees	Litter (%)	Fallen Logs (m)	High Threat Weeds
													>5	5-10	10-20	20-30	30-50	50-80					
VZ 1 – PCT289 Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion – *Moderate to Good*																							
4107Jan03	4	5	5	1	0	2	45.5	21	33	0	0	1.5	1	1	1	1	1	1	6	1	80.6	59	0
VZ 2 – PCT 335 Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion – *Moderate to Good*																							
33	0	0	8	2	0	0	0	0	48.6	1	0	0	0	0	0	0	0	0	0	0	78	8	5.7
35	0	0	4	0	0	0	0	0	90.4	0	0	0	0	0	0	0	0	0	0	0	40	0	1.4
4107Feb02	0	0	8	0	0	0	0	0	16.5	0	0	0	0	0	0	0	0	0	0	0	97	1	1.7
VZ 3 – PCT 350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion – *Moderate to Good*																							
1	2	5	8	12	0	0	15	35	79	13	0	0	1	1	1	0	1	1	1	1	9	26	2
15	2	1	5	3	0	1	30	1	9	1.2	0	5	1	1	1	1	1	1	1	1	82	144	0
6	3	0	4	1	0	0	30.1	0	10.7	0.2	0	0	1	0	1	1	1	1	1	0	48	10	5
31	3	0	13	0	0	0	32	0	88.2	0	0	0	1	0	0	0	1	1	3	4	42	48	0.4
43	3	0	7	3	0	1	45.0	0.0	12.5	0.3	0.0	1.0	1	1	1	1	0	1	2	3	74.0	70.0	1.0
DMRP1	1	1	9	9	0	0	65	0.8	5.7	1.8	0	0	1	1	1	1	1	1	4	4	88	33	0.3
P03	3	0	2	0	0	1	30	0	2	0	0	1	1	1	1	1	1	1	2	0	70.8	6	3
VZ 4 – PCT 350 Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion – *Derived Native Grassland*																							
11	0	0	10	4	0	0	0	0	49	5.2	0	0	1	0	0	0	0	0	0	0	23	0	4.4
32	0	0	7	1	0	0	0	0	71	1	0	0	1	0	0	0	0	0	0	0	93.8	0	10.4
DMRP3	1	2	8	9	0	2	0.1	0.4	72.4	1	0	0.2	1	0	0	0	0	0	0	0	2.6	0	0.2
4107Jan02	1	0	7	3	1	3	1	0	44.9	3.3	1	0.0	1	0	0	1	0	0	0	0	3.4	1	5.0
4107Feb03	0	0	5	0	0	0	0	0	5.5	0	0	0	1	0	0	0	0	0	0	0	73.6	0	0.1
VZ 5 – PCT 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion – *Moderate to Good*																							
16	5	7	7	3	0	1	34.5	11.2	31.2	5.6	0	2	1	1	1	1	1	0	0	0	58	119	0
20	4	5	5	7	0	2	55.4	35.8	10.4	5	0	3	1	1	1	1	1	0	0	3	25	246	0
23	5	3	3	2	0	1	50.4	6	45	3.4	0	0.4	1	1	1	1	1	0	0	10	80.4	207	0
26	2	8	5	5	0	0	60	11.3	27.6	3.2	0	0	1	1	1	1	1	0	0	3	78	29.5	0
8	4	0	6	1	0	0	30	0	26.3	0.1	0	0	1	0	0	1	1	1	4	8	41	154	0.5
13	4	5	7	8	0	1	42	12.4	33.4	10.3	0	5	1	1	1	1	1	1	8	2	24	49	0
42	2	2	5	2	0	0	40.0	0.7	5.1	0.2	0.0	0.0	1	1	1	1	1	0	2	2	87.0	54.0	0.0
J3	1	7	12	8	1	1	35	38.5	23.5	1.2	0.5	0.1	0	0	1	0	1	1	1	1	39	147	0
VZ 6 – PCT 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion – *Derived Native Grassland*																							
21	1	0	4	1	0	0	0.5	0	31.4	1	0	0	1	0	0	0	0	0	0	0	84	92	10
30	0	1	6	2	0	0	0	1	36.8	0.8	0	0	1	0	0	0	0	0	0	0	2	0	0
12	0	1	9	4	0	0	0	0.8	54.8	10.1	0	0	1	0	0	0	0	0	0	0	14.6	0	1
14	0	0	6	4	0	0	0	0	50	1.6	0	0	1	0	0	0	0	0	0	1	29	73	25.4
DMRP2	0	1	10	1	0	0	0	0.6	61	0.3	0	0	1	0	0	0	0	0	0	0	6	0	0.2
4107Feb04	0	0	11	2	0	0	0	0	48.5	0.2	0	0	1	0	0	0	0	0	0	0	85	2	0

	COMPOSITION						STRUCTURE						FUNCTION										
	Tr	Sh	Gr	Fb	Fn	Ot	Tr	Sh	Gr	Fb	Fn	Ot	Regen	Stem Classes (cm)					No. Large Trees	No. Hollow Trees	Litter (%)	Fallen Logs (m)	High Threat Weeds
													>5	5-10	10-20	20-30	30-50	50-80					
J1	0	0	8	1	1	1	0	0	77.6	0.5	0.1	0.1	0	0	0	0	0	0	0	0	1	0	0.2
J2	0	1	8	2	1	0	0	0.3	62.4	0.2	1	0	0	0	0	0	0	0	0	0	0	0	1
J7	0	1	9	1	0	0	0	0.2	90.1	0.1	0	0	0	0	0	0	0	0	0	0	0	2.4	0.6
J8	0	2	8	4	0	0	0	0.02	56.31	0.7	0	0	0	0	0	0	0	0	0	0	2	0	0.2
VZ 7 – PCT 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion – *Acacia Shrubland*																							
10	1	6	7	8	1	1	20	16.1	80.8	1.3	0.3	0.1	1	0	0	0	0	0	0	0	14.4	21	0
24	1	6	8	4	1	1	25	18.3	40.4	2.2	0.4	0.5	1	1	1	1	1	1	1	3	35	45	0
36	1	2	4	0	1	0	45	10.4	35	0	0.4	0	1	1	1	1	0	0	0	0	48.2	8	0
J4	1	4	7	4	1	1	6	7.5	76.8	0.6	0.2	0.3	1	1	1	1	0	0	0	0	25	0	0.2
VZ 8 – PCT 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion – *Sifton Bush Shrubland*																							
18	1	1	4	0	0	0	1	30	21.4	0	0	0	0	0	0	0	0	0	0	0	15.8	37	2.4
28	2	4	6	3	0	0	11	69	4.3	0.3	0	0	0	0	0	0	0	0	0	0	41	0.5	0
29	0	5	7	1	0	1	0	65.8	18.6	0.1	0	0.1	0	0	0	0	0	0	0	0	41	9	0
34	0	7	6	3	1	0	0	72.8	38.8	1.4	3	0	0	0	0	0	0	0	0	0	60	10	0
4107Feb 01	0	1	8	1	0	0	0	80	1.2	0.1	0	0	0	0	0	0	0	0	0	0	82.4	32	0.2
VZ 9 – PCT 351 Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion – *Argyle Apple Forest*																							
9	3	4	4	3	1	1	25.1	1.3	41.5	0.4	0.1	0.5	1	1	1	1	0	1	2	0	41	25	0
4107Jan 01	6	4	8	2	0	1	37	5.02	14.3	0.02	0	0.8	1	0	1	1	1	1	11	6	69	131	0
VZ 10 – Non-native Vegetation																							
7	0	0	1	1	0	0	0	0	0.3	0.2	0	0	1	0	0	0	0	0	0	0	0.6	0	5.2
5	0	0	1	2	0	0	0	0	0.2	0.3	0	0	1	0	0	0	0	0	0	0	2.4	0	0
P01	1	0	4	2	0	0	3	0	11	2	0	0	1	0	1	1	1	0	0	0	12	0	5
P02	0	0	3	5	0	0	0	0	3	5	0	0	1	0	0	0	0	0	0	0	10	0	12
P04	1	1	3	0	0	0	25	3	4	0	0	0	1	1	1	0	1	1	7	0	60	7	14
J5	0	0	7	0	0	0	0	0	1.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
J6	0	1	6	0	0	0	0	0.1	28.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6



APPENDIX E

Rye Park Wind Farm – Prescribed Impacts Assessment

umwelt
Environmental & Social Consultants

renewables

RYE PARK WIND FARM

BDAR – Prescribed Impacts
Section 9.2.1.8

FINAL

August 2020

RYE PARK WIND FARM

BDAR – Prescribed Impacts
Section 9.2.1.8

FINAL

Prepared by
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Document Status

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	Name	Date	Name	Date
Final	David Moore	16/07/2020	Travis Peake	13 August 2020

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Appendices

1.0 Introduction

This document has been prepared to address criterion 9.2.1.8 a- k within the 'assessing prescribed biodiversity impacts' section of the Biodiversity Assessment Method as required under the NSW *Biodiversity Conservation Act 2016* (BC Act) for the proposed Rye Park Wind Farm modification. These criterion request further analysis of project related impacts on aerial species, particularly threatened species. Aerial species considered as part of this analysis were selected based on recorded flight data collected during bird and bat utilisation surveys during 2011-2013 (NGH 2014) and during 2018/19 by Umwelt in the Project Area. At the request of the Biodiversity and Conservation Division 14 species were considered in this assessment comprising 13 threatened species (nine bird and four bat species) and one non-threatened bird species (wedge-tailed eagle).

This assessment considers the utilisation of the 14 fauna species across a broad Project Area, which includes the extent of landholdings involved with the Project. This is necessary to capture given the mobility of the species being assessment and the criterion being considered.

In **Figures 4.1**, **4.2** and **4.3**, we present the Indicative Development Footprints which comprises the entirety of the Indicative Development Footprint for the Rye Park Wind Farm. The Indicative Development Footprints includes a combination of the Indicative Development Footprint – Wind Farm, the Indicative Development Footprint – External Roads and the Indicative Development Footprint – Permanent Met Masts.

2.0 Predict the likelihood of impact on aerial species resident in, or likely to fly over, the project area including but not limited to bat/bird strike and barotrauma

To ascertain the likelihood and consequence of impacts on aerial species, a risk-based assessment approach has been applied. This assessment has been developed based on a recent report completed by the Arthur Riley Institute (Lumsden *et al.* 2019). The assessment considers the likelihood of blade strike based on recorded flight behaviours and assesses consequence using a range of measures associated with population ecology, abundance and conservation status.

The results of the risk assessment are summarised in **Table 2.1** below, with five species considered a high risk, six considered a moderate risk and three considered a minor risk of being impacted by the Project. The resultant risk rating for these species is primarily due to their relative abundance in the Project Area, their predicted or observed flight behaviour in the Project Area and/or their known susceptibility to blade strike at wind farms in south-east Australia.

The interpretation and justification for these results is provided in **Section 4.0** with reference to data collected during bird utilisation surveys conducted in the Project Area and in consideration of the scant relevant and publicly available data from Australian wind farms.

Table 2.1 Risk Assessment Summary

Common Name	Latin Name	Likelihood	Consequence	Risk Rating
Little eagle	*Hieraaetus morphnoides*	High	Moderate	High
Black falcon	*Falco subniger*	High	Moderate	High
Wedge-tailed eagle	*Aquila audax*	High	Low	Moderate
Superb parrot	*Polytelis swainsonii*	High	Moderate	High
White-throated needletail	*Hirundapus caudacutus*	High	Moderate	High
White-fronted chat	*Epthianura albifrons*	High	Low	Moderate
Brown treecreeper	*Climacteris picumnus victoriae*	Low	Moderate	Minor
Varied sittella	*Daphoenositta chrysoptera*	Moderate	Low	Minor
Painted honeyeater	*Grantiella picta*	Moderate	Moderate	Moderate
Dusky woodswallow	*Artamus cyanopterus*	High	Low	Moderate
Large bent-winged bat	*Miniopterus schreibersii oceanensis*	High	Moderate	High
Yellow-bellied sheathtail bat	*Saccolaimus flaviventris*	Moderate	Moderate	Moderate
Southern myotis	*Myotis macropus*	Low	Moderate	Minor
Eastern false pipistrelle	*Falsistrellus tasmaniensis*	Moderate	Moderate	Moderate

3.0 Predict the rate of impact per turbine per year for species likely to be affected

The rate of impact per turbine per year is not quantitatively estimated here given the lack of information on key relevant factors such as turbine avoidance. Rather, a risk-based assessment, similar to that developed by the Arthur Riley Institute (Lumsden *et al.* 2019) has been completed. The details of this assessment are included within the response to **Section 4.0**.

Where available, mortality estimates from other Australian wind farms has been considered for each aerial species within the responses below. Mortality estimates include data from two of 15 Victorian wind farms at which mortality monitoring has been undertaken and mortality rates for particular species determined (Moloney *et al.* 2019). However, it is emphasised that mortality rates are likely to vary considerably between wind farms, depending on a range of variables such as their proximity to key habitat features (e.g. important cave roosts), turbine size, landscape position and the inherent spatial variability in species abundance and utilisation of airspace (Richardson 2000, Drewitt and Langston 2006, Krijgsveld *et al.* 2009). For this reason, it is not advisable to extrapolate or predict mortality estimates provided in Moloney *et al.* (2019) for other wind farms such as the Project. However, the consideration of available mortality data is important when considering estimating relative risk for a species, such as in **Section 4.3**.

4.0 Justify predictions of likelihood of impact and rates of impact, with reference to relevant literature and other published sources of information

4.1 Risk Assessment Method

The relative risk of blade strike for the eleven species assessed here was estimated using two criteria to ascribe likelihood of risk and four criteria to ascribe consequence of risk (**Table 4.1, Table 4.2**). These six criteria were employed in a recent study conducted with the aim of developing a science-based approach to aid decision-making regarding turbine collision risk for birds and bats in Victoria (Lumsden *et al.* 2019). Each criterion was either adopted unchanged or was adjusted for the purposes of this current assessment as appropriate to ensure the particulars of each criterion was relevant to specific aspects of the Project such as geographic location. For the purposes of this assessment, Criterion A, C and F were slightly altered, Criterion B was substantially altered and the thresholds and spatial scale for Criterion E were adjusted.

Table 4.1 Criteria used to ascribe likelihood of risk

A	B
Known or likely frequency of flights within RSA height	Status or frequency of occurrence in the Project Area

Table 4.2 Criteria used to ascribe consequence of risk

C	D	E	F
Highly localised or concentrated population (for whole or part of lifecycle), such that siting of wind farm could have significant consequence to regional, national or international population	Impact on population relative to demographic capacity to replace fatalities (i.e. generalised combination of dispersal capacity of potential replacements, fecundity and generation time)	Known or estimated size of national or global population	Listed conservation status under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or the BC Act

Each species was ranked either low, moderate or high for each criterion depending on which is most appropriate in consideration of the assessed species' ecology and observed or predicted utilisation of the Study Area. Descriptions for each ranking are outlined in (**Table 4.3**).

Criterion A (flight height) was assessed by identifying the frequency of flights observed between 30 m and 200 m in the Study Area, and assessing this with consideration of observed and reported flight behaviour from elsewhere in Australia. Given that flight height data for bird and bat species in Australia is scant and observation data from pre-construction surveys at wind farms sites is largely unavailable, estimates of flight height require an adequate number of observations from the assessed site coupled with consideration of expert opinion on known flight behaviour for each species assessed. This Criterion is important as flight height is the primary variable through which a relative estimate of collision risk can be reached.

Criterion B (status in Project Area) was assessed by determining the status or estimating the frequency of occurrence in the Project Area. This Criterion is included as it is an essential component for estimating overall blade strike risk.

Criterion C (geographic population concentration) was assessed by estimating the degree to which a species' population may be concentrated due to site related factors such as geographic location, habitat type, proximity to important habitat or roost locations (i.e. significant wetlands, roost caves) and how this relates to the specific landscape in which the Project Area is located. Lumsden *et al*. (2019) noted that this criterion is intended to account for situations where the degree to which a taxon is geographically concentrated may influence the risk posed by the particular location of a wind farm. Where large flocks or aggregations are involved the concentration of individuals may be for short seasonal periods, but may nonetheless substantially heighten risk to a large portion of a species' total population. This is particularly important if a large proportion of a species' population passes through a localised area, such as a migratory corridor, over the course of each seasonal passage.

Criterion D (demographic resilience) was assessed through consideration of known aspects of each assessed species breeding biology and, most specifically, the nature of species' life-history traits. This criterion is included in the risk assessment as it is necessary to estimate the capacity to which a species' may replace individuals lost to mortality resulting from blade strike.

Criterion E (population size) is included to account for the variation in the significance of mortality of a given number of individuals between species as a result of the large variation in assessed species' national or global populations. This, when assessed in combination with Criterion D provides a measure through which the relative vulnerability of a species to loss of individuals can be estimated.

Criterion F (listed conservation status) refers to the status of bird and bat species listed under the EPBC Act or the BC Act. In instances where a species listing differs between Acts, for example one that is listed vulnerable under the EPBC Act and endangered under the BC Act the most threatened listing category is selected for the purposes of this assessment. Species listed as migratory and/or marine under the EPBC Act are not assigned a rank for this criterion.

Table 4.3 Descriptions of each ranking for Criterion A-F

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	Species that do not or rarely fly at RSA height	Species that rarely occur in the Project Area.	Species that are widely distributed within areas of suitable habitat and the habitat itself is relatively widely dispersed	Species that form breeding territories and that have a reasonable proportion of the population as nonbreeding 'floaters' that can rapidly replace breeding territorial adults if lost; species that may or may not form breeding territories and that are short-lived and have high fecundity; species that have capacity for long range or widespread juvenile or sub-adult dispersal	Total population (i.e. whether that corresponds to the national population of Australian endemics or a migrant's global population) is estimated to number more than 20,000 individuals	Species not listed or listed as near threatened or data deficient under the EPBC Act or the BC Act
Moderate	Species which regularly fly below RSA height and occasionally fly at RSA height	Species that occasionally occur in, or occasionally move through the Project Area	Species that may be more widespread or have greater flexibility in the range of suitable habitat availability, but where a high proportion of their population is likely to be concentrated at sites where they do occur	Species with life-history characteristics that sit between the low and high descriptions here	Total population is estimated to number between 5,000 and 20,000 individuals	Species listed as vulnerable under the EPBC Act or the BC Act
High	Species in which a high proportion of flight activity is at RSA height	Species that regularly occur in, or regularly move through the Project Area	Bat species that have major aggregations at a few caves, or bird or bat species that have either very restricted distributions or those where a substantial proportion of a population may move through certain areas (i.e. migratory pathways)	Species that form breeding territories but where there is limited capacity for a lost breeding adult to be readily replaced; species that do not form breeding territories and that are long-lived and/or have low fecundity; species that may have short-distance juvenile or sub-adult dispersal capacity only	Total population is estimated to number less than 5,000 individuals	Species listed as endangered or critically endangered under the EPBC Act or the BC Act

4.2 Estimating overall risk

Estimates of overall risk for each assessed species were determined by following an approach similar to that employed by Lumsden *et al*. (2019) with the most notable exception being the difference in spatial scale for which resulting estimates of risk are intended to be relevant to (i.e. state-wide vs site-specific). Elements of the likelihood and consequence of collision were combined to form an overall qualitative risk category ('low'/'moderate'/'high') specific to the Project for the likelihood of collision and the consequence of collision. Likelihood of collision questions (Criterion A and B) and consequence of collision questions (Criterion C to F) were combined in a generally additive process to determine whether the overall likelihood and consequence of collisions was 'low', 'moderate' or 'high'.

For the overall estimate of **likelihood of collision** to be considered 'high', then at least Criterion A or Criterion B must be considered 'high' and neither could be considered 'low'. To be considered 'low', the rank for both these criteria must be 'low'. All other combinations are considered 'moderate'.

For the overall estimate of **consequence of collision**, the modal response of Criterion C, Criterion D, Criterion E and Criterion F was used as the estimate. In cases where responses are evenly spread between two risk ratings, the higher risk rating was designated. In cases where the risks were spread across all three levels, 'low'; ''moderate' and 'high', a 'moderate' risk was selected. The exception was in cases where the risk associated with criterion C for localised concentration was 'high'. It was considered that the consequences of high mortality due to wind turbine collisions for species that have a limited distribution and/or are highly concentrated is sufficiently large such that, if a species risk associated with this element was 'high', the consequences of collision should also be set to 'high', irrespective of the risks of the other criteria.

Once the overall risk levels for the likelihood and consequence of collision specific to the Project had been assigned for a species, the results were then placed into a risk matrix to determine the level of concern (**Table 4.4**). Five categories of risk were used, namely 'negligible', 'low', 'moderate', 'high' and 'severe', based on the combination of the scores for likelihood and consequence.

Table 4.4 Risk matrix

		Consequence of collisions		
		Low	Moderate	High
Likelihood of collisions	Low	Negligible	Minor	Moderate
	Moderate	Minor	Moderate	High
	High	Moderate	High	Severe

4.3 Assessment of likelihood and consequence of impact

4.3.1 Black falcon

4.3.1.1 Information on black falcon from Australian wind farms

There is one published record of blade strike of black falcon in the available literature (Wood 2015, Moloney *et al.* 2019). Over a two-year monitoring period from March 2013 to February 2015 one deceased black falcon was detected at Macarthur Wind Farm in south-western Victoria (Wood 2015). It was noted that the black falcon had a relatively low occurrence on the wind farm site having not been recorded during pre or post construction surveys, and was therefore unlikely to be significantly impacted by collision with wind turbines (at that wind farm) (Wood 2015). This case highlights that though a lack of records from pre-construction surveys at a wind farm may be interpreted as indicating a lower likelihood of blade strike, the risk of blade strike for highly mobile species considered to be 'unlikely to occur' or 'rare' in the region should not be discounted.

4.3.1.2 Status and flight behaviour in the Project Area

Black falcon were recorded on three occasions during bird utilisation surveys conducted in 2018/19 (**Figure 4.1**). All three observations were from February 2019 in open woodland on lower slopes of the landscape:

- 5 February 2019: one black falcon was observed foraging at RSA height at an average of 80 m AGL, 4 kms north-east of the Project Area at a control vantage point.
- 6 February 2019: a pair were observed circling at RSA height (at an average of 50 m AGL) on the western slopes of the Project Area, 800 m west of proposed turbine #84 before departing to the south.
- 8 February 2019: one bird was incidentally observed flying rapidly at 10 m AGL, 2 km west of the Project Area near the southern portions of the Project.

Black falcons were not recorded in the Project Area during bird utilisation surveys conducted during 2011 - 2013 (NGH 2014).

Based on the broad habitat requirements, high mobility and wide-ranging distribution of this species, there is potential for this species to occur at any location within the Project Area. As with other raptors, the black falcon is likely to spend a high proportion of time at RSA height whilst flying within the Project Area.

4.3.1.3 Likelihood and Consequence of Impacts

The overall risk rating for black falcon is high, based on a high likelihood and moderate consequence of collisions (**Table 4.5**). The high likelihood of collisions is based on this species' flight behaviour though it is noted that given black falcon only occasionally occur in the Project Area the rate of collisions is likely to be relatively low. Rationale for responses to each criterion is as follows:

a) A high proportion of the black falcon's flight activity is at RSA height

b) The black falcon occasionally occurs in the Project Area.

c) The black falcon is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d) The life-history characteristics of the black falcon overlap with certain aspects of both the descriptions for a 'low' and 'high' rating for Criterion D (Marchant and Higgins 1993).

e) In 2009, the national population of black falcon was estimated between 1,000 to 10,000 individuals, roughly equating to 670 – 6,700 mature individuals, although the data quality is reported as being poor (Birdlife International 2020). Hence, Criterion E is conservatively assigned 'high'.

f) The black falcon is listed as vulnerable in NSW under the BC Act.

The black falcon's risk rating of high largely reflects the potentially high consequence of low frequencies of blade strike in the Project Area.

Table 4.5 Black falcon risk assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X			
Moderate		X		X		X
High	X				X	
Risk Rating						
Likelihood	High	**Consequence**	Moderate	**Risk Rating**	High	

4.3.2 Little eagle

4.3.2.1 Information on little eagle from Australian wind farms

Moloney *et al.* (2019) reported one record of blade strike of little eagle from post-construction mortality monitoring of 15 wind farms in Victoria from 2003 to 2018. Smales (2014), reported two records of blade strike of little eagle from eight wind farms in south-eastern Australia (i.e. Victoria and South Australia). It is likely that these reports are referring to the same record of blade strike in Victoria.

4.3.2.2 Status and flight behaviour in the Project Area

Little eagle were recorded twice in the Project Area during surveys conducted in 2018/19 (**Figure 4.1**):

- 9 November 2018: one bird was observed foraging approximately 750 m north-east of proposed turbine #18 at 150 m AGL.
- 1 February 2019: one bird was observed flying east to west over the main ridge, at approximately 60 m AGL at proposed turbine #80.

Little eagles were not recorded in the Project Area during bird utilisation surveys conducted during 2011 - 2013 (NGH 2014).

Based on the broad habitat requirements, high mobility and wide-ranging distribution of this species, there is potential for this species to occur at any location within the Project Area. As with other raptors, the little eagle is likely to spend a high proportion of time at RSA height whilst flying within the Project Area.

4.3.2.3 Likelihood and Consequence of Impacts

The overall risk rating for little eagle is high, based on a high likelihood and moderate consequence of collisions (**Table 4.6**). The high likelihood of collisions is based on this species' flight behaviour though it is

noted that given little eagle only occasionally occur in the Project Area the rate of collisions is likely to be relatively low. Rationale for responses to each criterion is as follows:

a) A high proportion of the little eagle's flight activity is at RSA height

b) The little eagle occasionally occurs in the Project Area.

c) The little eagle is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d) The life-history characteristics of the little eagle overlap with certain aspects of both the descriptions for a 'low' and 'high' rating for Criterion D (Marchant and Higgins 1993).

e) In 2009, the population of little eagle was estimated to number 10,000 to 100,000 individuals, based upon an estimate made by Ferguson and Christie (2001), although the data quality is listed as poor (Birdlife International 2020). Given the uncertainty of this estimate and the decline of little eagle in NSW (Barrett et al. 2007) and the ACT (Olsen and Fuentes 2005) Criterion E was assigned 'moderate' (based on the lower population estimate).

f) The little eagle is listed as vulnerable in NSW under the BC Act.

The little eagle's risk rating of high largely reflects the potentially high consequence of low frequencies of blade strike in the Project Area.

Table 4.6 Little eagle risk assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X			
Moderate		X		X	X	X
High	X					
Risk Rating						
Likelihood	High	**Consequence**	Moderate	**Risk Rating**	High	

4.3.3 Wedge-tailed eagle

4.3.3.1 Information on wedge-tailed eagle from Australian wind farms

The wedge-tailed eagle is commonly reported during mortality monitoring events at wind farms in Australia. Moloney *et al.* (2019) report wedge-tailed eagle as the second most frequently recorded bird species found dead during monitoring from 2003 to 2018 across 15 wind farms in Victoria, with 58 carcasses detected and equating to 10% of all birds found. Using this data, Moloney *et al.* (2019) calculated mortality estimates of 0.06 (95% CI: 0.02 – 0.41) and 0.1 (95% CI: 0 - 0.2) individuals per turbine per year at two Victorian wind farms.

At two wind farms in north-western Tasmania, 18 wedge-tailed eagle carcasses were recorded during monitoring conducted for three and six years at Bluff Point Wind Farm and Studland Bay Wind Farm respectively (Hull *et al.* 2013). This particular monitoring program modelled a mortality estimate of 1.5 and 1.1 collisions per annum at Bluff Point (37 turbines) and Studland Bay (25 turbines). A 95% turbine avoidance rate closely approximated the observed mean annual mortality rate of 1.6 and 1.1 individuals per annum at each wind farm respectively (Smales *et al.* 2013).

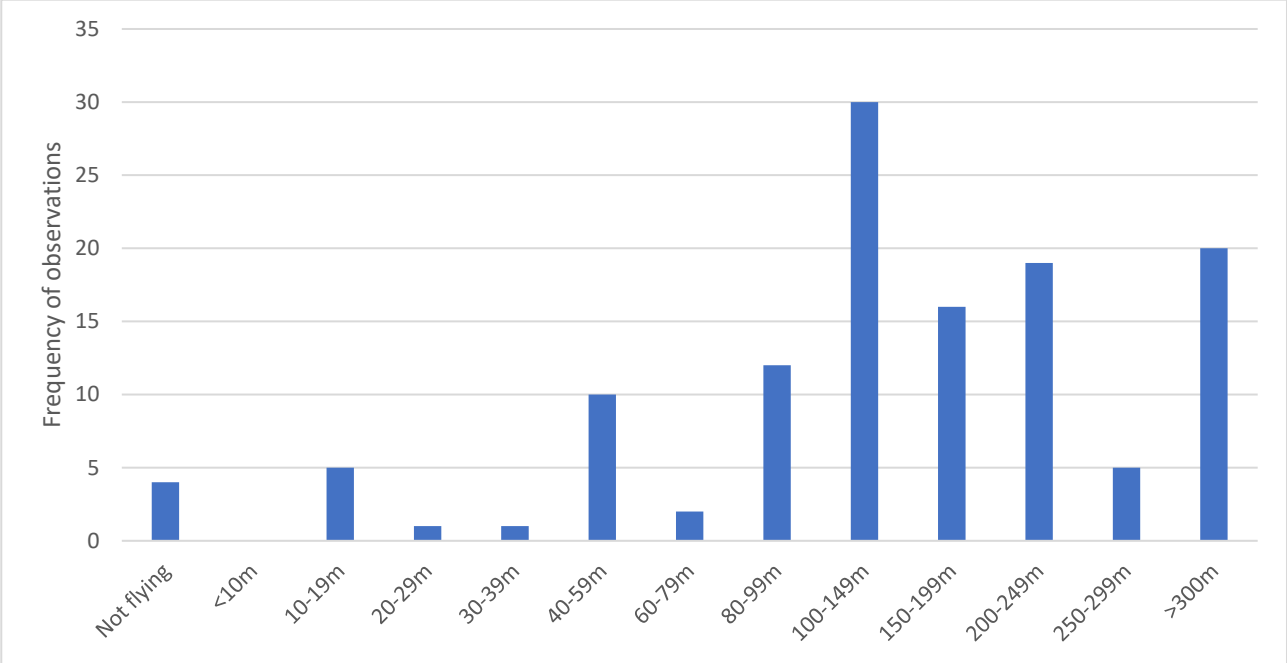
Wedge-tailed eagles are known to have collided with wind turbines in south-east NSW however the total number of fatalities detected in this region is not publicly available (BCD unpublished data). Six wedge-tailed eagle carcasses were recorded under turbines at Gullen Range Wind Farm during monthly monitoring of 30-32 (of 73 turbines) conducted from January – June 2015 (BLA, 2016).

4.3.3.2 Status and flight behaviour in the Project Area

Wedge-tailed eagle were observed throughout the Project Area and recorded on 125 occasions during the 2018/19 bird utilisation surveys (**Figure 4.2**). No nests were recorded in the Project Area during these surveys, though one active nest was recorded on the boundary of the Project Area 1.5 km south-east of proposed turbine #87. NGH (2014) recorded wedge-tailed eagle on 14 occasions in the Project Area during bird utilisation surveys conducted during 2011 - 2013. One inactive wedge-tailed eagle nest was recorded in the central section of the Project Area, resulting in proposed turbine #91 being removed from the layout and proposed turbine #92 being shifted south (NGH 2014).

A summary of wedge-tailed eagle observations made during the 2018/19 survey is presented below:

- 64% (80/125) of observations were of individuals, 29% (36/125) were of pairs, 6% (7/125) were of three birds and less than 2% (2/125) were of four birds.
- Wedge-tailed eagles were recorded in flight on 121 occasions:
    - Observed flights were almost exclusively of individuals or pairs soaring, displaying or circling above 40 m AGL (92% of observations) (Error! Reference source not found.).
    - 74% of flights (90/121) were recorded between 30 – 200 m.
- Of the vantage point sites surveyed during each season (five sites), wedge-tailed eagles were recorded during 60% (24/40) of surveys (Umwelt 2018 /19).



Graph 4.1 Frequency of wedge-tailed eagle observations in each height class.

Wedge-tailed eagle observations were distributed fairly consistently between the three 'impact' vantage points, lower at one 'control' site VPC03 and higher 'control' site VPC04 (**Table 4.7**). The higher number of observed wedge-tailed eagle at VPC04, may be attributed to landscape factors and the layout of elevated ridges surrounding the observer location. VPC03's position differed markedly in that it was positioned on a prominent high point along the dominant ridgeline of the Project Area and there were no other elevated areas (e.g. hills or ridges) within detection distance to the east or west.

Wedge-tailed eagle were regularly recorded regardless of wind speed at the three 'impact' vantage points although it is noted that no surveys were conducted in the early morning prior to thermals becoming active, meaning that very few surveys were conducted in still conditions (**Table 4.8**).

Table 4.7 Summary of wedge-tailed eagle observations at 'impact' and 'control' vantage survey points

	VPI01	VPI03	VPI04	VPC03	VPC04
Proportion of surveys detected	50% (4/8)	88% (7/8)	50% (4/8)	25% (2/8)	75%(6/8)
Number of individuals observed	13	14	12	6	24

Table 4.8 Summary of wedge-tailed eagle observations at vantage point surveys by recorded wind speed

	<11km/h	11-28km/h	29-38km/h	39-61km/h
Proportion of surveys detected	64% (7/11)	43% (6/14)	75% (9/12)	66% (2/3)
Number of individuals observed	20	14	24	11
Number of records / survey	1.8	1.0	2	3.7

4.3.3.3 Likelihood and Consequence of Impacts

The overall risk rating for wedge-tailed eagle is moderate, based on a high likelihood and low consequence of collisions (**Table 4.9**). The rationale for responses to each criterion is as follows:

a) A high proportion of the wedge-tailed eagle's flight activity is at RSA height.

b) The wedge-tailed eagle is a common resident in the Project Area.

c) The wedge-tailed eagle is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d) The life-history characteristics of the wedge-tailed eagle overlap with certain aspects of both the descriptions for a 'low' and 'high' rating for Criterion D however overall they average out between the two and hence Criterion D is assigned 'moderate' (Marchant and Higgins 1993).

e) The total population of wedge-tailed eagle is described as very large by Birdlife International (2020) and given this species very large distribution (c. 10.6 million km^2) the total population is likely to exceed 20,000 individuals.

f) The subspecies of wedge-tailed eagle that occurs in the Project Area is not listed as threatened under the EPBC Act or the BC Act.

The wedge-tailed eagle's risk rating of moderate reflects the moderate level of impact that a potentially high frequency of blade strike in the Project Area is likely to have on this species' total population.

Table 4.9 Wedge-tailed eagle risk assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X		X	X
Moderate				X		
High	X	X				
Risk Rating						
Likelihood	High	**Consequence**	Low	**Risk Rating**	Moderate	

4.3.4 Superb parrot

4.3.4.1 Information on superb parrot from Australian wind farms

There are no records of blade strike of superb parrot in the available literature from Victoria (Moloney *et al.* 2019) which is unsurprising given the lack of wind farms in the superb parrot's range in north-eastern Victoria. There are no records of blade strike of superb parrot in the available data collected in south-eastern NSW to date (BCD unpublished data). In south-eastern NSW, there are three operational wind farms which may present a risk to superb parrot, namely Cullerin Range, Gunning and Gullen Range. These three wind farms are located at the current eastern edge of the superb parrot's range in the Southern Tablelands region.

Given the location of the Project and considering the construction of the Bango Wind Farm an increase in the risk of blade strike to superb parrot in south-eastern NSW is likely to result. Research to be conducted on the movement of superb parrots in the Yass region including at the under construction Bango Wind Farm is likely to improve understanding of the susceptibility of this species to blade strike and indirect

impacts resulting from the operation of turbines (Rayner 2019). Potential cumulative impacts on superb parrot from wind farms in this region are discussed in **Section 6.0**.

4.3.4.2 Status and flight behaviour in the Project Area

Superb parrots were frequently recorded in box-gum woodland in the lower-lying parts of the landscape immediately west of the Project Area during the 2011-13 surveys (NGH 2014) and the 2018/19 surveys. The species was observed in various locations in the Project Area during both the 2011/2013 and 2018/2019 survey periods. The majority of records during both surveys were concentrated in an area in the southern portion of the Project Area.

During 2011-2013, NGH (2014) documented regular superb parrot flights near proposed turbines #106, 107, 109 and 110 where an observer watched activity from a dedicated vantage point. In response to this finding, proposed turbines #106, 107, 109 and 110 were removed from the proposed layout. Additional records, including breeding pairs were detected to the north of proposed turbines #119, 120, 122, 124, 125 and 142. The majority of superb parrot records during 2018/2019 were also recorded within this area.

Superb parrots were recorded on 30 occasions during 2018/2019 bird surveys (**Figure 4.1**), with survey effort focussed immediately north (in the range of approximately 200 to 1000 m north) of proposed turbines #119, 120, 122, 124, 125 and 142. These six proposed turbines are likely to pose the highest risk to superb parrots in the Project Area. Active breeding was not detected during 2018/19, however, given surveys were generally restricted to a specific area in which transects designed to monitor movements were walked, breeding in nearby suitable habitat may have gone undetected.

Other notable records made during the 2018/2019 survey, include two records from the northern portion of the Project Area (all other records for the species in the Project Area during 2018/19 were from the southern areas) and one from control site VPC04 to the north-east of the Project Area. These records are detailed below:

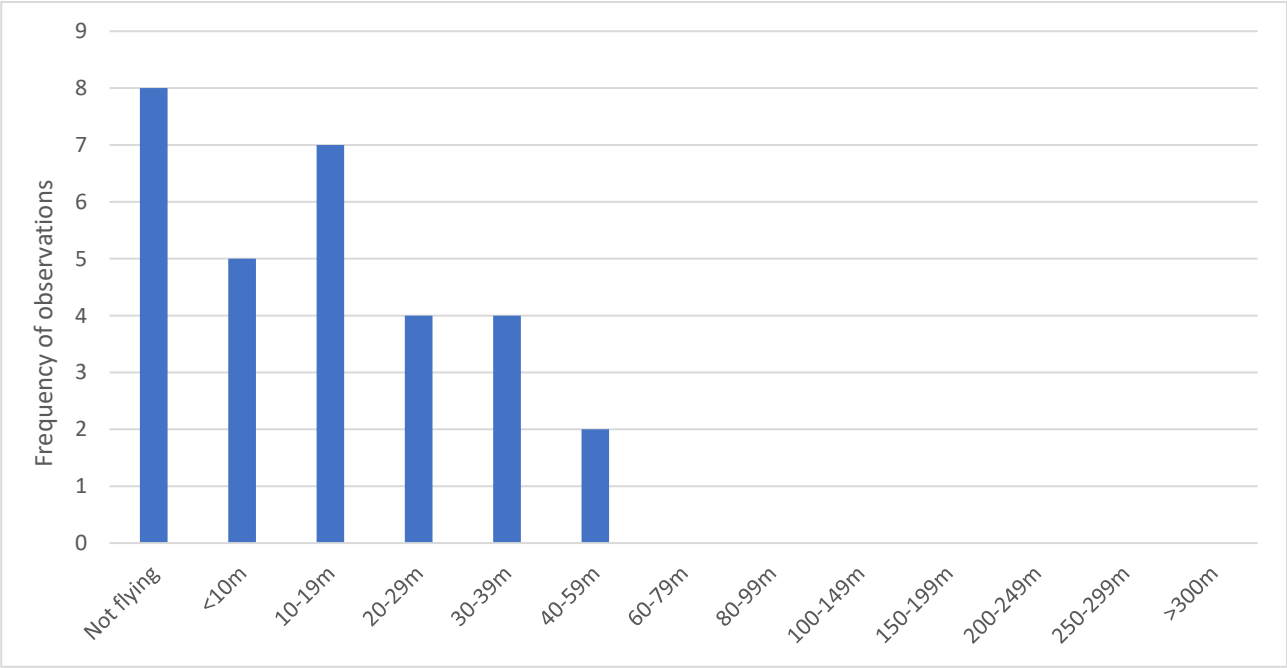
- 30 January 2019: three superb parrots were observed flying in a northerly direction at 15 m AGL in the north-eastern section of the Project Area 500 m east of proposed turbine #22 and 700 m west of proposed turbine #136.
- 30 January 2019: a group of five superb parrots were observed perched in the far northern section of the Project area, 600 metres west of proposed turbine #4.
- 30 January 2019: one individual was recorded at a ‘control’ vantage point north-east of the Project Area (VPC04) flying north-east at 40 m AGL.

Further to the above, ten incidental superb parrot observations (2018/19 surveys) were made in the vicinity of Dalton Road and Little Plains Road approximately 1-2.5 km west of the Project Area. These observations confirm similar records made NGH (2014) during 2011-2013 in this area.

Of the records made the 2018/19 surveys, superb parrots were observed in flight on 22 occasions (**Graph** 4.2). A summary of these observations is provided below:

- 18% (4/22) of flights were of individuals or flocks flying between 20-29m AGL, 18% (4/22) at 30-39m AGL and 9% (2/22) at 40-49m AGL whilst the remaining 55% (12/22) of flights were below 20 m AGL.
- In the southern section of the Project Area superb parrot were observed in flight on 14 occasions. 43% (6/14) of flights were below 20 m AGL, 29% (4/14) were at 20-29 m AGL, 21% (3/14) were at 30-39 m and one was at 40 m AGL.

Based on observations from elsewhere in their range it is expected that the observed maximum flight of 40 m AGL does not correspond with the maximum flight height of this species. Further, the true frequency of flights above 20 m AGL relative to the number of flights below 20 m AGL is likely to be higher than depicted in **Graph 4.2**.



Graph 4.2 Frequency of superb parrot observations in each height class

4.3.4.3 Likelihood and Consequence of Impacts

The overall risk rating for superb parrot is high, based on a high likelihood and moderate consequence of collisions (**Table 4.10**). Rationale for responses to each criterion is as follows:

a) The superb parrot regularly flies below RSA height and occasionally flies at RSA height

b) The superb parrot regularly occurs in the Project Area.

c) The superb parrot's range is relatively restricted and the extent of its habitat has been reduced substantially since European settlement. Superb parrot are known to congregate in areas of remaining habitat particularly in the south-eastern portion of their range during spring and summer. Furthermore, a large proportion of their total population occurs and moves through the region in which the Project Area is located.

d) The life-history characteristics of the superb parrot overlap with certain aspects of both the descriptions for a 'low' and 'high' rating for Criterion D (Higgins 1999)

e) There are several estimates of total superb parrot population size. Higgins (1999) estimated that there were less than 5,000 breeding pairs, Garnett and Crowley (2000) estimated a total of 5000 adult birds, Baker-Gabb (2011) estimated a total of 5,000 to 8,000 individuals and Garnett et al. 2011 estimated there to be well over 10,000 individuals. Based on these population estimates Criterion E was assigned 'moderate'.

f) The superb parrot is listed as vulnerable under the EPBC Act and the BC Act.

Table 4.10 Superb parrot risk assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low						
Moderate	X		X	X	X	X
High		X				
Risk Rating						
Likelihood	High	**Consequence**	Moderate	**Risk Rating**	High	

4.3.5 White-throated needletail

4.3.5.1 Information on white-throated needletail from Australian wind farms

The white-throated needletail is particularly vulnerable to blade strike (Hull *et al.* 2013). Five birds have been found during post-construction mortality monitoring conducted at 15 wind farms in Victoria from 2003 to 2018 (Moloney *et al.* 2019). There are 11 records of blade strike of white-throated needletail at both Bluff Point Wind Farm and at Studland Bay Wind Farm in north-west Tasmania (Hull *et al.* 2013). White-throated needletail are known to have collided with wind turbines in south-east NSW, with much of the data collected in this region being not publicly available (BCD unpublished data). Despite this, there are six records of deceased white-throated needletail at Capital Wind Farm from 2012/13 on the Atlas of Living Australia.

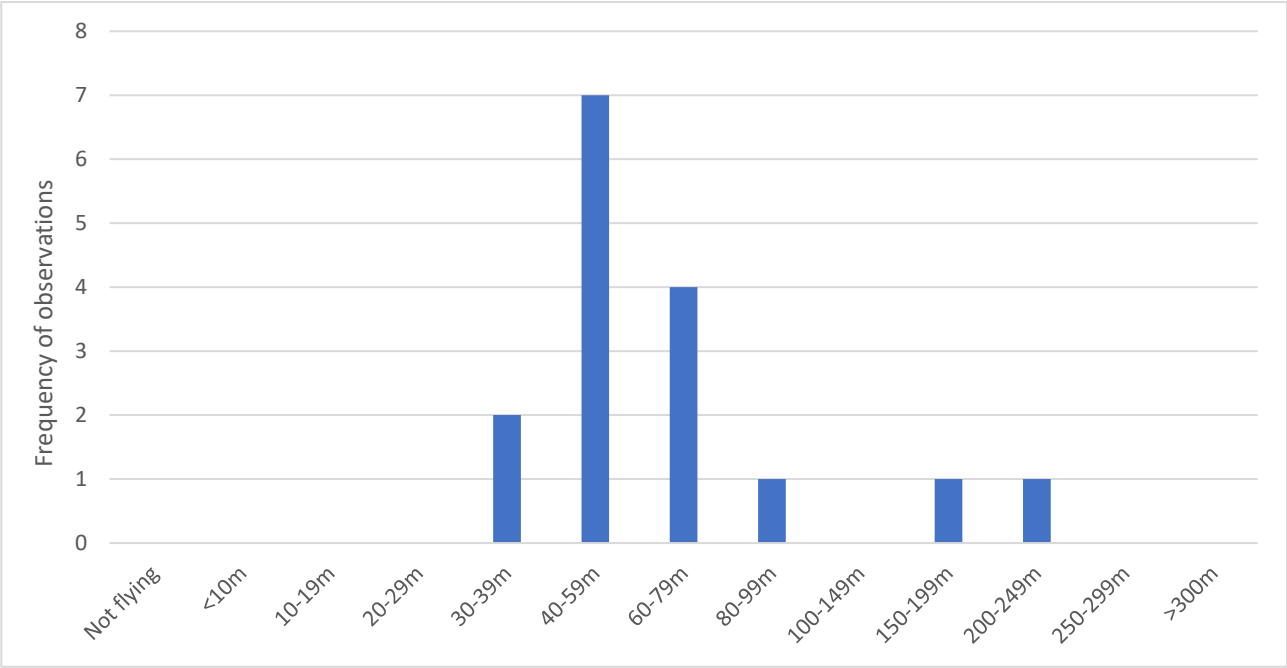
4.3.5.2 Status and flight behaviour in the Project Area

White-throated needletails were recorded on 16 occasions in the Project Area in February/March 2019 (**Figure 4.1**). These observations were not concentrated in any particular section of the Project Area, although the majority were instances of foraging above or moving through the higher sections of the Project Area (i.e. 700 m above sea level). White-throated needletail were not recorded in the Project Area during bird utilisation surveys conducted during 2011 - 2013 (NGH 2014).

A summary of the white-throated needletail observations made within the Project Area is presented below:

- 4-6 February 2019: a flock of 24 individuals, 500 m west of proposed turbine #69 was observed circling at approximately 200 m AGL. There were a further seven observations during the next two days including an observation of 13 birds flying south at 60 m AGL near proposed turbine #120 in the southern section of the Project Area and 15 birds flying east at the same height above Grassy Creek Road in the northern section of the Project Area.
- 13 – 15 February 2019: six observations, including one of a flock of 55 individuals flying around proposed turbines #80 and #82 at RSA height.
- 14 February 2019: 41 individuals were observed flying directly along the ridge in a southerly direction at RSA height over a period of 15 minutes near three proposed turbines removed from the layout (#102, 103 and 104).
- 8 March 2019: Two observations comprising five and six individuals, observed at a control vantage point (VPC03) north of Blakney Creek South Road and between proposed turbines #83 and #143.

Each observation of white-throated needletails in the Project Area was of individuals or flocks flying at RSA height (**Graph 4.3**). The majority of observations were of birds flying between 40 - 80 m AGL with 83% (165/200) of observed individuals occurring within this height range. Although not recorded during the surveys, white-throated needletails would also forage below and above RSA in the Project Area.



Graph 4.3 Frequency of observations of white-throated needletail in each height class.

4.3.5.3 Likelihood and Consequence of Impacts

The overall risk rating for white-throated needletail is high, based on a high likelihood and moderate consequence of collisions (**Table 4.11**). The rationale for responses to each criterion is as follows:

a) A high proportion of the white-throated needletail's flight activity is at RSA height.

b) Based on the observations of this species in the Project Area, Criterion B could either be assigned 'moderate' or 'high' because this species could either be an occasional or a regular seasonal visitor in the Project Area each year. Regardless, because a rating of 'low' for Criterion B is not considered, the overall likelihood of collision is automatically deemed 'high' due to the 'high' rating assigned for Criterion A.

c) Although the white-throated needletail has a very large range it is noted that because a large proportion of this species' population may occur at specific preferred foraging areas or use particular migratory paths there is a high degree of variability in the likelihood of collisions between locations across its distribution in eastern Australia.

d) The location of the Project Area in the western section of its range in south-eastern NSW suggests that it is unlikely that a high proportion of this species' population occurs in the Project Area annually. However, observations from the Project Area indicate that the NNW-SSE aligned ridge running the length of the Project Area is potentially an important landscape feature in a regional context for white-throated needletail.

e) The life-history characteristics of the white-throated needletail overlap with certain aspects of both the descriptions for a 'low' and 'high' rating for Criterion D (Higgins 1999).

f) The total population of white-throated needletail has not been estimated (Birdlife International 2020). The population size of the nominate subspecies that migrates to Australia is likely to comprise approximately 10,000 individuals (DoE 2015).

g) The white-throated needletail is listed as vulnerable and migratory under the EPBC Act.

Table 4.11 White-throated needletail risk assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low						
Moderate		X	X	X	X	X
High	X					
Risk Rating						
Likelihood	High	**Consequence**	Moderate	**Risk Rating**	High	

4.3.6 White-fronted chat

4.3.6.1 Information on white-fronted chat from Australian wind farms

There are no published records of blade strike of white-fronted chats in the available literature in Victoria (Moloney *et al.* 2019), south-east New South Wales (BCD unpublished data) or in north-west Tasmania (Hull *et al.* 2013). This is despite having a wide distribution in southern Australia, a preference for open landscapes in which the majority of wind farms are situated and a tendency to occasionally fly above the typical minimum RSA height. Given the survey effort of post-construction monitoring to date, scavenger rates in open landscapes and the small size of this species amongst other factors it is plausible that instances of blade strike have gone undetected at Australian wind farms.

A review of literature identified that the species may actively avoid turbines, with an observation of turbine avoidance from Codrington Wind Farm in south-western Victoria. Meredith *et al.* (2002) reported a 100% turbine avoidance rate for the species at this location. However, given that the context of the situation in which this observation was made is unknown (i.e. the survey effort, number of observed flights, habitat type and all other relevant factors are unspecified) little can be drawn from this observation other than the conclusion that white-fronted chat do indeed avoid turbines (though the question of the rate at which they do remains unanswered).

4.3.6.2 Status and Flight Behaviour in the Project Area

White-fronted chats were regularly recorded in the northern half of the Project Area during bird utilisation surveys conducted in 2018/19, from four distinct areas of occupancy (**Figure 4.1**). These areas supported suitable habitat for the species, being open areas containing isolated patches of low bracken. Across all surveys conducted during 2018/2019, white-fronted chats were recorded on 86 occasions, occurring in flocks of up to 28 individuals. 90% of observations were recorded in the particular areas highlighted in **Figure 4.1**, including one record of an active nest.

White-fronted chats were recorded on four occasions in the Project Area during bird utilisation surveys conducted during 2011 - 2013 (NGH 2014).

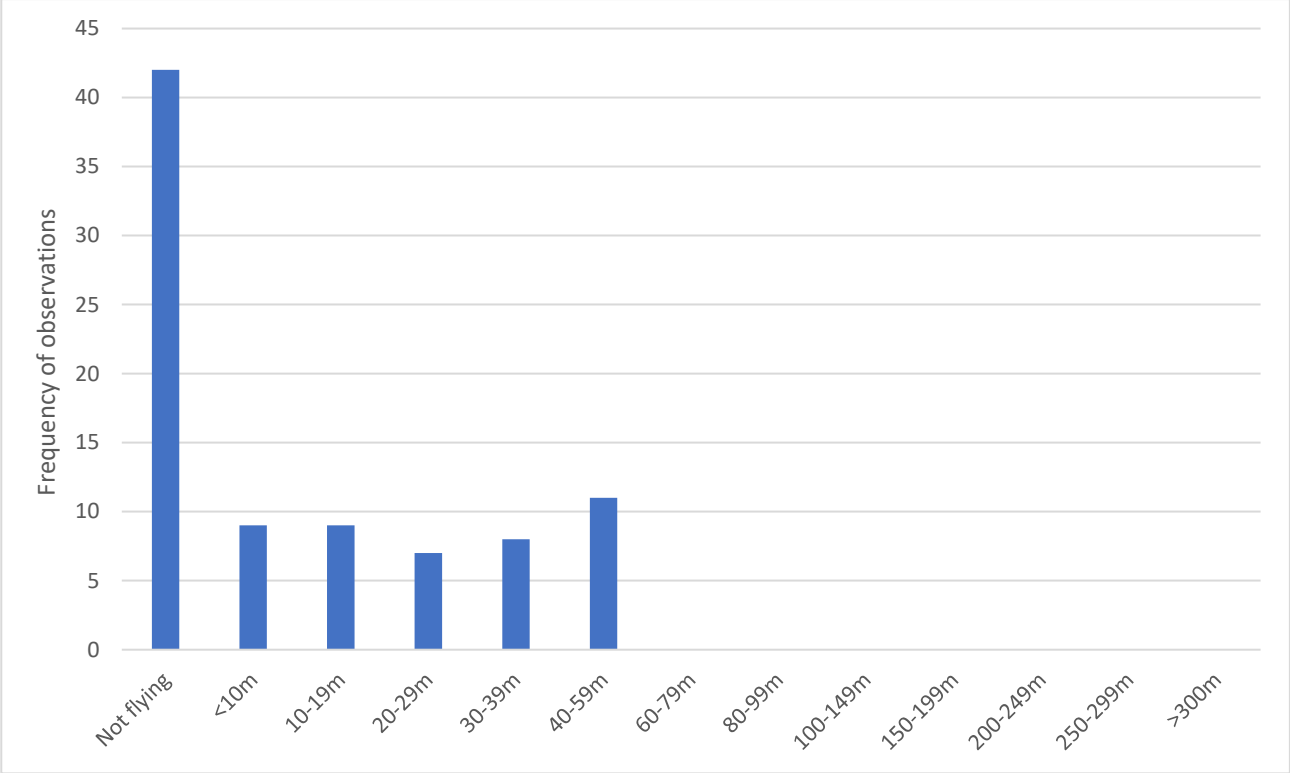
Based on the extent of occupied habitat and the proportion of potential habitat surveyed it is likely that white-fronted chats most frequently occur at 25 proposed turbine locations in the Project Area (**Figure 4.1, Table 4.12**). Movement between the four areas of occupancy is considered likely, given the relatively short

distances and absence of barriers. For this reason, the occurrence of white-fronted chat is unlikely to be restricted to these 25 identified proposed turbine locations alone, although abundance and flight records appear to be greatest in such areas throughout the 2018/19 surveys.

Table 4.12 Proposed turbines located within likely white-fronted chat area of occupancy

Area	Turbines
North-western area	1, 2, 3, 4, 5, 7, 9, 151
North-eastern area	18, 21, 22, 25, 26, 30, 31, 36, 39, 135, 136, 137, 138
High Rock Rd property	73, 74,
Flakney Creek Rd area	82, 83

Whilst white-fronted chats tended to spend a considerable amount of time foraging on the ground or perched on low shrubs or fences (49% of observations), the species was also regularly recorded flying at or above 30 m AGL in the Project Area (**Graph 4.4**). On eight occasions (18% of observed flights), individuals or flocks were recorded flying at between 30-39 m AGL and on 11 occasions (25% of observed flights), they were recorded between 40-59 m AGL. Observed flights at RSA height were typically undertaken by individuals, pairs or larger groups across a distance of several hundred metres at a time. Of the observed flights at and above 40 m AGL three were of a single bird, six were of pairs and the remaining two comprised flocks of 10 and 16 individuals.



Graph 4.4 Frequency of observations of white-fronted chat in each height class.

4.3.6.3 Likelihood and Consequence of Impacts

The overall risk rating for white-fronted chat is moderate, based on a high likelihood and low consequence of collisions (**Table 4.13**). The rationale for responses to each criterion is as follows:

a) The white-fronted chat regularly flies below RSA height and occasionally flies at RSA height.

b) The white-fronted chat is a resident in the Project Area and frequently occurs in areas where turbines are proposed.

c) The white-fronted chat is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d) The white-fronted chat is not long-lived, has relatively high fecundity and a high capacity to replace individuals lost (Higgins et al. 2001).

e) There are no estimates of the total population of white-fronted chat (Birdlife International 2020) however given their large area of occupancy its population is likely to exceed 20,000 individuals.

f) The white-fronted chat is listed as vulnerable in NSW under the BC Act.

Table 4.13 White-fronted chat risk assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X	X	X	
Moderate	X					X
High		X				
Risk Rating						
Likelihood	High	**Consequence**	Low	**Risk Rating**	**Moderate**	

4.3.7 Brown treecreeper

4.3.7.1 Information on brown treecreeper from Australian wind farms

There are no published records of blade strike of brown treecreepers in the available literature in Victoria (Moloney *et al.* 2019) or south-east New South Wales (BCD unpublished data), though it is noted that the majority of wind farms monitored in Victoria are on the south-western edge or outside of this species' distribution.

4.3.7.2 Status and flight behaviour in the Project Area

Brown treecreepers were not recorded in the Project Area in 2018/19 despite extensive surveys across suitable habitat. Brown treecreeper were recorded on six occasions in the Project Area during bird utilisation surveys conducted during 2011 - 2013 (NGH 2014). All observations were of birds near proposed turbines #102, 103 and 104 (which have since been removed from the layout). Each observation was of birds below 20 m AGL (NGH 2014).

4.3.7.3 Likelihood and Consequence of Impacts

The overall risk rating for brown treecreepers is minor, based on a low likelihood and moderate consequence of collisions (Table 4.14). The rationale for responses to each criterion is as follows:

a) Based on observations from the Project Area and knowledge of this species' flight behaviour from elsewhere, the brown treecreeper is unlikely to fly at RSA height in the Project Area.

b) The surveys conducted in 2011-2013 and 2018/19 indicate that the brown treecreeper is currently an uncommon/rare visitor or resident in the Project Area. This species has declined considerably in the greater region during the past three decades (Reid 1999, Trail and Duncan 2000, COG 2020) to the point that certain sites that were formerly occupied are now irregularly visited or no longer support brown treecreeper (e.g. as documented in parts of the ACT) (COG 2020).

c) The brown treecreeper is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d) The brown treecreeper is not long-lived and has relatively high fecundity, though appears to have a limited capacity to replace individuals lost in certain fragmented landscapes such as the region in which the Project Area is located (Higgins et al. 2001).

e) The population size of the brown treecreeper is unknown (Birdlife International 2020), though it is likely to exceed 20,000 individuals based on the size of its distribution in eastern Australia (c. 3.3 million km^2). Due to the estimated extent of occurrence of the south-eastern subspecies (*C. p melanotus*) of approximately 600,000 km2 (Garnett et al. 2011) and its decline Criterion E is conservatively assigned 'moderate' because the population of this subspecies may number between 5,000 and 20,000 individuals.

f) The brown treecreeper is listed as vulnerable in NSW under the BC Act.

Table 4.14 Brown treecreeper risk assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X	X	X			
Moderate				X	X	X
High						
Risk Rating						
Likelihood	Low	**Consequence**	Moderate	**Risk Rating**	Minor	

4.3.8 Varied sittella

4.3.8.1 Information on varied sittella from Australian wind farms

There are no published records of blade strike of varied sittellas in the available literature in Victoria (Moloney *et al.* 2019) or south-east New South Wales (BCD unpublished data).

4.3.8.2 Status and flight behaviour in the Project Area

Varied sittellas were observed on eight occasions in the Project Area in 2018/19 (**Figure 4.1**) comprising three records in the far southern section of the Project Area, four records in the central section and one in the northern section. Of these eight observations, two were at proposed turbines #80 and 150 in the central section of the Project Area. Observations were not concentrated in any particular area of the Project Area. Varied sittella may occur in any area of woodland (including open woodland supporting scattered paddock trees) or dry forest in the Project Area.

All observations during 2018/19 were of groups foraging or moving between paddock trees at or below canopy height. A total of 1/6 (17%) flight observations were of birds flying at 10 m AGL, 2/6 (33%) at 15 m AGL and 3/6 (50%) at 20 m AGL. Varied sittellas were recorded on four occasions between 0 – 20 m AGL in the Project Area during bird utilisation surveys conducted during 2011-2013 (NGH 2014).

4.3.8.3 Likelihood and Consequence of Impacts

The overall risk rating for varied sittella is minor, based on a moderate likelihood and low consequence of collisions (Table 4.15). The rationale for responses to each criterion is as follows:

a) Based on observations from the Project Area and knowledge of this species' flight behaviour from elsewhere varied sittella are likely to rarely fly at RSA height in the Project Area.

b) The varied sittella is a resident in the Project Area.

c) The varied sittella is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d) The varied sittella is not long-lived, has relatively high fecundity and a high capacity to replace individuals lost (Higgins and Peter 2002).

e) The total population of varied sittella is unknown (Birdlife International 2020) though it is likely to exceed 20,000 individuals given its very large distribution across the Australian mainland (c. 9.2 million km2) (Birdlife International 2020).

f) The varied sittella is listed as vulnerable in NSW under the BC Act.

Table 4.15 Varied sittella risk assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X		X	X	X	
Moderate						X
High		X				
Risk Rating						
Likelihood	Moderate	**Consequence**	Low	**Risk Rating**	Minor	

4.3.9 Painted honeyeater

4.3.9.1 Information on painted honeyeater from Australian wind farms

There are no published records of blade strike of painted honeyeaters in the available literature in Victoria (Moloney *et al.* 2019) or south-east New South Wales (BCD unpublished data). The majority of wind farms monitored in Victoria are on the south-western edge or outside of this species' distribution.

4.3.9.2 Status and flight behaviour in the Project Area

Painted honeyeaters were not recorded in the Project Area in 2018/19 despite extensive surveys in suitable habitat. Painted honeyeaters were recorded on seven occasions in the Project Area during bird utilisation surveys conducted during November 2013 (NGH 2014). Six of these observations were of birds in flowering mistletoe in an area of box-gum woodland in the southern section of the Project Area, west of four proposed turbines (#106, 107, 109 and 110) that have since been removed from the layout. It was estimated that 10-12 individuals were present in this particular area during November 2013 (NGH 2014). The southernmost record is approximately 800 m north of proposed turbine #120. The other observation during November 2013 was from an area of box-gum woodland in the central section of the Project Area approximately 800 m north-west of proposed turbine #143. Flight data was only recorded for two observations. Both flight records were of individuals below 10 m AGL (NGH 2014).

4.3.9.3 Likelihood and Consequence of Impacts

The overall risk rating for painted honeyeater is moderate, based on a moderate likelihood and moderate consequence of collisions (Table 4.16).The rationale for responses to each criterion is as follows:

a) Based on observations from the Project Area and knowledge of this species' flight behaviour from elsewhere, painted honeyeaters are likely to regularly fly below and occasionally fly at RSA height in the Project Area.

b) The painted honeyeater is an uncommon/rare visitor, most likely to occur during spring and summer when mistletoe is flowering in the Project Area.

c) The painted honeyeater is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d) The painted honeyeater is not long-lived, has relatively high fecundity and a high capacity to replace individuals lost (Higgins et al. 2001).

e) Garnett et al. (2011) estimated a declining population of between 2,500 and 10,000 mature individuals, roughly equivalent to 3,750 - 15,000 individuals in total. Taking a precautionary approach, the lower estimate has been accepted and Criterion E is assigned 'high'.

f) The painted honeyeater is listed as vulnerable under the EPBC Act and the BC Act.

Table 4.16 Painted honeyeater risk assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low		X	X	X		
Moderate	X					X
High					X	
Risk Rating						
Likelihood	Moderate	**Consequence**	Moderate	**Risk Rating**	Moderate	

4.3.10 Dusky woodswallow

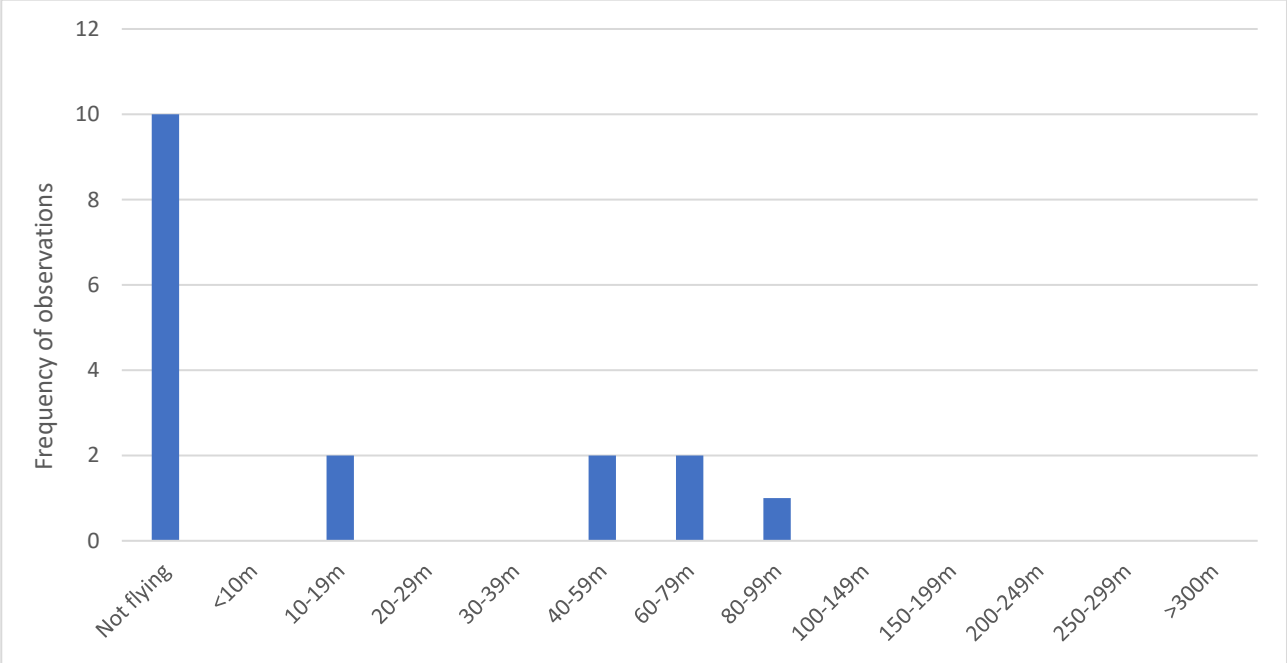
4.3.10.1 Information on dusky woodswallow from Australian wind farms

Moloney *et al.* (2019) reported one record of blade strike of dusky woodswallows at Victorian wind farms from post-construction mortality monitoring from 2003 to 2018. Smales (2014) also reported one record of blade strike from a total of eight wind farms in south-eastern Australia (i.e. Victoria and South Australia). It is likely that these reports are referring to the same record.

4.3.10.2 Status and flight behaviour in the Project Area

Dusky woodswallows were recorded on 17 occasions in the Project Area in 2018/19 (**Figure 4.1**). These observations were not concentrated in any particular section of the Project Area although dusky woodswallows were more frequently seen at a vantage survey point (VPI04) at proposed turbine #31 than at any other vantage point of transect. Dusky woodswallows were recorded on three occasions in the Project Area during bird utilisation surveys conducted during 2011 - 2013 (NGH 2014).

Of all observations in 2018/2019, 58% (10/17) were of dusky woodswallows perched, whilst 71% (5/7) of flight records comprised flocks or individuals foraging at RSA height between 40-100 m AGL (**Graph 4.5**).



Graph 4.5 Frequency of observations of dusky woodswallow in each height class.

4.3.10.3 Likelihood and Consequence of Impacts

The overall risk rating for dusky woodswallow is moderate, based on a high likelihood and low consequence of collisions (**Table 4.17**). The rationale for responses to each criterion is as follows:

a) A high proportion of the dusky woodswallow's flight activity is at RSA height.

b) The dusky woodswallow regularly occurs in the Project Area.

c) The dusky woodswallow is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d) The dusky woodswallow is not long-lived, has relatively high fecundity and a high capacity to replace individuals lost (Higgins et al. 2006).

e) The total population of the dusky woodswallow is unknown (Birdlife International 2020) though it is likely to exceed 20,000 individuals.

f) The dusky woodswallow is listed as vulnerable in NSW under the BC Act.

Table 4.17 Dusky woodswallow risk assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X	X	X	
Moderate						X
High	X	X				
Risk Rating						
Likelihood	High	**Consequence**	Low	**Risk Rating**	Moderate	

4.3.11 Large bent-winged bat

4.3.11.1 Information on large bent-winged bat from Australian wind farms

There are no published records of blade strike of large bent-winged bats in the available literature in Victoria (Moloney *et al.* 2019) or south-east New South Wales (BCD unpublished data). The majority of wind farms monitored to date in Victoria are located outside of this species' distribution. There are eight published records of blade strike of the closely related southern bent-winged bat in the available literature in Victoria (Moloney *et al.* 2019). A mortality model for southern bent-winged bat generated a mortality rate estimate of 0.1 individuals per turbine per year (95% CI 0-0.5) for one particular wind farm (Moloney *et al.* 2019).

Large bent-winged bats are known to have collided with wind turbines in south-east NSW however data collected in this region is not publicly available (BCD unpublished data).

4.3.11.2 Status and flight behaviour in the Project Area

Three confirmed large bent-winged bat calls were recorded during the 2018/19 survey. Each of these records were from ground level, 250 m south-west of proposed turbine #124 (**Figure 4.3**). During the November 2011 and April 2012, 41 large bent-winged bats were recorded in the Project Area (NGH 2014). The majority of these calls were from the central section of the Project Area between proposed turbines #80 and #143 (NGH 2014). The species was also recorded in the southern section of the Project Area near the removed turbines #104 and 105 and in the northern section of the Project Area near proposed turbines #9 and #25.

As very few confident large bent-winged bat identifications were made from the data collected in 2018/19, unresolved calls that may have been from large bent-winged bats were pooled to create a "possible large bent-winged bat" dataset (**Appendix E1**). This allowed for the comparison of data within and outside the bent-winged bat migration period.

A total of 1107 sample nights were included in the analyses from 30 different sites. Overall, there was no spike in activity during the autumn migration season. The data suggest that whilst the Project Area is located within an area that large bent-winged bats migrate through (Dwyer 1969) there is no evidence that a highly utilised autumn migratory path intersects the Project Area.

4.3.11.3 Likelihood and Consequence of Impacts

The overall risk rating for large bent-winged bat is high, based on a high likelihood and moderate consequence of collisions (**Table 4.18**). The rationale for responses to each criterion is as follows:

a) Based on available data large bent-winged bats are likely to occasionally fly at RSA height in the Project Area.

b) The number of large bent-winged bat records in 2011-2013 and in 2019, indicate that this species either occasionally or regularly occurs in the Project Area. Criterion B is conservatively assigned 'high' here.

c) Large bent-winged bats congregate in large numbers at a few caves in the region the nearest being a maternity cave located at Wee Jasper approximately 45 kilometres south-west of the Project Area. There was no spike in activity of confirmed or potential large bent-winged bat calls during the migration period in autumn 2019. Hence, Criterion C is assigned 'moderate'.

d) The life-history characteristics of the large bent-winged bat overlap with certain aspects of both the descriptions for a 'low' and 'high' rating for Criterion D.

e) It is likely that the total population of large bent-winged bats is over 20,000 individuals (Churchill 1998, Pennay *et al.* 2011).

f) The large bent-winged bat is listed as vulnerable in NSW under the BC Act.

Table 4.18 Large bent-winged bat risk assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low					X	
Moderate	X		X	X		X
High	X	X				
Risk Rating						
Likelihood	High	**Consequence**	Moderate	**Risk Rating**	High	

4.3.12 Yellow-bellied sheathtail bat

4.3.12.1 Information on yellow-bellied sheathtail bat from Australian wind farms

There are no published records of blade strike of yellow-bellied sheathtail bats in the available literature from post-construction monitoring conducted in its range in south-eastern Australia (BCD unpublished data, Moloney *et al.* 2019).

4.3.12.2 Status and flight behaviour in the Project Area

The yellow-bellied sheathtail bat was recorded in the Project Area during both the 2011-2013 and 2018/2019 survey events.

Calls for yellow-bellied sheathtail bats were recorded during the 2018/19 surveys, with 14 calls recorded from five locations (**Figure 4.3**). Seven calls were detected from ground level in wooded habitat approximately 1.3 km north of proposed turbine #145. One call from ground level and two calls at 45 m AGL were also recorded at proposed turbine #31. Single calls were recorded from ground level and at 45 m AGL near proposed turbine #80. Single calls were also recorded from ground level near proposed turbine #69 and from ground level near proposed turbine #2.

During the 2011-2013 survey, four yellow-bellied sheathtail bat calls were recorded at one location near proposed turbine #80. NGH (2014) considered this species to be an occasional seasonal visitor in the Project Area.

4.3.12.3 Likelihood and Consequence of Impacts

The overall risk rating for yellow-bellied sheathtail bat is moderate, based on a moderate likelihood and moderate consequence of collisions (**Table 4.19**). The rationale for responses to each criterion is as follows:

a) The yellow-bellied sheathtail bat is likely to regularly fly below RSA height and occasionally fly at RSA height.

b) The yellow-bellied sheathtail bat is likely to occasionally occur in or move through the Project Area. NGH (2014) considered this species to be an occasional seasonal visitor in the Project Area. The data collected during the 2018/19 survey support this.

c) The yellow-bellied sheathtail bat is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d) The life-history characteristics of the yellow-bellied sheathtail bat overlap with certain aspects of both the descriptions for a 'low' and 'high' rating for Criterion D.

e) Very little is known about the ecology of the yellow-bellied sheathtail bat though given its very large distribution (Churchill 2008) its population is likely to exceed 5,000 individuals and may possibly be over 20,000. Given the migratory nature of individuals that occur in south-eastern Australia coupled with the lack of any population estimates Criterion E is conservatively assigned 'moderate'.

f) The yellow-bellied sheathtail bat is listed as vulnerable in NSW under the BC Act.

Table 4.19 Yellow-bellied sheathtail bat risk assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X			
Moderate	X	X		X	X	X
High						
Risk Rating						
Likelihood	Moderate	**Consequence**	Moderate	**Risk Rating**	Moderate	

4.3.13 Southern myotis

4.3.13.1 Information on southern myotis from Australian wind farms

There are no records of blade strike of southern myotis in the available literature from post-construction monitoring conducted in its range in south-eastern Australia (BCD unpublished data, Moloney *et al.* 2019).

4.3.13.2 Status and flight behaviour in the Project Area

One southern myotis call was recorded in the Project Area during the 2018/19 bat surveys from ground level near proposed turbine #18 on 12 November 2018. NGH (2014) considered the likelihood of occurrence of this species in the Project Area unlikely.

4.3.13.3 Likelihood and Consequence of Impacts

The overall risk rating for southern myotis is minor, based on a low likelihood and moderate consequence of collisions (**Table 4.20**). The rationale for responses to each criterion is as follows:

a) The southern myotis is likely to rarely fly at RSA height.

b) The southern myotis is likely to rarely occur in the Project Area due to the Project Area's location relative to this species' known range in the region coupled with the vegetation present and the number of records from bat surveys conducted in the Project Area to date.

c) The southern myotis is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d) The life-history characteristics of the southern myotis overlap with certain aspects of both the descriptions for a 'low' and 'high' rating for Criterion D.

e) The southern myotis has a large distribution in northern and eastern Australia where it is generally uncommon (Churchill 2008). Given the lack of any population estimates Criterion E is conservatively assigned 'moderate'.

f) The southern myotis is listed as vulnerable in NSW under the BC Act.

Table 4.20 Southern myotis risk assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low	X	X	X			
Moderate				X	X	X
High						
Risk Rating						
Likelihood	Low	**Consequence**	Moderate	**Risk Rating**	Minor	

4.3.14 Eastern false pipistrelle

4.3.14.1 Information on eastern false pipistrelle from Australian wind farms

There are 28 records of dead eastern false pipistrelles found at Victorian wind farms during post-construction mortality monitoring from 2003 to 2018 (Moloney *et al.* 2019). Moloney *et al.* 2019 calculated mortality estimates of 1.6 (95% CI: 0.6 – 2.9) individuals per turbine per year at one wind farm.

4.3.14.2 Status and flight behaviour in the Project Area

The eastern false pipistrelle was recorded once in the Project Area during the 2018/19 bat surveys, from ground level near proposed turbine #69 (**Figure 4.3**). Four eastern false pipistrelle calls have previously been recorded at one location near proposed turbine #80 (NGH 2014). This relatively low number of detections is probably a result of the Project Area's location corresponding to the western edge of the eastern false pipistrelle's known range in the region.

4.3.14.3 Likelihood and Consequence of Impacts

The overall risk rating for eastern false pipistrelles is moderate, based on a moderate likelihood and moderate consequence of collisions (**Table 4.21**). The rationale for responses to each criterion is as follows:

a) The eastern false pipistrelle likely regularly flies below RSA height and occasionally flies at RSA height.

b) The eastern false pipistrelle is considered to rarely or occasionally occur in the Project Area due to the Project Area's location relative to this species' known range in the region coupled with the vegetation present in the Project Area and the low number of records from bat surveys conducted in the Project Area to date.

c) The eastern false pipistrelle is widely distributed within areas of suitable habitat across its range and the habitat itself is relatively widely dispersed.

d) The life-history characteristics of the eastern false pipistrelle overlap with certain aspects of both the descriptions for a 'low' and 'high' rating for Criterion D

e) Given the lack of any population estimates for eastern false pipistrelles Criterion E is conservatively assigned 'moderate'.

f) The eastern false pipistrelle is listed as vulnerable in NSW under the BC Act.

Table 4.21 Eastern false pipistrelle risk assessment

	Criterion A	Criterion B	Criterion C	Criterion D	Criterion E	Criterion F
Low			X			
Moderate	X	X		X	X	X
High						
Risk Rating						
Likelihood	Moderate	**Consequence**	Moderate	**Risk Rating**	Moderate	

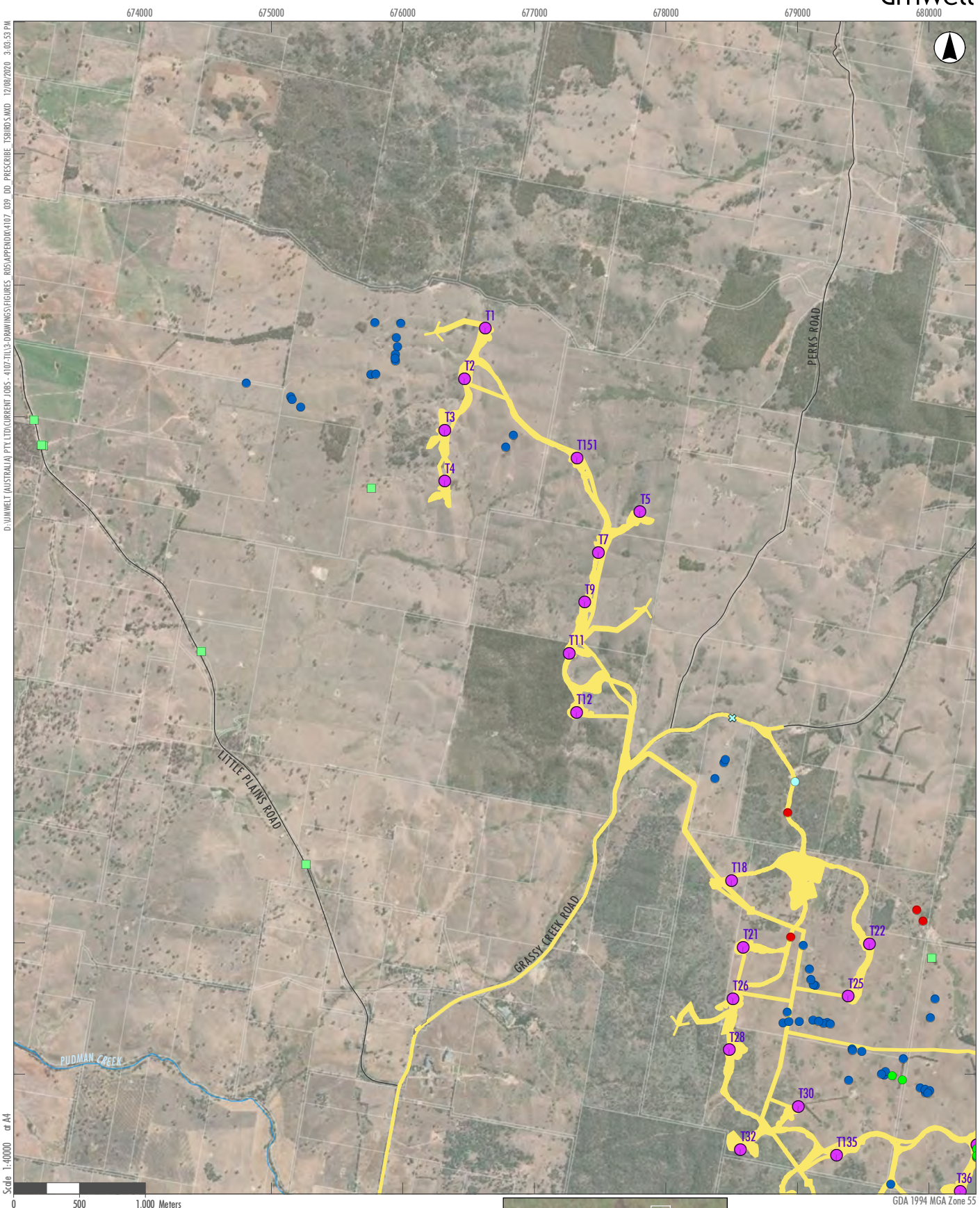


FIGURE 4.1.1

Location of Threatened Bird Species Records in the Project Area (2018 /19 Bird Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses

NSW BC Act and EPBC Act Species

- Superb Parrot

NSW BC Act Species

- Dusky Woodswallow
- Varied Sittella
- Black Falcon
- Little Eagle
- Hooded Robin
- Scarlet Robin
- Flame Robin
- Speckled Warbler
- White-fronted Chat

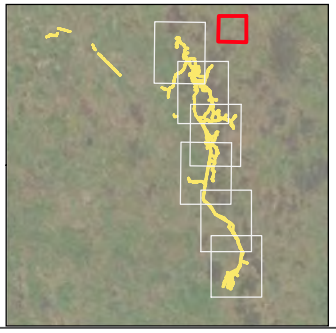
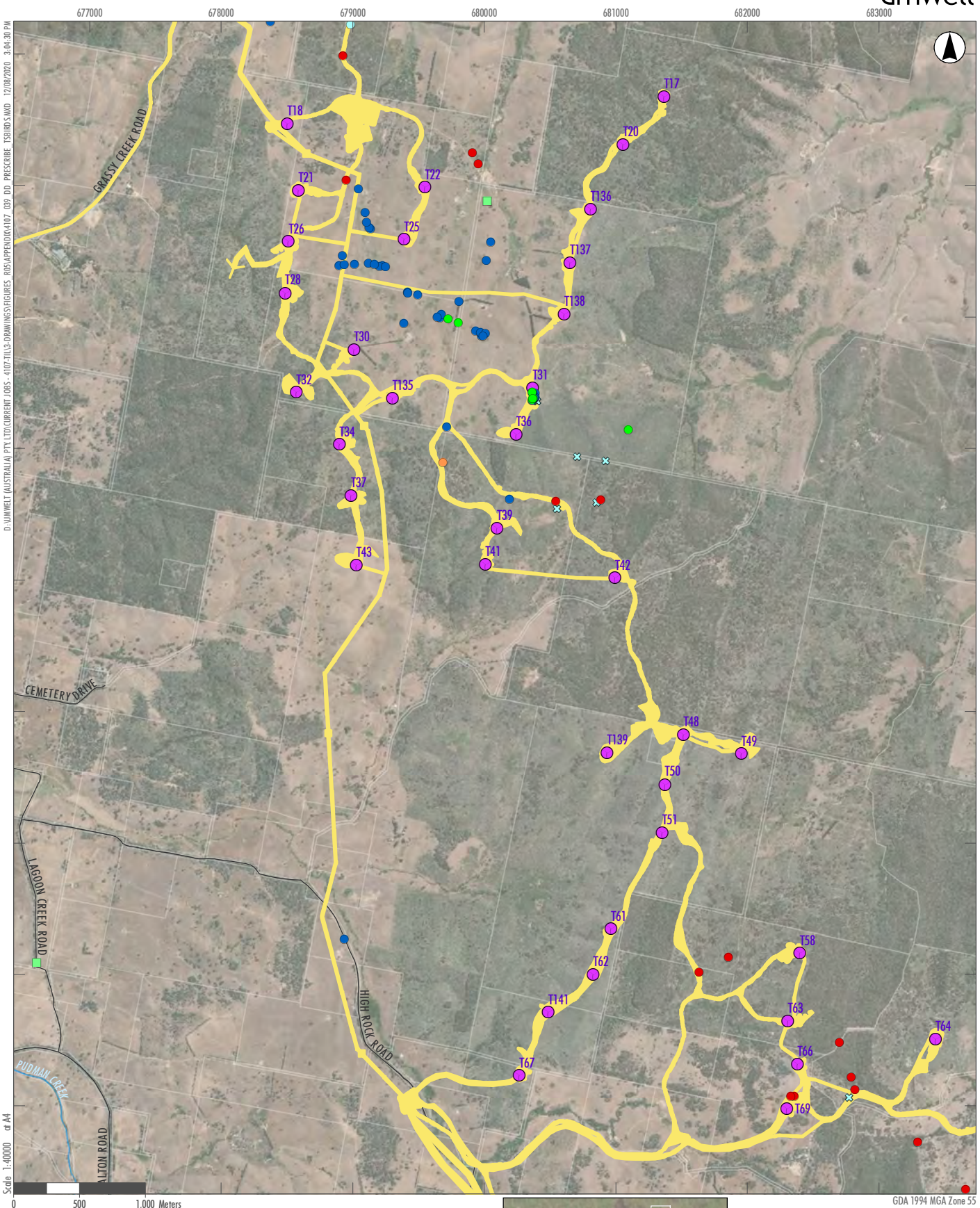


FIGURE 4.1.2

Location of Threatened Bird Species Records in the Project Area (2018 /19 Bird Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses

EPBC Act Species

- White-throated Needletail

NSW BC Act and EPBC Act Species

- Superb Parrot

NSW BC Act Species

- Dusky Woodswallow
- Varied Sittella
- Black Falcon
- Little Eagle
- Hooded Robin
- Scarlet Robin
- Flame Robin
- Speckled Warbler
- White-fronted Chat

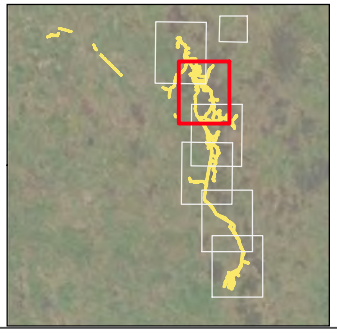
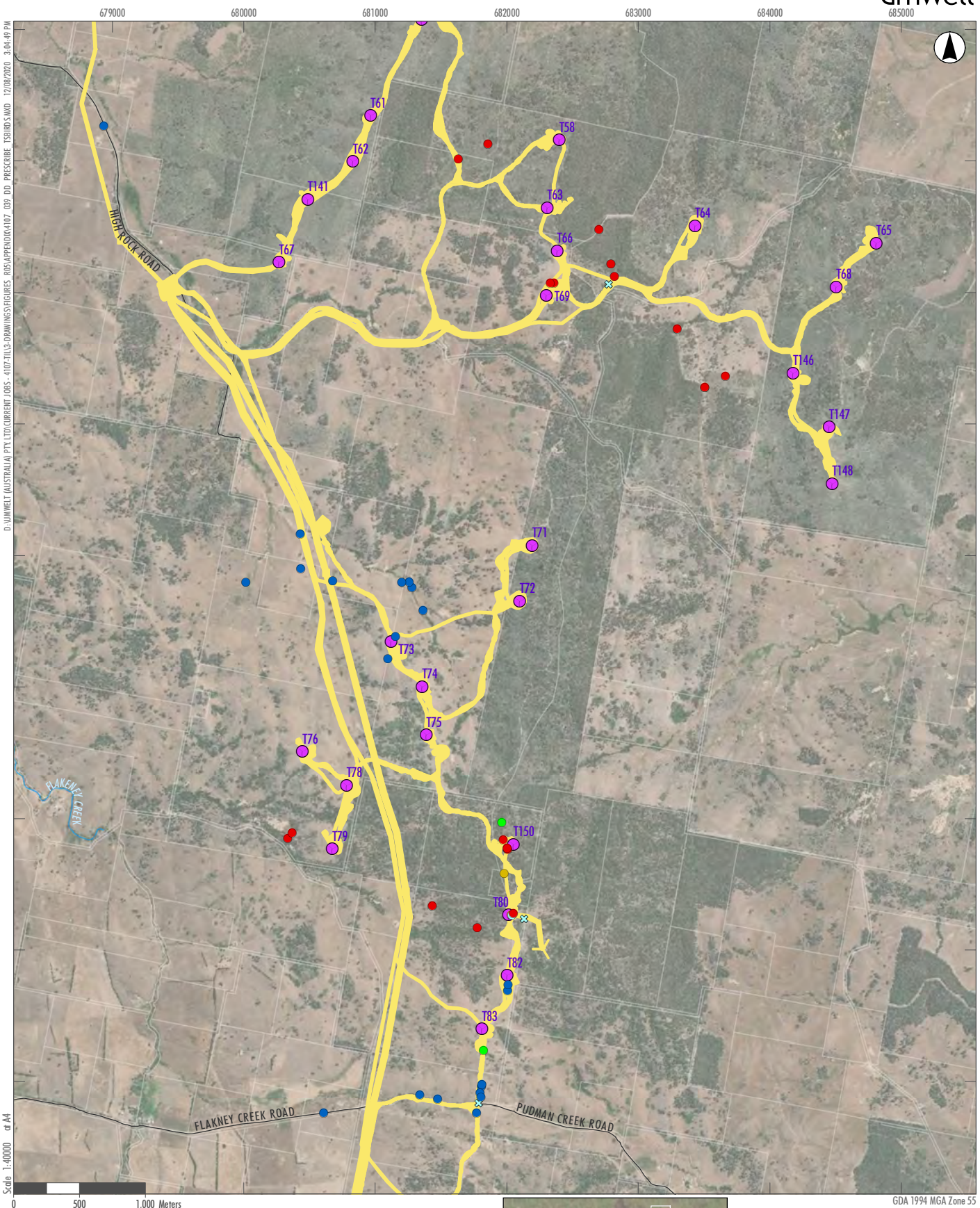


Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 4.1.3

Location of Threatened Bird Species Records in the Project Area (2018 /19 Bird Utilisation Surveys)



Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses

EPBC Act Species

- White-throated Needletail

NSW BC Act Species

- Dusky Woodswallow
- Varied Sittella
- Black Falcon
- Little Eagle
- Hooded Robin
- Scarlet Robin
- Flame Robin
- Speckled Warbler
- White-fronted Chat

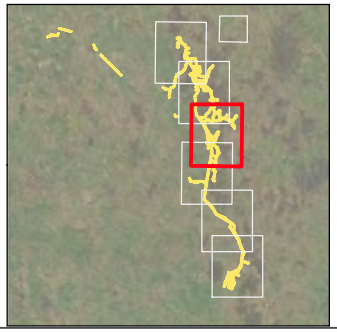
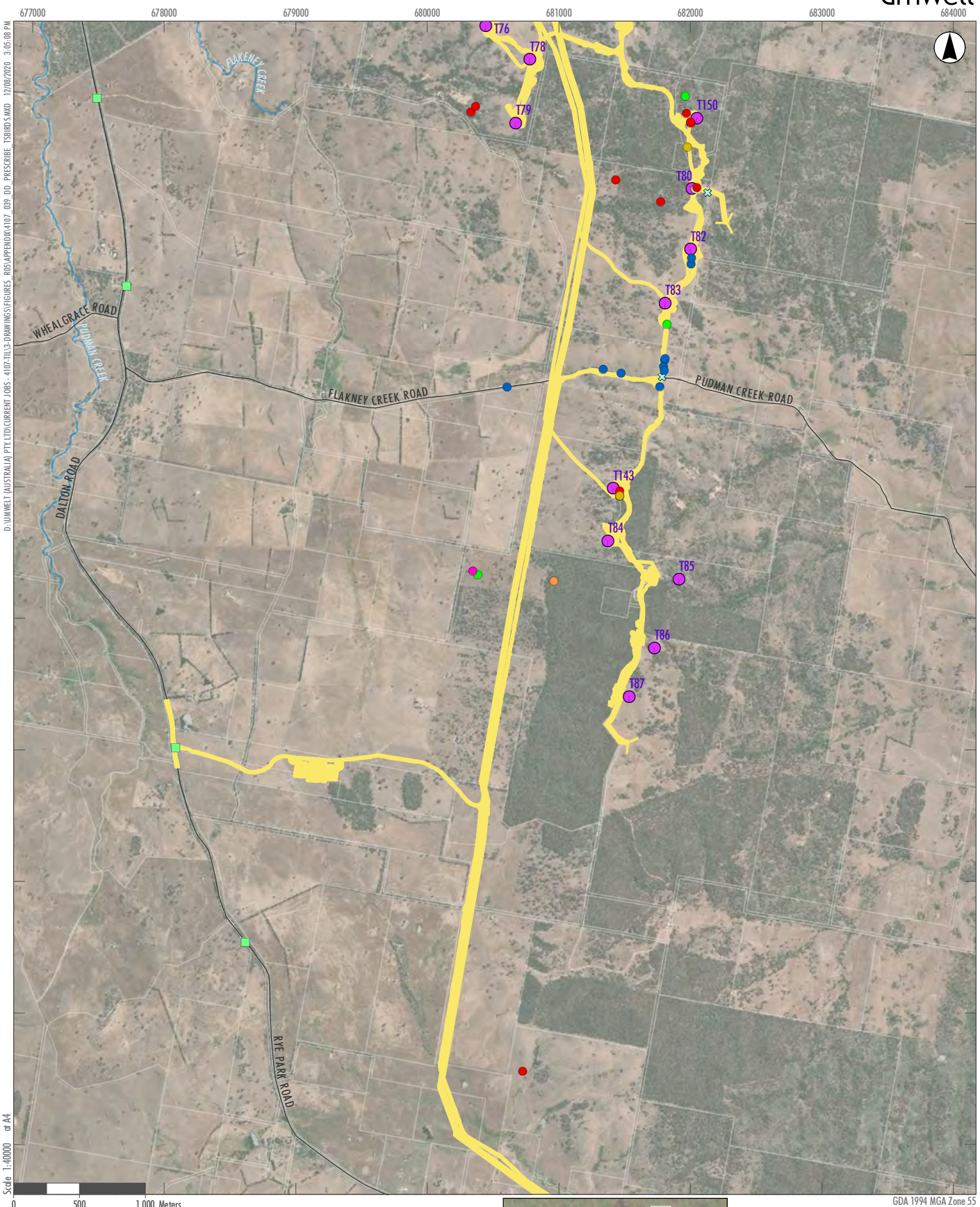


FIGURE 4.1.4

Location of Threatened Bird Species Records in the Project Area (2018 /19 Bird Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses

EPBC Act Species

- White-throated Needletail

NSW BC Act and EPBC Act Species

- Superb Parrot

NSW BC Act Species

- Dusky Woodswallow
- Varied Sittella
- Black Falcon
- Little Eagle
- Hooded Robin
- Scarlet Robin
- Flame Robin
- Speckled Warbler
- White-fronted Chat

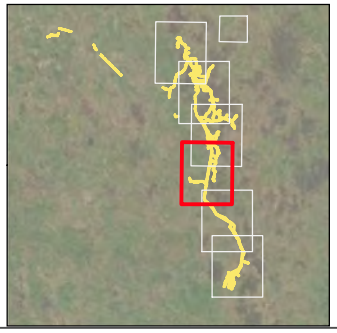
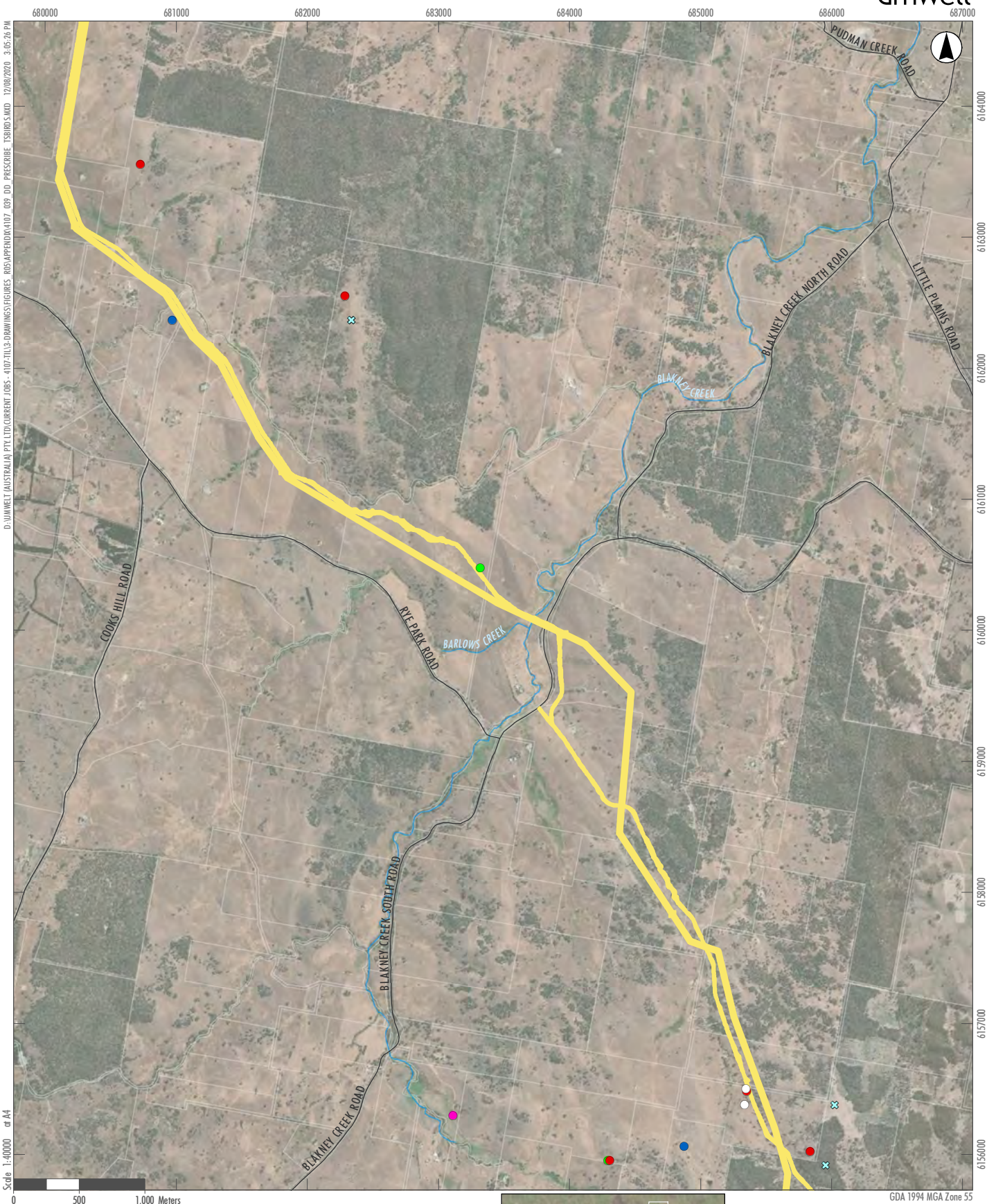


FIGURE 4.1.5

Location of Threatened Bird Species Records in the Project Area (2018 /19 Bird Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses

EPBC Act Species

- White-throated Needletail

NSW BC Act Species

- Dusky Woodswallow
- Varied Sittella
- Black Falcon
- Little Eagle
- Hooded Robin
- Scarlet Robin
- Flame Robin
- Speckled Warbler
- White-fronted Chat

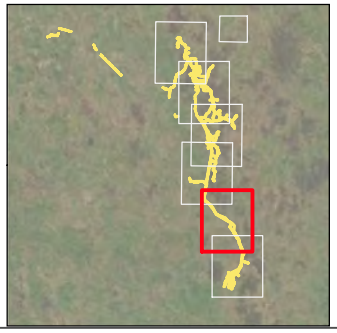
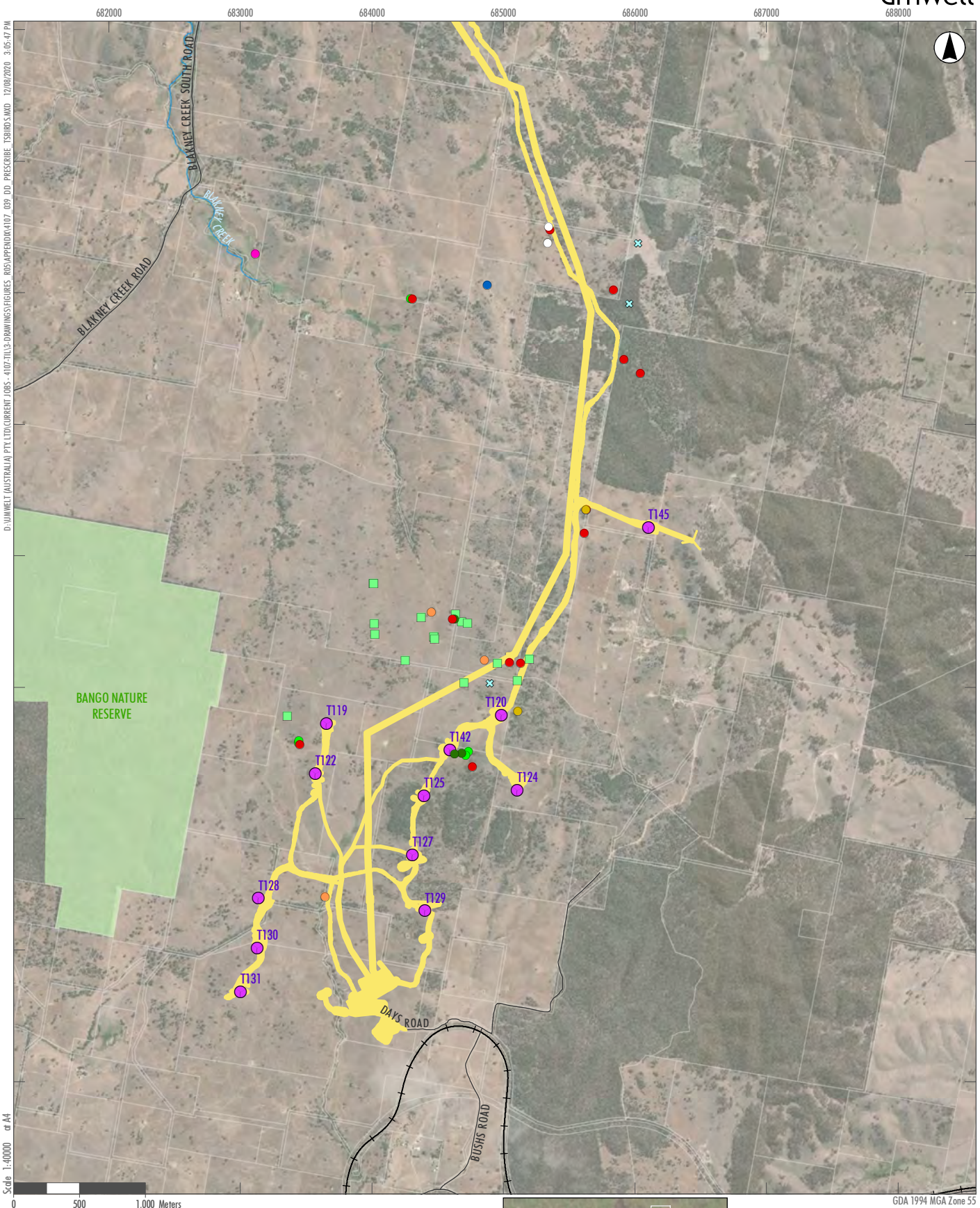


FIGURE 4.1.6

Location of Threatened Bird Species Records in the Project Area (2018 /19 Bird Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses
- Railways
- NPWS Estate

EPBC Act Species

- White-throated Needletail

NSW BC Act and EPBC Act Species

- Superb Parrot

NSW BC Act Species

- Dusky Woodswallow
- Varied Sittella
- Black Falcon
- Little Eagle
- Hooded Robin
- Scarlet Robin
- Flame Robin
- Speckled Warbler
- White-fronted Chat

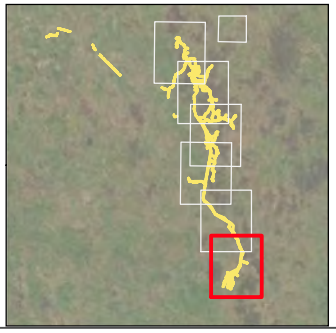


FIGURE 4.1.7

Location of Threatened Bird Species Records in the Project Area (2018 /19 Bird Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

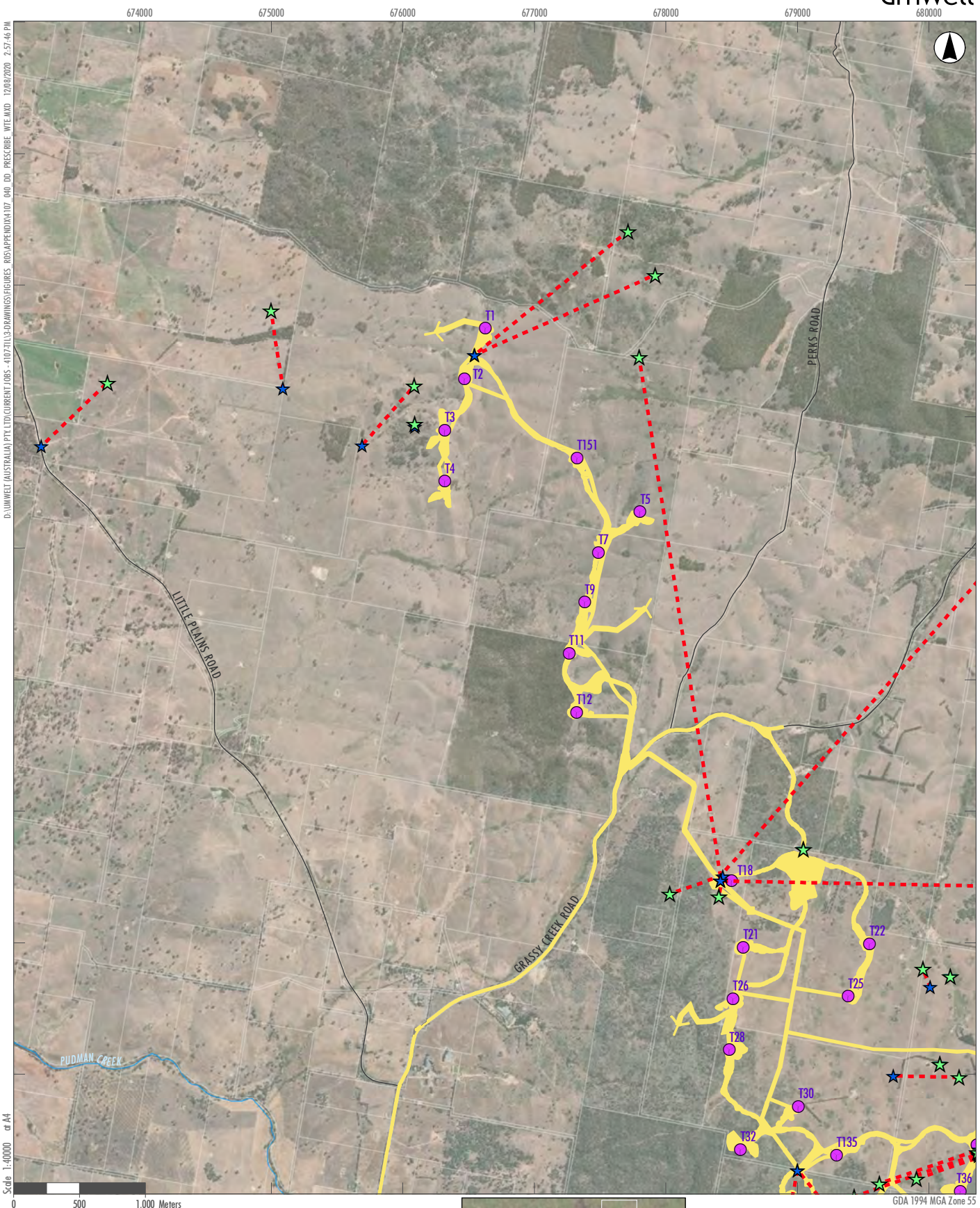
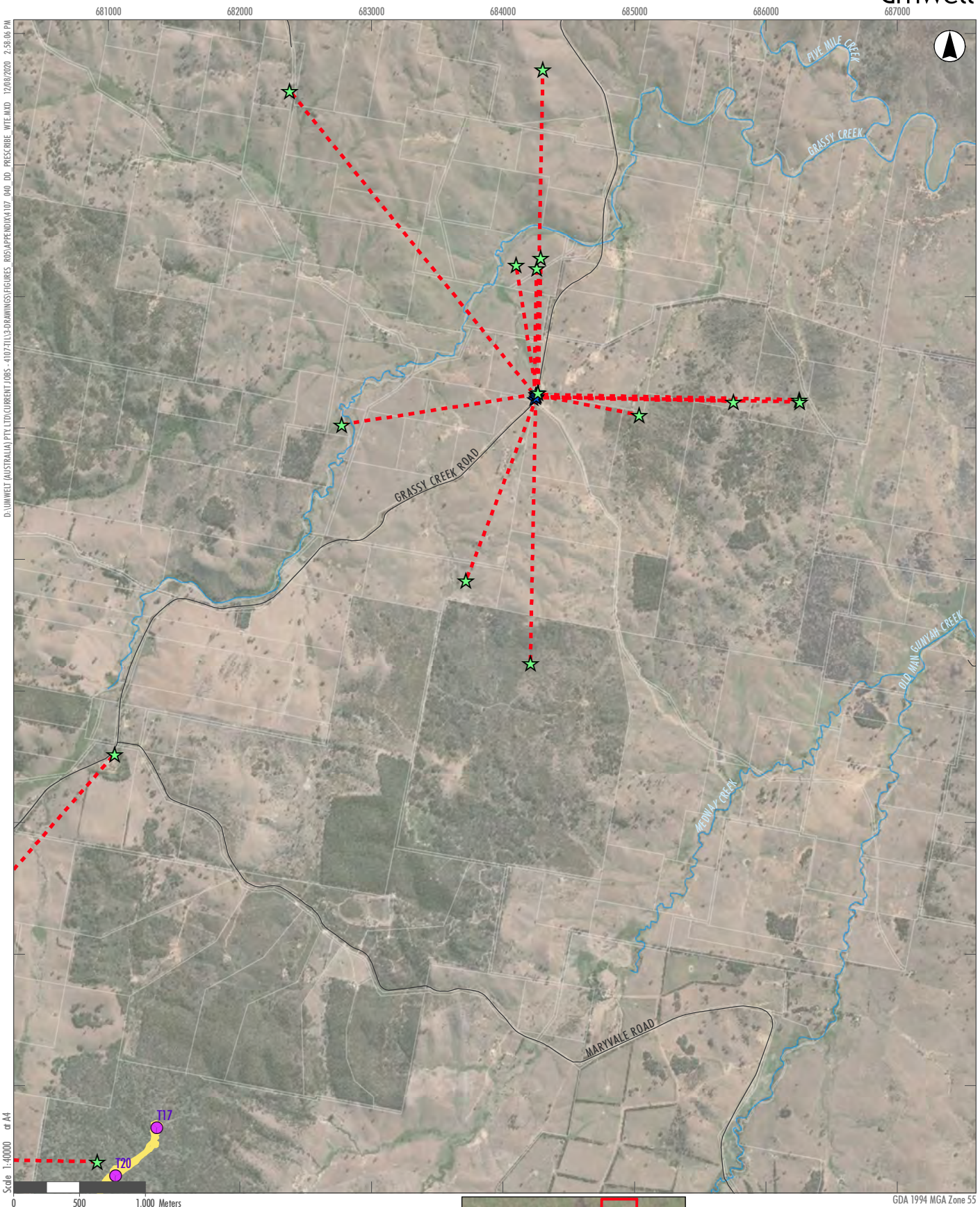


FIGURE 4.2.1

Location of Wedge-Tailed Eagles Records in the Project Area (2018 / 19 Bird Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Scale 1:40000 at A4

Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses
- Observer Location
- Observer Direction and Distance of Wedge-Tailed Eagle Sighting
- Wedge-Tailed Eagle Location

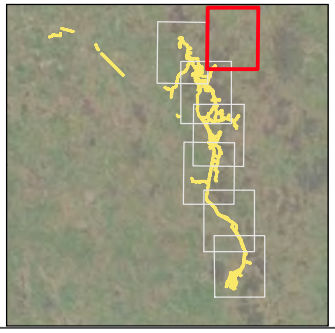
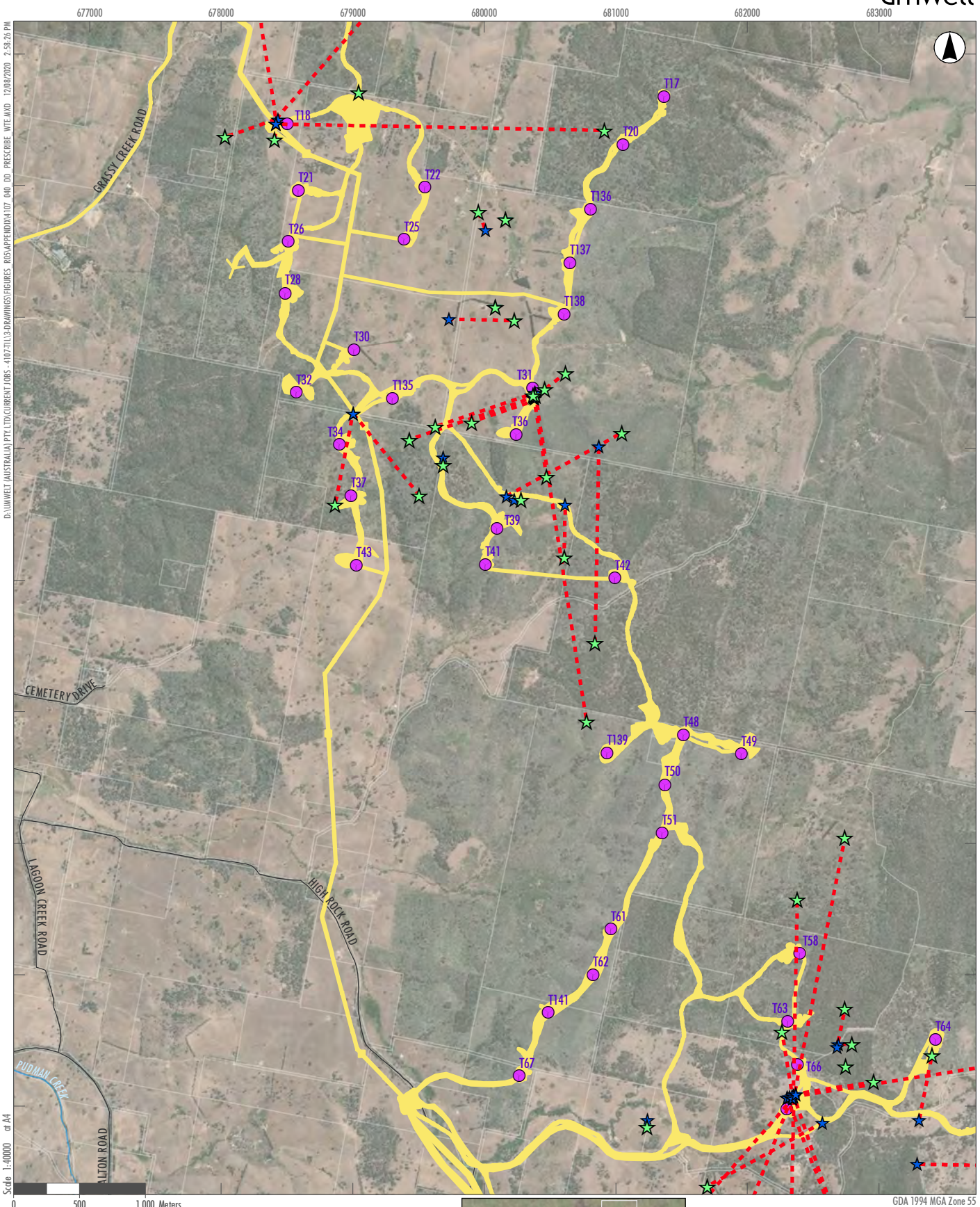


FIGURE 4.2.2

Location of Wedge-Tailed Eagles Records in the Project Area (2018 / 19 Bird Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



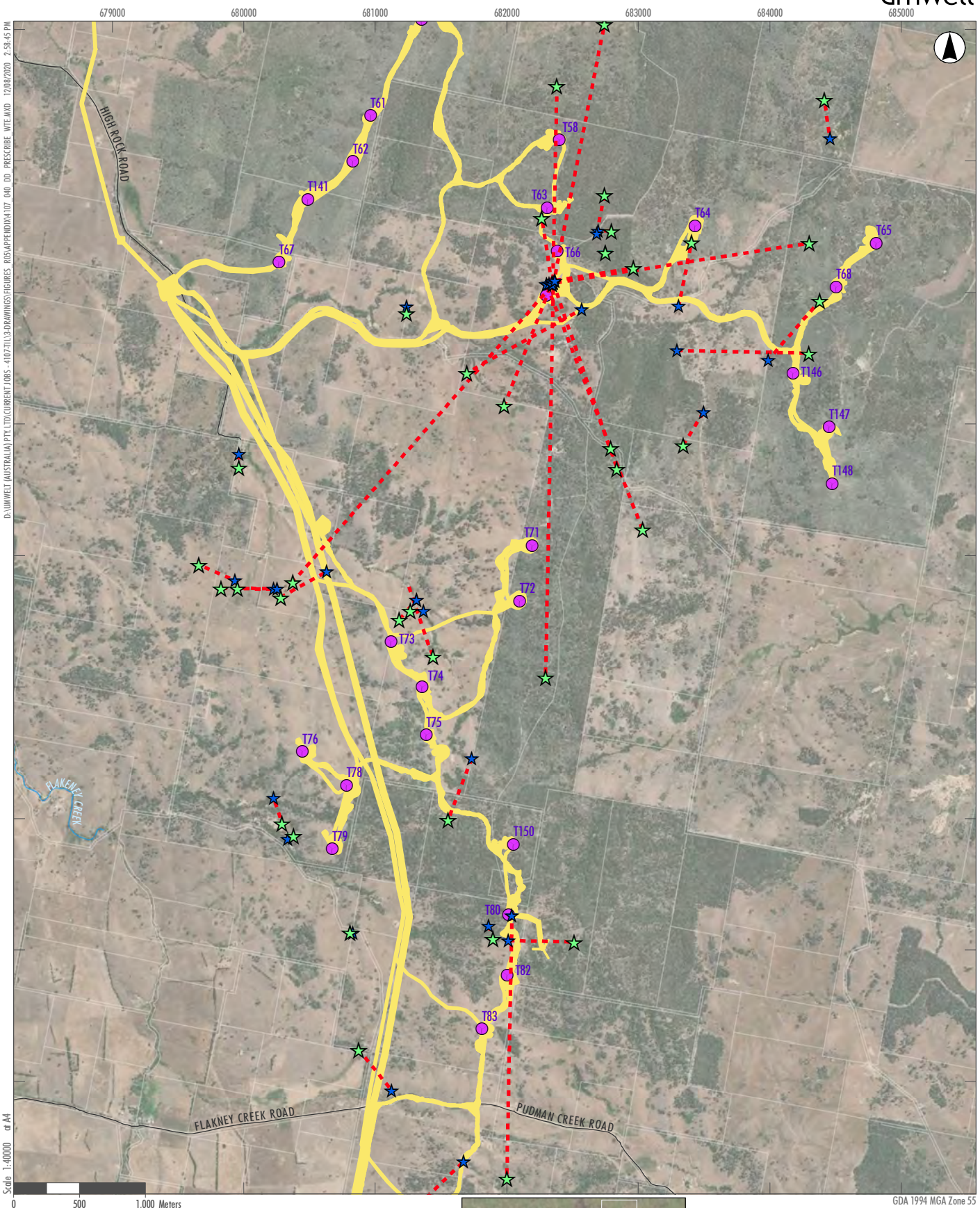
Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses
- Observer Location
- Observer Direction and Distance of Wedge-Tailed Eagle Sighting
- Wedge-Tailed Eagle Location

FIGURE 4.2.3

Location of Wedge-Tailed Eagles Records in the Project Area (2018 / 19 Bird Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



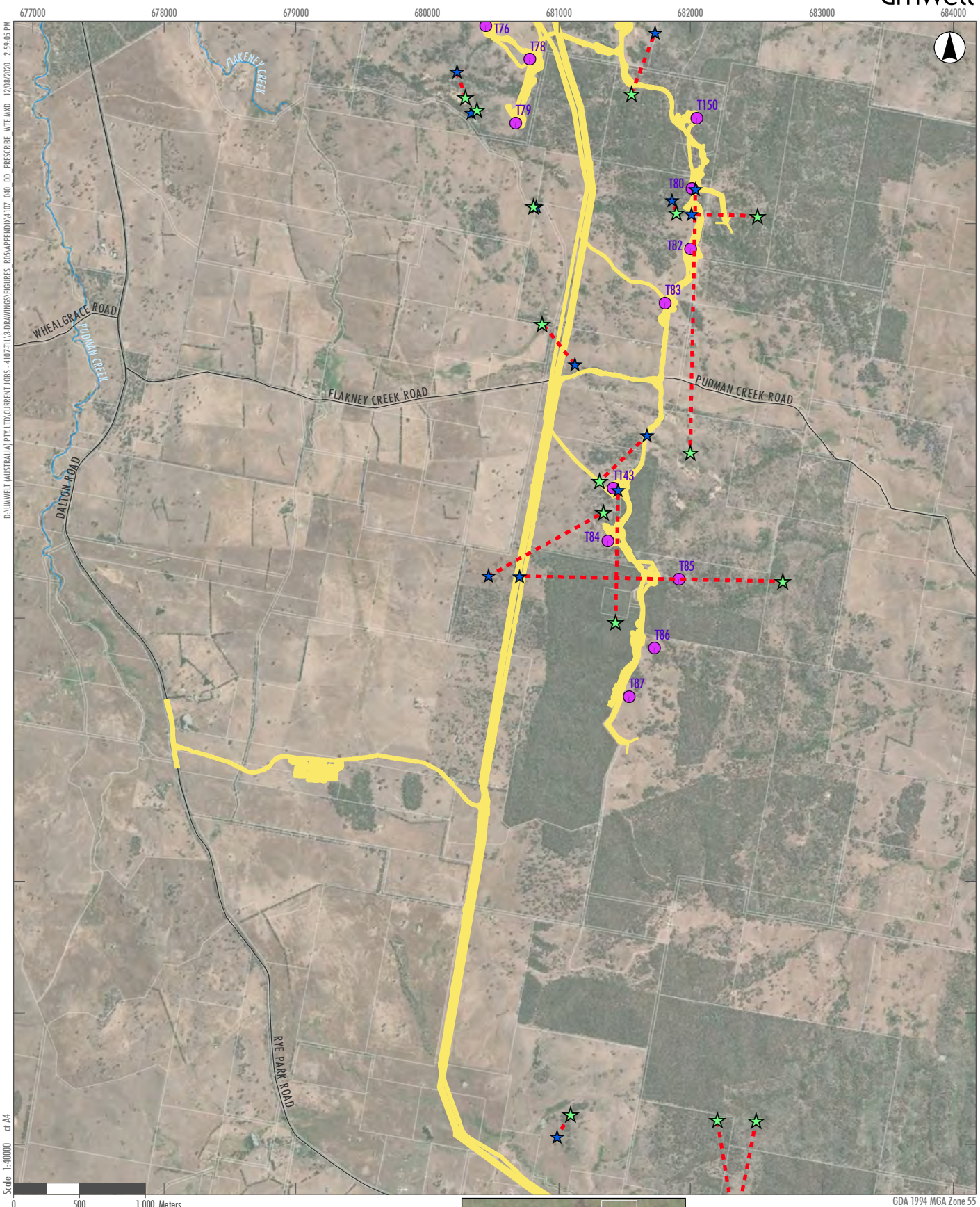
Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses
- Observer Location
- Observer Direction and Distance of Wedge-Tailed Eagle Sighting
- Wedge-Tailed Eagle Location

FIGURE 4.2.4

Location of Wedge-Tailed Eagles Records in the Project Area (2018 / 19 Bird Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses
- Observer Location
- Observer Direction and Distance of Wedge-Tailed Eagle Sighting
- Wedge-Tailed Eagle Location

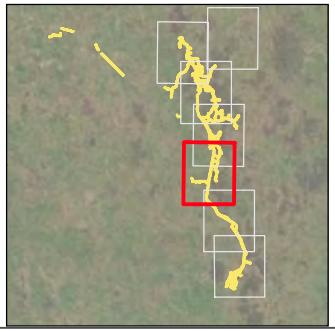
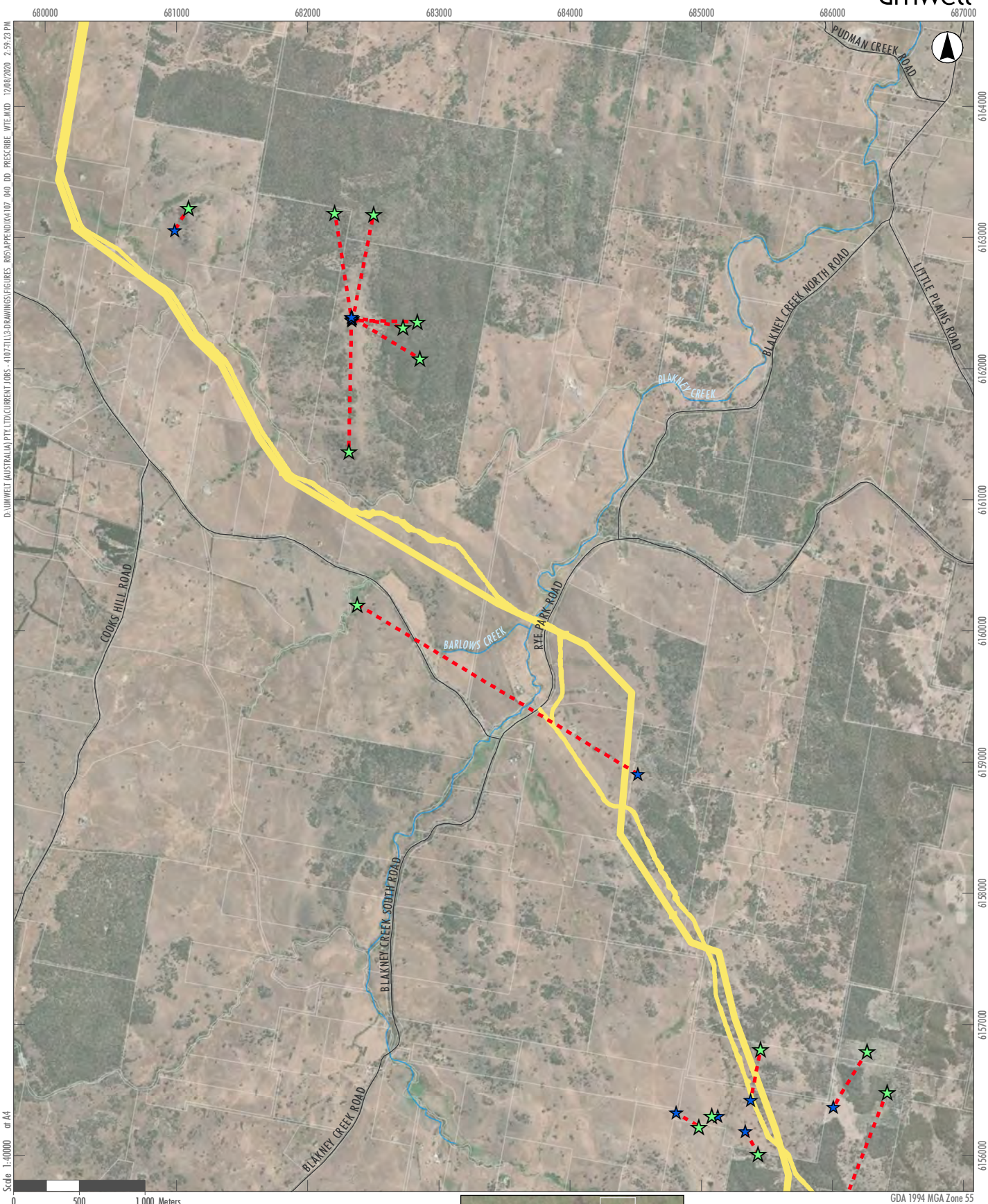


FIGURE 4.2.5

Location of Wedge-Tailed Eagles Records in the Project Area (2018 / 19 Bird Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses
- Observer Location
- Observer Direction and Distance of Wedge-Tailed Eagle Sighting
- Wedge-Tailed Eagle Location

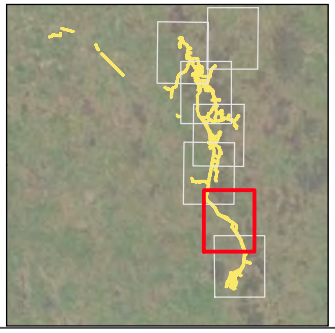
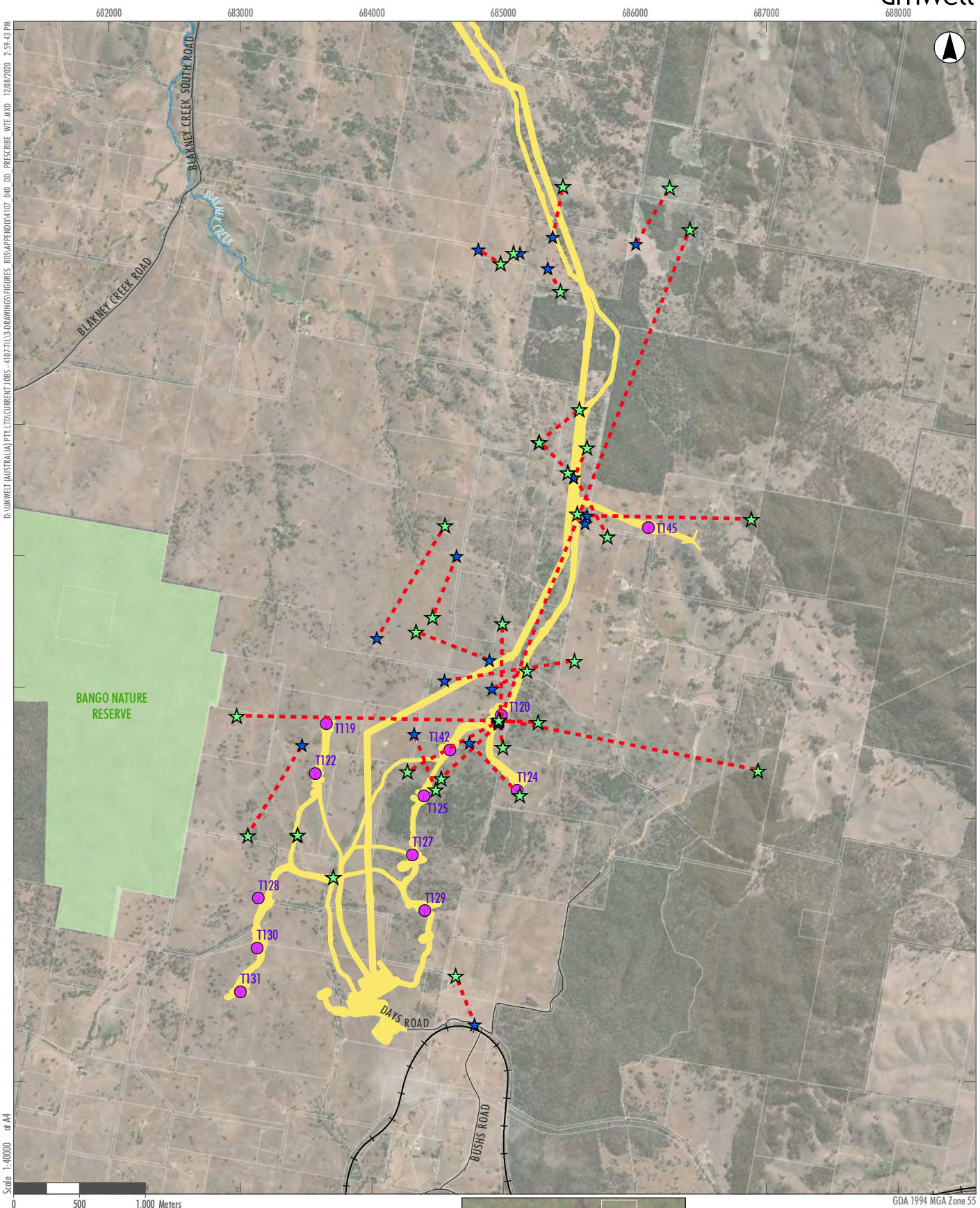


FIGURE 4.2.6

Location of Wedge-Tailed Eagles Records in the Project Area (2018 / 19 Bird Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



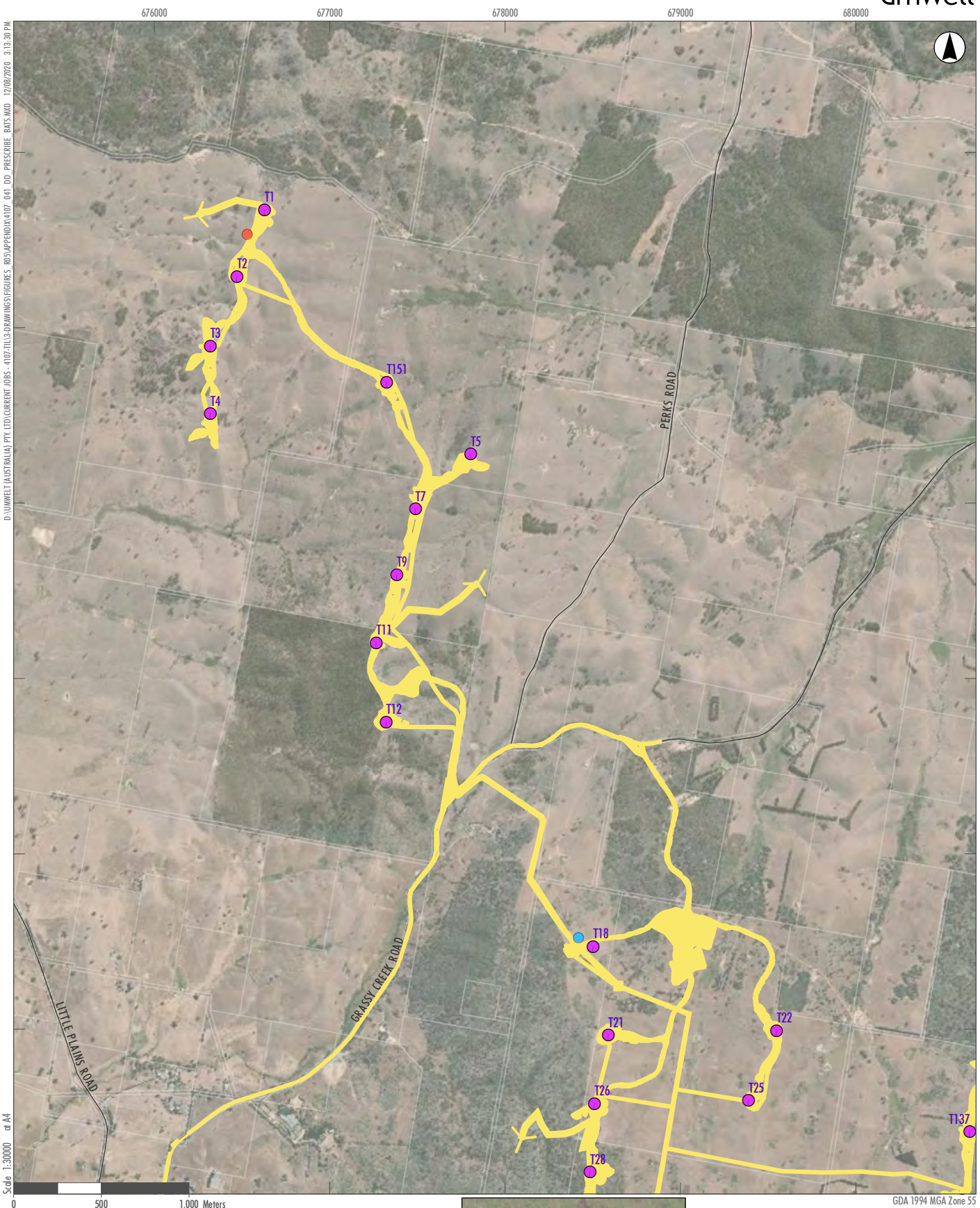
Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses
- Railways
- NPWS Estate
- Observer Location
- Observer Direction and Distance of Wedge-Tailed Eagle Sighting
- Wedge-Tailed Eagle Location

FIGURE 4.2.7

Location of Wedge-Tailed Eagles Records in the Project Area (2018 / 19 Bird Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses

Threatened Bat Records

- Myotis macropus (Southern myotis)
- Saccolaimus flaviventris (Yellow-bellied sheathtail bat)

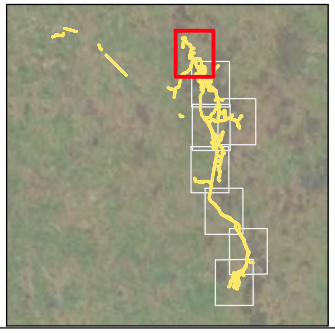
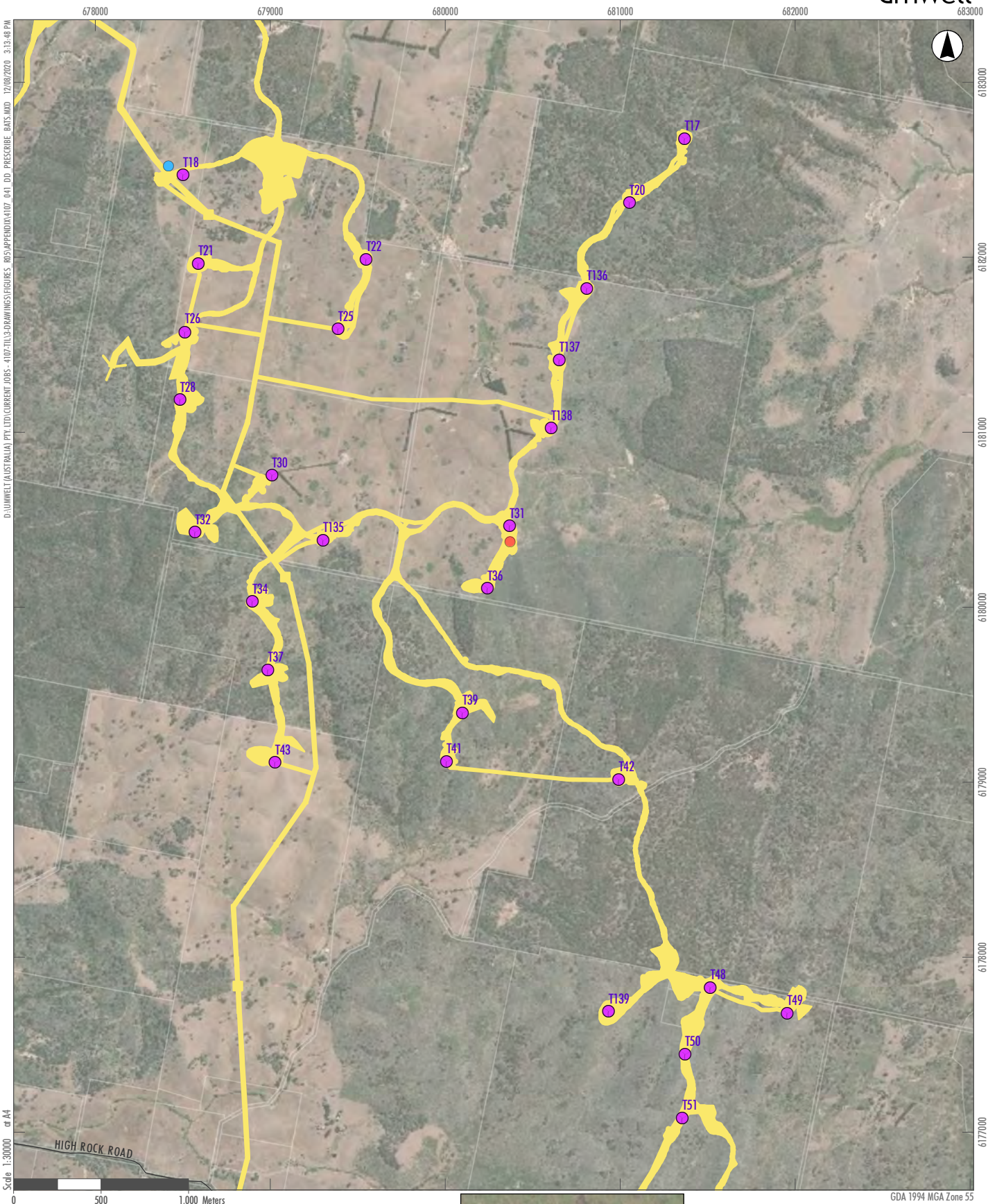


FIGURE 4.3.1

Location of the Threatened Bat Species in the Project Area (2018 / 19 Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses

Threatened Bat Records

- Myotis macropus (Southern myotis)
- Saccolaimus flaviventris (Yellow-bellied sheathtail bat)

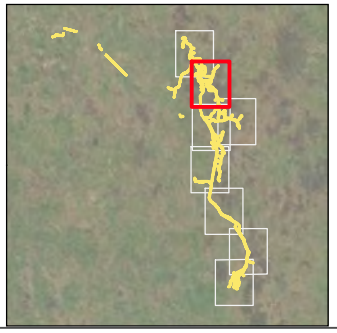
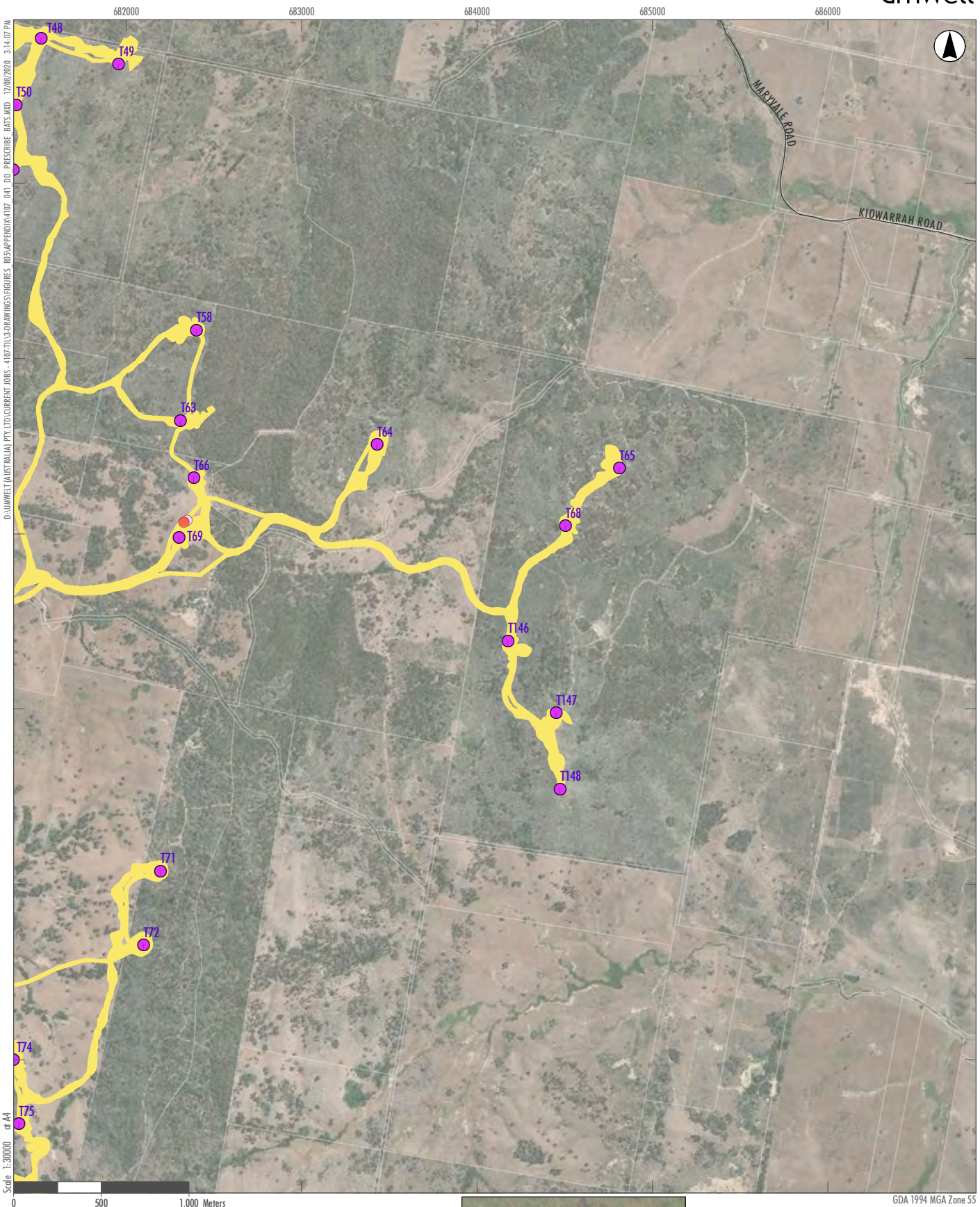


FIGURE 4.3.2

Location of the Threatened Bat Species in the Project Area (2018 / 19 Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses

Threatened Bat Records

- Falsistrellus tasmaniensis (Eastern false pipistelle)
- Saccolaimus flaviventris (Yellow-bellied sheathtail bat)

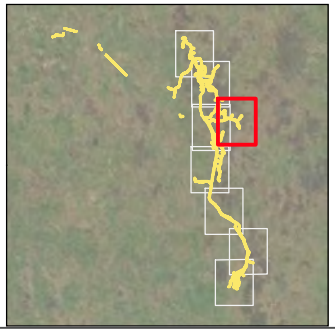
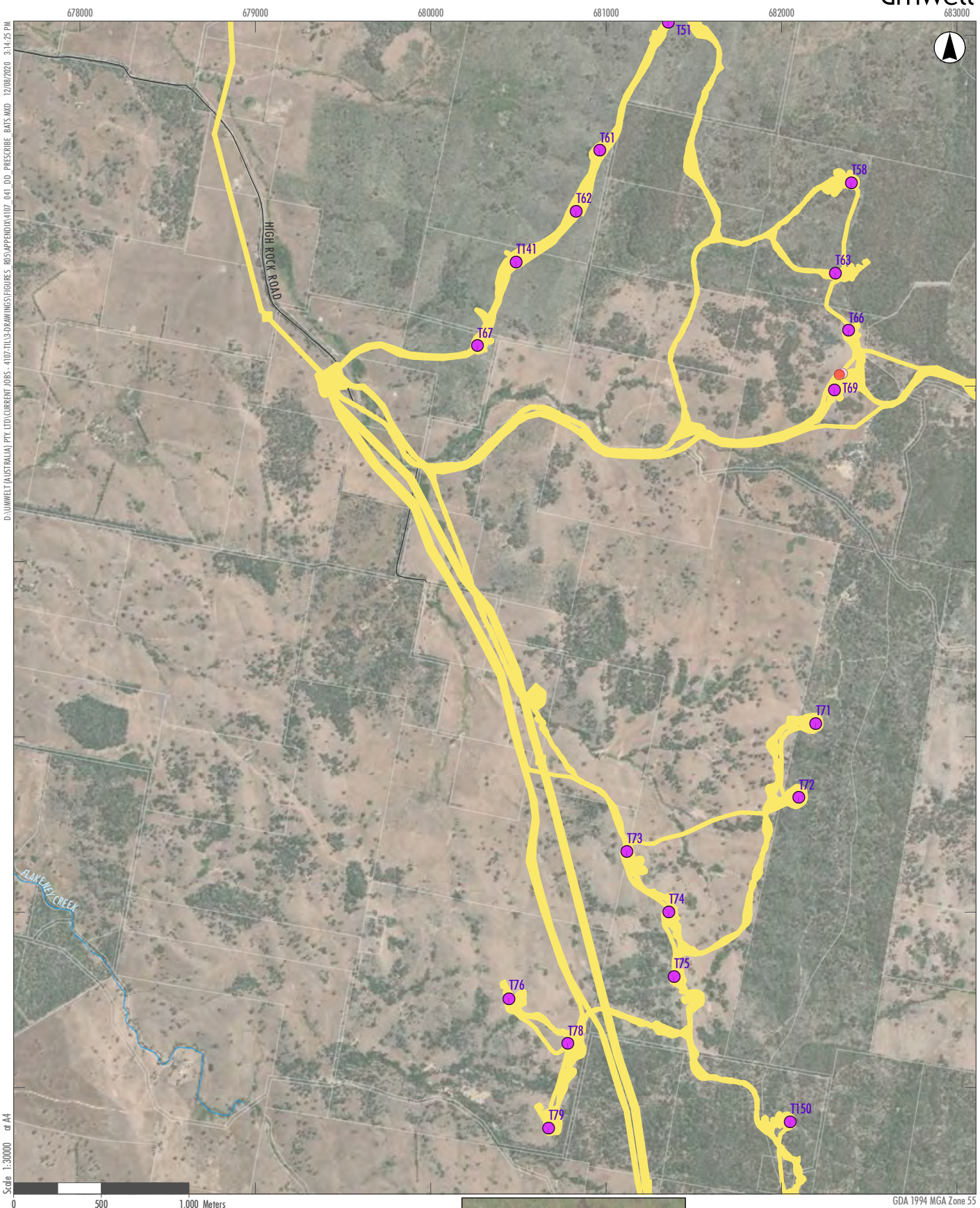


FIGURE 4.3.3

Location of the Threatened Bat Species in the Project Area (2018 / 19 Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses

Threatened Bat Records

- Falsistrellus tasmaniensis (Eastern false pipistelle)
- Saccolaimus flaviventris (Yellow-bellied sheathtail bat)

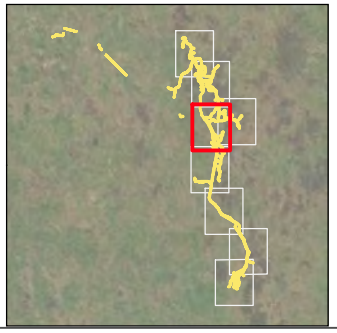
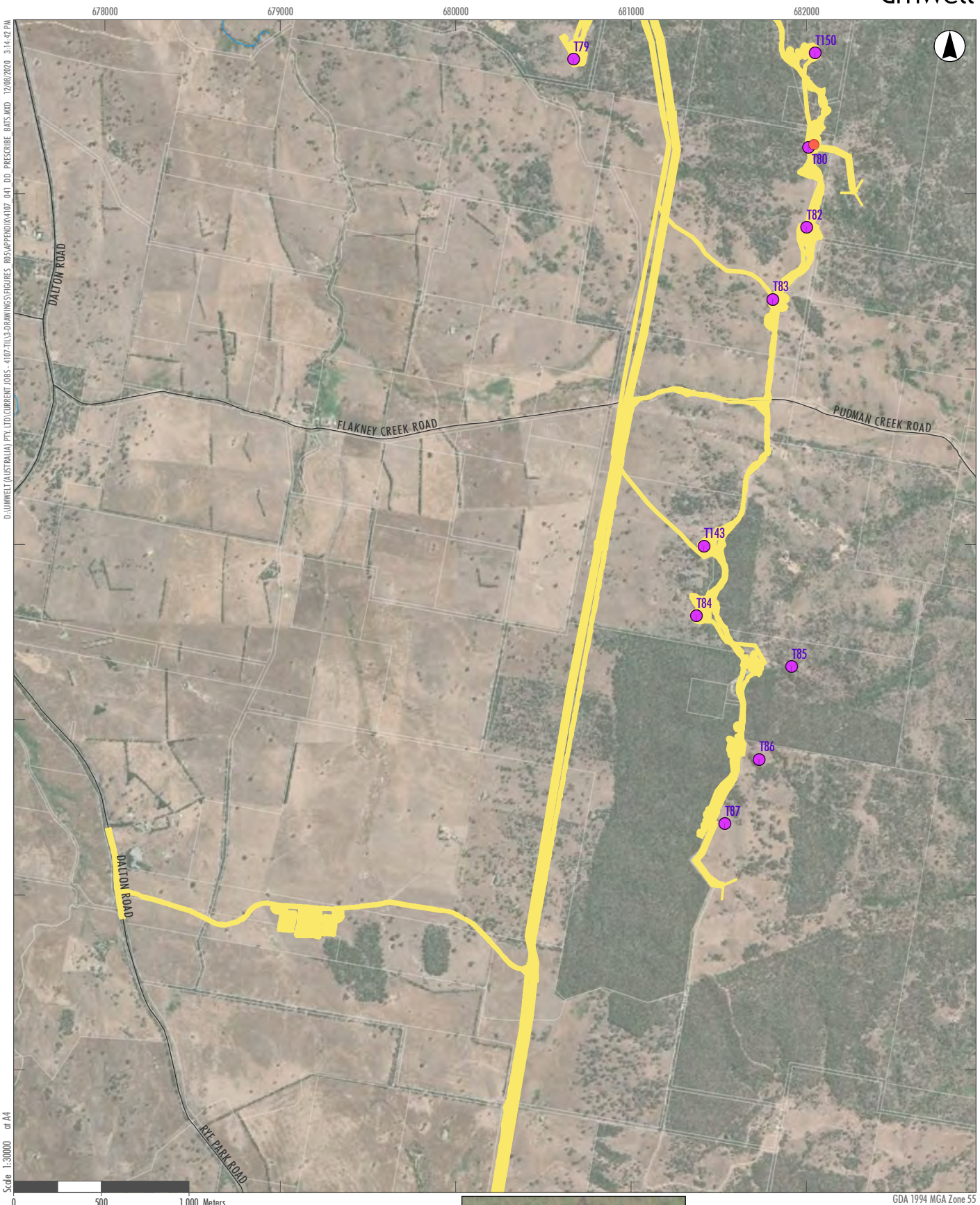


FIGURE 4.3.4

Location of the Threatened Bat Species in the Project Area (2018 / 19 Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses

Threatened Bat Records

- Saccolaimus flaviventris (Yellow-bellied sheathtail bat)

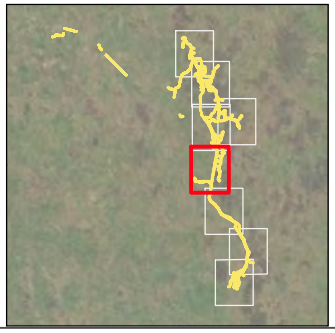


FIGURE 4.3.5

Location of the Threatened Bat Species in the Project Area (2018 / 19 Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

FIGURE 4.3.6

Location of the Threatened Bat Species in the Project Area (2018 / 19 Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses

Threatened Bat Records

- Saccolaimus flaviventris (Yellow-bellied sheathtail bat)

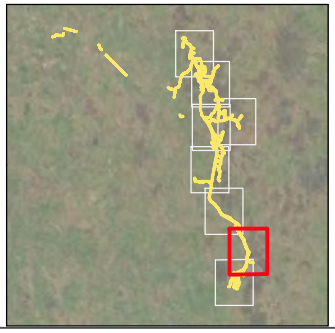
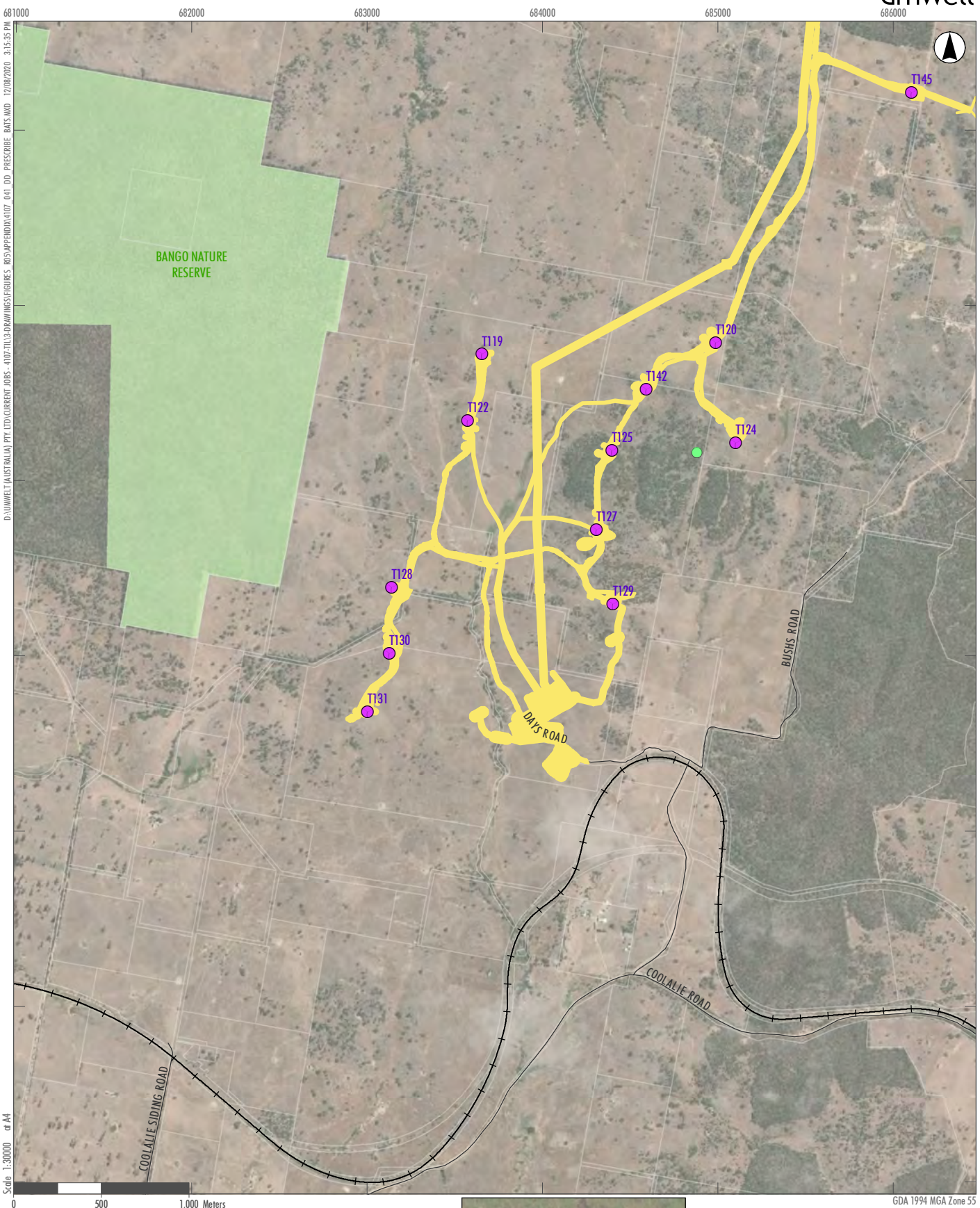


FIGURE 4.3.7

Location of the Threatened Bat Species in the Project Area (2018 / 19 Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)



Legend

- Indicative Development Footprints
- Turbines Locations
- Property Boundaries
- Watercourses
- Railways
- NPWS Estate

Threatened Bat Records

- Miniopterus orianae oceanensis (Large bent-winged bat)

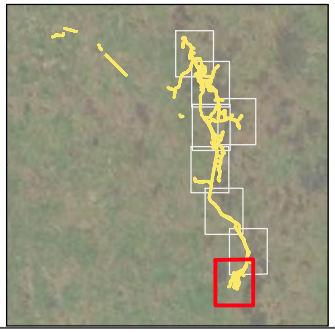


FIGURE 4.3.8

Location of the Threatened Bat Species in the Project Area (2018 / 19 Utilisation Surveys)

Image Source: ESRI Basemap (2020) Data source: NSW LPI (2020); Rye Park Renewable Energy Pty Ltd (2020)

5.0 Predict the consequences of impacts for the persistence of bioregional populations, with reference to relevant literature and other published sources of information

The consequences of impacts for the persistence of the assessed species in the bioregion depends on a range of poorly understood or unknown factors including the following:

- the relative importance of the Project Area for the long-term persistence of the greater population in the bioregion
- the degree of connectivity in regard to the movement of individuals between the Project Area and surrounding areas
- whether likely mortality rates from blade strike in the Project Area would exceed the rate of replacement of individuals either in situ or through dispersal from elsewhere.

Given the lack of data with which to predict estimates and the inherent high uncertainty associated with predictions if attempted, the consequence of impacts for the persistence of bioregional populations is not predicted here.

6.0 Predict the cumulative impacts of the project together with existing wind farms on aerial species mortality and provide justification for these predictions

For the purpose of this section, the following aerial species which have a highly localised population at or near the Project Area are examined:

- Large bent-winged bat
- Superb parrot.

In order to adequately assess cumulative impacts of the Project together with other wind farms in the region, it is first necessary for the effects of all other relevant wind farms to be quantified to a consistent standard and to be available (Moloney et al. 2019). In the absence of this information, a summary including an examination of basic factors such as species distribution relative to nearby wind farms and the total number of turbines in the region is provided below.

The following three operational projects, three projects under construction and one approved project are considered to be in the region (c. 3,000km^2) in which the Project is situated:

- Cullerin Range Wind Farm (operational since 2009), 15 turbines
- Gullen Range Wind Farm (operational since 2013), 73 turbines
- Gunning Wind Farm (operational since 2011), 31 turbines
- Bango Wind Farm (under construction), 46 turbines
- Collector Wind Farm (under construction), 54 turbines
- Biala Wind Farm (under construction), 31 turbines
- Coppabella Wind Farm (approved), 75 turbines.

At present there are a total of 122 operational turbines in the region with a further 131 under construction and 75 approved. Therefore, the installation of 80 turbines approved at Rye Park Wind Farm will result in a 32% increase in the number of turbines in the region (assuming completion of the three wind farms currently under construction). It is noted that the impact of each turbine on the species assessed here would not be equal across the region considering variability in abundance and site occupancy at multiple spatial scales (i.e. landscape scale, within wind farm scale) and variability in turbine specifications would influence the likelihood of collisions.

6.1 Superb parrot

Factors such as the superb parrot's flight behaviour and their movement patterns in the region, coupled with the proportion of their population that occurs in the region highlights the potential for a cumulative impact on this species as a result of the direct and indirect impacts associated with wind farms.

Superb parrots have been recorded at the four wind farms that are approved or under construction in the region and may occur at the three operational wind farms. Due to the location of the three wind farms operational as of July 2020 (Cullerin Wind Farm, Gullen Range Wind Farm and Gunning Wind Farm) on the eastern edge of the superb parrot's range it is likely that the cumulative impact at present is relatively low. However, the introduction of three wind farms in their core range (namely Bango Wind Farm, Coppabella Wind Farm and the Project) has the to result in increase the risk of a cumulative impact in this region once these projects are operational.

The construction of the Project would result in the addition of 80 turbines which corresponds to a 32% increase in the total number of turbines in the region. The degree to which this development will contribute to the overall cumulative impact is unknown however, as discussed in **Section** Error! Reference source not found.**,** certain turbines are likely to pose a greater risk than others. Due to the location of Bango Wind Farm, its position in the landscape and the amount of suitable superb parrot habitat present (ERM 2013), it is considered that that wind farm will pose a greater risk per turbine (and potentially overall) to superb parrot than the Project especially given specific turbines identified by NGH (2014) as posing the highest risk to superb parrots have been removed from the Project's layout.

Research to be conducted on the movement of superb parrots in the Yass region and impact monitoring to be conducted in the Project Area and at the under construction Bango Wind Farm as part of the Superb Parrot Population Monitoring Program is likely to improve our understanding of the susceptibility of this species to blade strike and indirect impacts resulting from the operation of turbines (Rayner 2019). This research may allow an informed cumulative impact assessment to be conducted for this region in the future.

6.2 Large bent-winged bat

Factors such as the large bent-winged bat's flight behaviour, and their movement patterns in the region, coupled the proportion of their population that occurs in the region indicates the potential for a cumulative impact on this species resulting from direct and indirect impacts associated with wind farms.

Large bent-winged bats have been recorded at four wind farms in the region and have potential to occur at the remaining three, for which there is poor availability of ecological survey data. Each of the three operational wind farms, the three under construction wind farms and the two approved wind farms in the region are located within 60 km of known maternity cave sites in the region at Wee Jasper and Bungonia. The movement of large bent-winged bats in this region is poorly understood. Increasing the number of wind farms in the region will increase the chance that a frequently used migratory pathway could be impacted.

The construction of the Project would result in the addition of 80 turbines which corresponds to a 32% increase in the total number of turbines in the region. The degree to which the Project will contribute to the overall cumulative impact is unknown. Data collected during autumn 2019 suggest that whilst the Project Area is located within an area that large bent-winged bats migrate through (Dwyer 1969) there is no evidence that a highly utilised autumn migratory path intersects the Project Area. Examination of mortality rates in the Project Area and at wind farms in the region through robust post-construction monitoring programs is required in order to estimate the magnitude of cumulative impacts on this species in this particular region.

7.0 Predict and map the likely zone of disturbance around wind turbines for aerial species resident in, or likely to fly over, the project area, with reference to relevant literature and other published sources of information

There is currently no information on the degree to which wind turbines disturb aerial species in Australia. For this reason, the likely zone of disturbance around wind turbines is unknown.

8.0 Map significant landscape and habitat features within the zone of disturbance for species likely to be affected, including but not limited to hollow bearing trees and important habitat for migratory species

No mapping of significant landscape and habitat feature mapping has been completed for the purpose of this assessment. Instead, for species for which there is clear spatial variability in site occupancy and abundance across the Project Area (i.e. superb parrot and white-fronted chat), specific areas which are likely to be more important than others are discussed in **Section 4.3**. Locations that are considered to present higher risk to certain species and would therefore be a key consideration of post-construction monitoring will be identified and mapped in the Bird and Bat Adaptive Management Plan (Umwelt, in preparation).

9.0 Predict the likelihood and describe the nature of indirect impacts on aerial species resident in, or likely to fly over, the project area including but not limited to barriers to migratory pathways and breeding, feeding and resting resources

There is currently no information on the degree to which wind turbines create barriers for aerial species in Australia. For this reason, the degree to which the Project may restrict the movement of each of the 14 species assessed in this report is unknown.

10.0 For migratory species, predict the impact of avoidance behaviour relative to migration distances and the availability of suitable habitat for breeding, feeding and resting over the migration route, with reference to relevant literature and other sources of published information

The potential influence that indirect impacts may have on migratory or partly migratory species is difficult to predict given the lack of relevant information available. Species for which a high proportion of their population exhibits migratory behaviour such as white-throated needletail, large bent-winged bat, superb parrot, little eagle and dusky woodswallow, may be more likely to be affected by indirect impacts than sedentary species though the magnitude and nature of such impacts on each is unknown.

11.0 Justify predictions of likelihood and nature of impact, with reference to relevant literature and other published sources of information

See response to **Section 9.0.**

12.0 Predict the cumulative impacts of the project together with existing wind farms with respect to movement patterns and use of adjacent habitat and provide justification for these predictions

There is currently no information on the degree to which wind farms effect movement patterns or use of adjacent habitat for any species in Australia. For this reason, the cumulative impacts of indirect impacts on movement patterns and use of adjacent habitat throughout the region in which the Project Area is located is not predicted.

13.0 Conclusion

Of the 14 species assessed five are considered a high risk, six are considered a moderate risk and three are considered a minor risk of being impacted by the Project (**Table 13.1**). The resultant risk rating for these species is primarily due to their relative abundance in the Project Area, their predicted or observed flight behaviour in the Project Area and/or their known susceptibility to blade strike at wind farms in south-east Australia. For each of the five species assigned an overall risk rating of high, the likelihood of collisions was considered high whilst the consequence of collisions was considered moderate.

The risk rating for the black falcon and little eagle largely reflects the potentially high consequence of small numbers of instances of blade strike of this species. The risk rating for white-throated needletail largely reflects the high likelihood of collision of birds in the Project Area given their known susceptibility to blade strike at other wind farms in Australia and the number and nature of observations in the Project Area during 2018/19. The risk rating for superb parrot and large bent-winged bat partly reflects the high importance of the greater region for both species, combined with factors such as the number and nature of observations in the Project Area.

Table 13.1 Risk Assessment Summary

Common Name	Latin Name	Likelihood	Consequence	Risk Rating
Little eagle	*Hieraaetus morphnoides*	High	Moderate	High
Black falcon	*Falco subniger*	High	Moderate	High
Wedge-tailed eagle	*Aquila audax*	High	Low	Moderate
Superb parrot	*Polytelis swainsonii*	High	Moderate	High
White-throated needletail	*Hirundapus caudacutus*	High	Moderate	High
White-fronted chat	*Epthianura albifrons*	High	Low	Moderate
Brown treecreeper	*Climacteris picumnus victoriae*	Low	Moderate	Minor
Varied sittella	*Daphoenositta chrysoptera*	Moderate	Low	Minor
Painted honeyeater	*Grantiella picta*	Moderate	Moderate	Moderate
Dusky woodswallow	*Artamus cyanopterus*	High	Low	Moderate
Large bent-winged bat	*Miniopterus schreibersii oceanensis*	High	Moderate	High
Yellow-bellied sheathtail bat	*Saccolaimus flaviventris*	Moderate	Moderate	Moderate
Southern myotis	*Myotis macropus*	Low	Moderate	Minor
Eastern false pipistrelle	*Falsistrellus tasmaniensis*	Moderate	Moderate	Moderate

14.0 References

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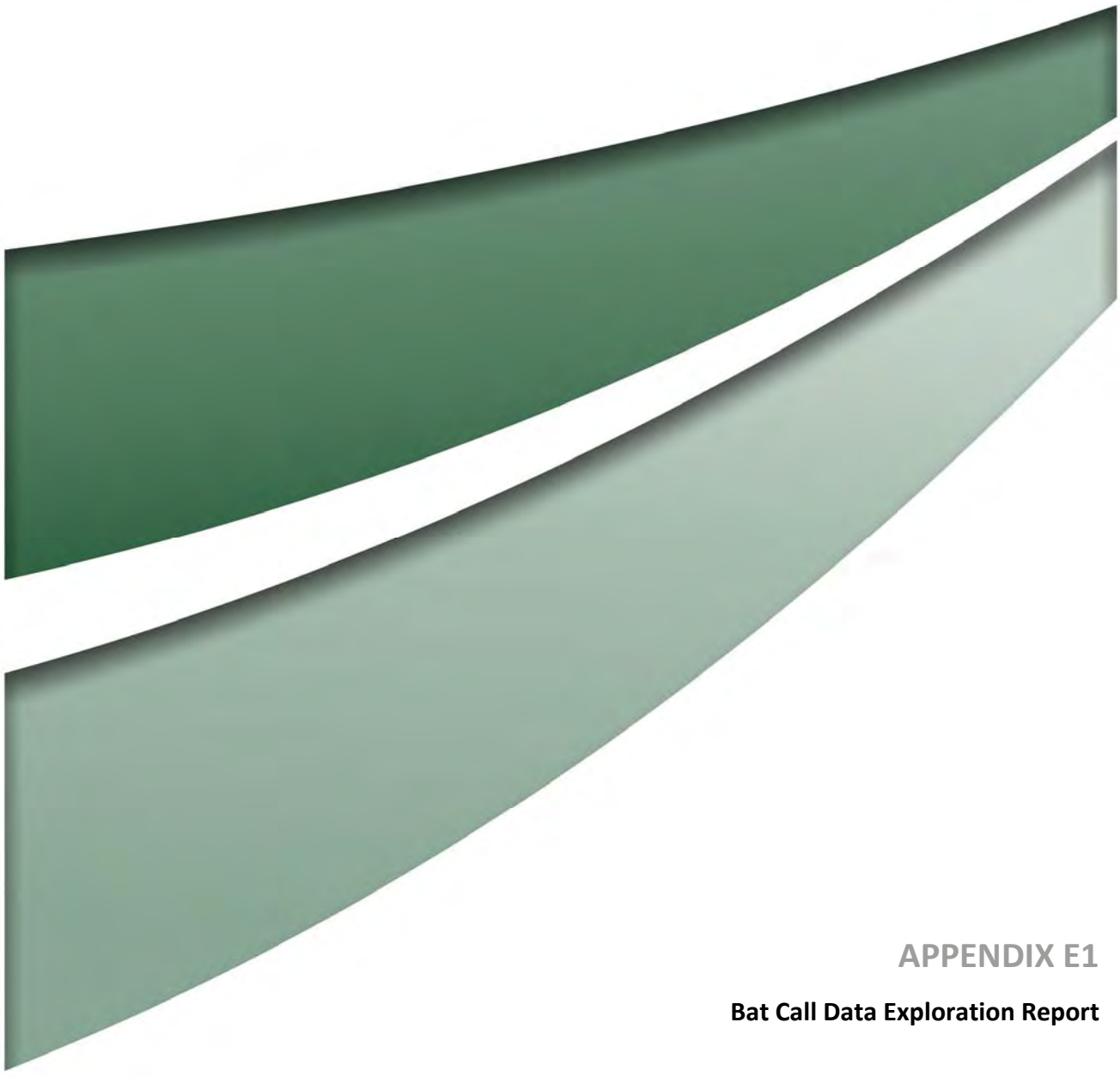
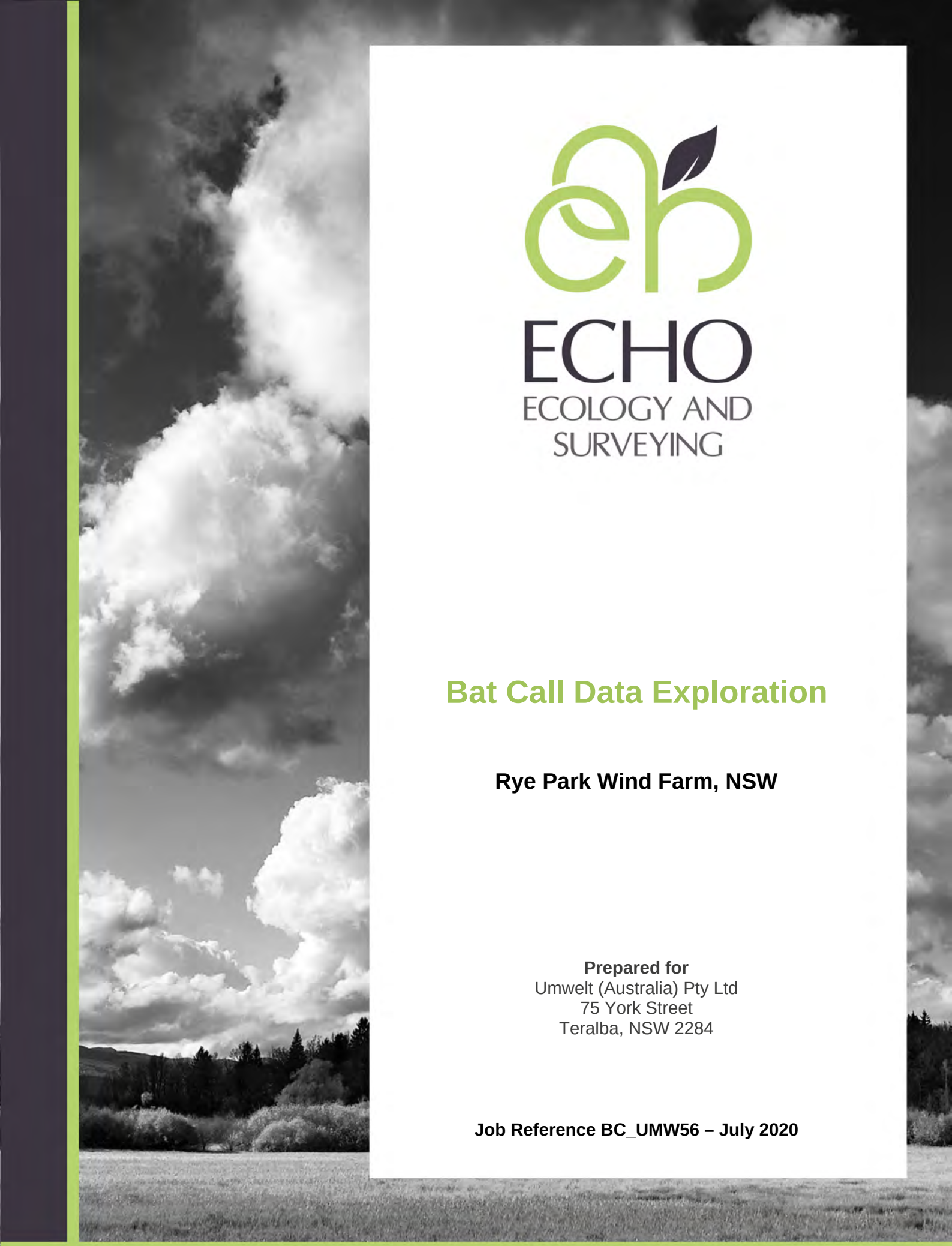


APPENDIX E1

Bat Call Data Exploration Report



ECHO
ECOLOGY AND
SURVEYING

Bat Call Data Exploration

Rye Park Wind Farm, NSW

Prepared for
Umwelt (Australia) Pty Ltd
75 York Street
Teralba, NSW 2284

Job Reference BC_UMW56 – July 2020

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This report has been prepared to document the analysis of digital ultrasonic bat echolocation data received from a third party. The data was not collected by the author and as such no responsibility is taken for the quality of data collection or for the suitability of its subsequent use.

This report was authored by

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PhD, B.Env.Sc.

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1.0 INTRODUCTION

This report has been commissioned by Umwelt (Australia) Pty Ltd to explore trends in the echolocation call data collected from Rye Park, NSW.

Comments have been received from the NSW Government requesting further information. The relevant received from the NSW Government are as follows:

> BCD commends the Applicant for the large number of sites surveyed both at ground level and elevation for microbats. However, there are a large number of 'possible' Large Bent-winged Bat calls in shown in Tables 4.3 and 4.4, relative to the number of 'definite' and 'probable' calls. This a trigger for further and more detailed investigation. It is recommended that the following information is provided:
>
> - Description on the method used to classify calls into 'definite' 'probably and 'possible' categories.
> - Information on the temporal distribution of the possible calls in terms of mean number of calls per hour and per day including whether there any noticeable spikes in activity or were these calls a consistent 'background' noise.
> - Information on whether there a similar level of uncertainty about the number of calls detected for Eastern False Pipistrelle, Yellow-bellied Sheathtail bat and Southern Myotis.

The first and third comments above have been addressed in the original bat call identification report prepared for the project: Echo Ecology and Surveying 2020 *Bat Call Identification: Rye Park Wind Farm, NSW*, prepared for Umwelt (Australia) Pty Ltd. We recommend supplying this report to BCD.

The overall aim of this report is to provide further data analysis of the bat call data for the Rye Park Wind Farm project. In particular,

- Use descriptive statistics and/or graphs to explore possible *Miniopterus orianae oceanensis* activity patterns:
    - the seasonal activity patterns (e.g. comparing mean nightly activity) of possible *M.o.oceanensis* calls with the aim of detecting any activity 'spikes' that may indicate *M.o.oceanensis* seasonal migration;
    - the nightly activity patterns (activity per hour) of possible *M.o.oceanensis* calls with the aim of determining nightly activity peaks
    - elevational activity patterns (e.g. 2m and 45m AGL sites) to determine whether possible *M.o.oceanensis* activity trends at height are similar to those at ground (seasonal and nightly)
- Review the seasonal and activity patterns of the other bat species with potential to occur at the site using similar methods as above.

2.0 METHODS

File identification reports were extracted from previously identified bat calls (Echo Ecology and Surveying, 2020) in Anabat Insight (Version 1.9.3, Titley Electronics) to tally the number of passes per species (or species group) per night and per hour.

As very few confident *M.o.oceanensis* identifications were made, we pooled these with all calls that may have been possibly from *M.o.oceanensis* to create a "possible *M.o.oceanensis*" dataset (often abbreviated in graphs and text as "Moo / Vespadelus"). This included the following species identifications:

- *Miniopterus orianae oceanensis* (Definite)
- *Chalinolobus morio / Miniopterus orianae oceanensis / Vespadelus vulturnus*
- *Miniopterus orianae oceanensis / Vespadelus darlingtoni / Vespadelus regulus / Vespadelus vulturnus*
- *Miniopterus orianae oceanensis / Vespadelus regulus*
- *Miniopterus orianae oceanensis / Vespadelus regulus / Vespadelus vulturnus*
- *Miniopterus orianae oceanensis / Vespadelus vulturnus*

As *M.o.oceanensis* most frequently overlaps in characteristics with *Vespadelus* spp. we also created a possible *Vespadelus* spp dataset (often abbreviated in graphs as "Vespadelus spp.") that included the following identifications:

- *Vespadelus vulturnus (Definite, Probable, Possible)*
- *Vespadelus darlingtoni (Definite, Probable, Possible)*
- *Vespadelus darlingtoni / Vespadelus regulus*
- *Vespadelus darlingtoni / Vespadelus regulus / Vespadelus vulturnus*
- *Vespadelus regulus / Vespadelus vulturnus*
- *Chalinolobus morio / Vespadelus vulturnus*

For the analyses and graphs involving other species, we only used confident classifications (Definite and Probable pooled together).

For the purposes of exploring the data we assigned sample dates to the categories outlined in Table 2-1 based on *M.o.oceanensis* breeding and migration status. The purpose of these categories were to allow a review of what 'background' activity patterns may be at different times of year. The Autumn migration start date is reasonably accurate based on those provided to Umwelt by the NSW Government. The other dates have been roughly extrapolated based on this Autumn migration date and only include the dates that were sampled.

Table 2-1: *M.o.oceanensis* season breeding and migration status dates

Moo Season	Date Start	Date End
1.Staging	5/11/2018	1/12/2018
2.Maternity	21/01/2019	18/03/2019
3.Weaning	18/03/2019	24/03/2019
4.AutumnMigration	25/03/2019	10/04/2019
5.Post-Migration	11/04/2019	1/05/2019

We added the following variables to the data:

- Site name
- Night
- Month
- Elevation (from ground)
    - 2m
    - 45m
- Habitat Type
    - Cleared Hilltop
    - Forest includes woodland and forest/woodland edge sites
    - Riparian
- Moo Season
    - 1.Staging
    - 2.Maternity
    - 3.Weaning
    - 4.Autumn Migration
    - 5.Post-Migration

Site details are provided in Appendix A.

We excluded nights with missing or incomplete data as best we could determine from microphone errors in log files, notes from the field ecologists and rainy nights where no data was recorded after a certain time (likely due to rain droplets covering the microphone).

To investigate seasonal activity levels we calculated average nightly site activity (average no. passes per site) for each seasonal category (Moo Season or Month), then graphed the mean ± SE of the average nightly activity. Whereas, hourly data graphs have pooled data (not first averaged per site).

All analyses and graphs were prepared using JMP (Version 15.1.0, SAS Institute Inc.).

2.1 Limitations

We have undertaken basic descriptive statistics and graphing to explore activity patterns. More complex statistical models and analyses may be able to better account for the effects of site, habitat type and differences in sample dates. However, this requires advanced statistics methods and is beyond the scope of this report.

We have most often used mean ± SE to summarise bat activity as it is easily viewed on graphs, but it should be noted that median values are often much lower.

3.0 RESULTS & DISCUSSION

A total of 1107 sample nights were included in the analyses from 30 different sites. Descriptive statistics are provided in Table 3-1 below (all nights pooled).

Table 3-1: Descriptive statistics for total bat activity and Moo / Vespadelus activity by variable. Results per night, all sites pooled.

Variable		n	Total Bat Activity				Moo/Vespadelus Activity			
			Mean	Median	SE	Range	Mean	Median	SE	Range
Month	Nov-18	262	188.98	66.5	15.64	0-3002	43.96	2	5.67	0-1910
	Jan-19	115	247.72	150	23.61	6-1995	41.46	4	8.56	0-534
	Feb-19	223	224.92	132	16.96	3-1381	29.61	1	6.14	0-620
	Mar-19	349	124.81	77	13.55	0-1057	1.28	0	4.91	0-23
	Apr-19	158	116.94	20.5	20.14	0-1624	27.04	0	7.30	0-725
Elevation	2m	744	216.22	112.5	9.15	0-3002	36.89	2	3.36	0-1910
	45m	363	80.79	46	13.10	0-523	0.43	0	4.81	0-27
Habitat Type	Cleared Hilltop	815	111.03	63	8.28	0-1057	1.93	0	2.97	0-131
	Forest	215	326.24	206	16.12	0-2762	82.49	32	5.78	0-1910

Variable		n	Total Bat Activity				Moo/Vespadelus Activity			
			Mean	Median	SE	Range	Mean	Median	SE	Range
	Riparian	77	383.97	246	26.93	0-3002	107.71	52	9.66	0-927
Moo Season	1.Staging	262	188.98	66.5	15..61	0-3002	43.96	2	5.72	0-1910
	2.Maternity	549	208.81	126	10.78	3-1995	21.33	1	3.95	0-620
	3.Weaning	72	87.50	50.5	29.78	6-575	1.07	0	10.92	0-15
	4.Autumn Migration	209	88.75	16	17.48	0-1624	19.88	0	6.41	0-725
	5.Post-Migration	15	79.53	25	65.24	6-346	9.80	0	23.92	0-45

3.1 Habitat Type

3.1.1 *Miniopterus orianae oceanensis*

Overall, Moo / Vespadelus spp. activity was much lower at cleared hilltop sites than either forest or riparian sites (Figure 3-1). This pattern is consistent when split by *M.o.oceanensis* season (not graphed here).

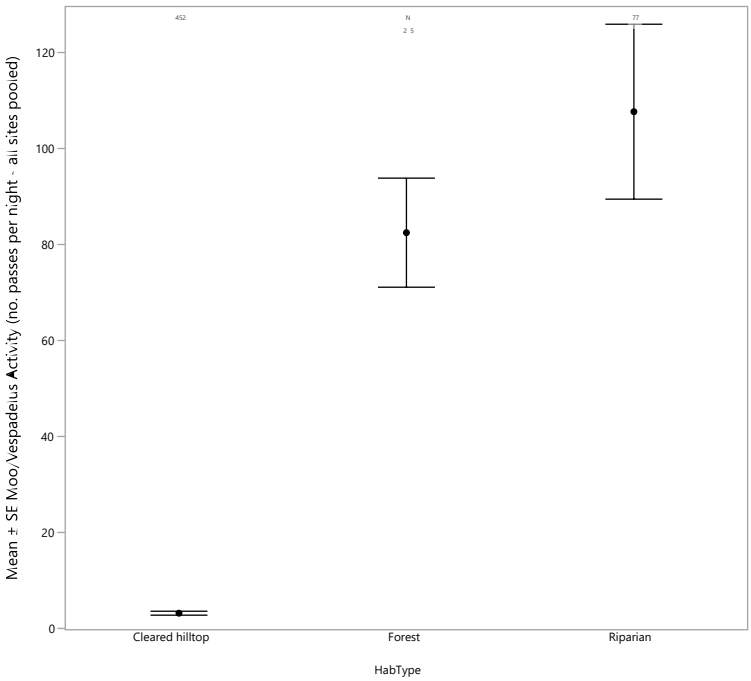

Figure 3-1: Mean ± SE nightly *Moo / Vespadelus* spp. activity by habitat type. All sites pooled and 45m sites excluded. n is shown at the top of the graph

3.2 Seasonal Activity Patterns

3.2.1 *Miniopterus orianae oceanensis*

There is no clear and consistent spike in Moo/Vespadelus activity during the Autumn migration season. When all activity data is pooled together (45m elevation sites excluded), there appears to be an increase in activity during the Autumn Migration period compared to both Weaning and Post-migration (Figure 3-2). However, when investigated by habitat type (Figure 3-3) or per site (see Appendix B), the trend appears to be a result of unequal sampling effort among the seasons (ie not all sites were sampled in every season and sampling was not always concurrent among sites). In this case, the 'Cleared Hilltop' sites are the only sites sampled during the 'Weaning' season and these sites typically had much lower activity levels than forest or riparian habitats. As such, we have often subset graphs by habitat type and we have included graphs of activity levels for individual sites in Appendix B so that these 'spikes' can be viewed in the context of site activity and sample effort.

In addition, activity patterns of Moo/Vespadelus are very similar to those of the *Vespadelus* spp. group (Figure 3-3) suggesting that other factors may also be influencing activity levels.

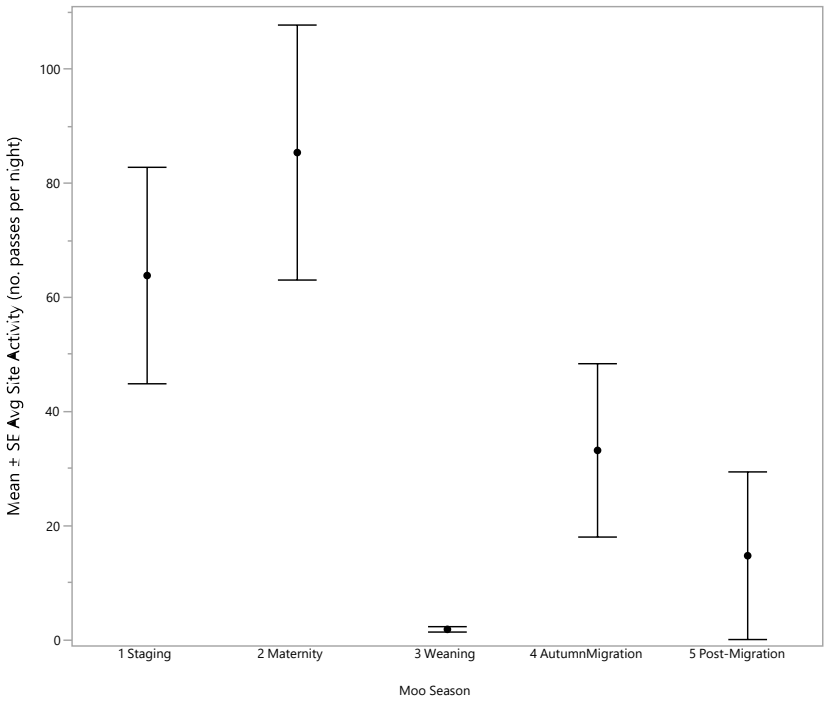

Figure 3-2: Mean ± SE Average nightly *Moo / Vespadelus* spp. activity by Moo season. 45m sites excluded.

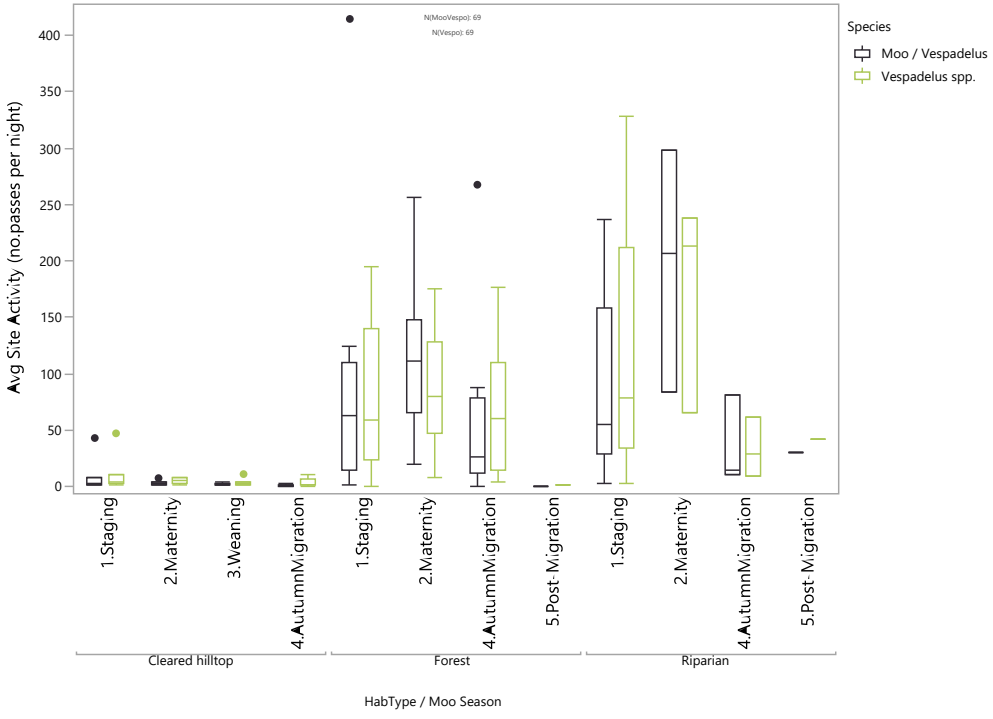

Figure 3-3: Average Site *Moo / Vespadelus* spp. and *Vespadelus* spp. activity by Moo season and habitat type. 45m sites excluded. n is shown at the top of the graph

Individual nights of high Moo/Vespadelus activity were detected as outliers in Figure 3-4; Figure 3-5; Figure 3-6 for sites BGIRP2, BGIRP3, BGIYAS, BGIRP8, BGI02 and BGI12. Activity on the 23/3/2019 at cleared hilltop sites and on 3/4/2019 at forested sites also

appears to be greater than surrounding dates (though variable as indicated by the large boxplot range). The high activity on 3/4/2019 (Figure 3-5) appears to be driven (as indicated by relatively low median value and large box plot range) by activity spikes at Site BGI02 and Site BGI09 on 3/4/2019 where 725 and 383 Moo/Vespadelus passes were recorded respectively (see Appendix B). Sample sizes for riparian sites are quite low either side of the *M.o.oceanensis* Autumn migration period and interpretation of this data should be cautious (Figure 3-6).

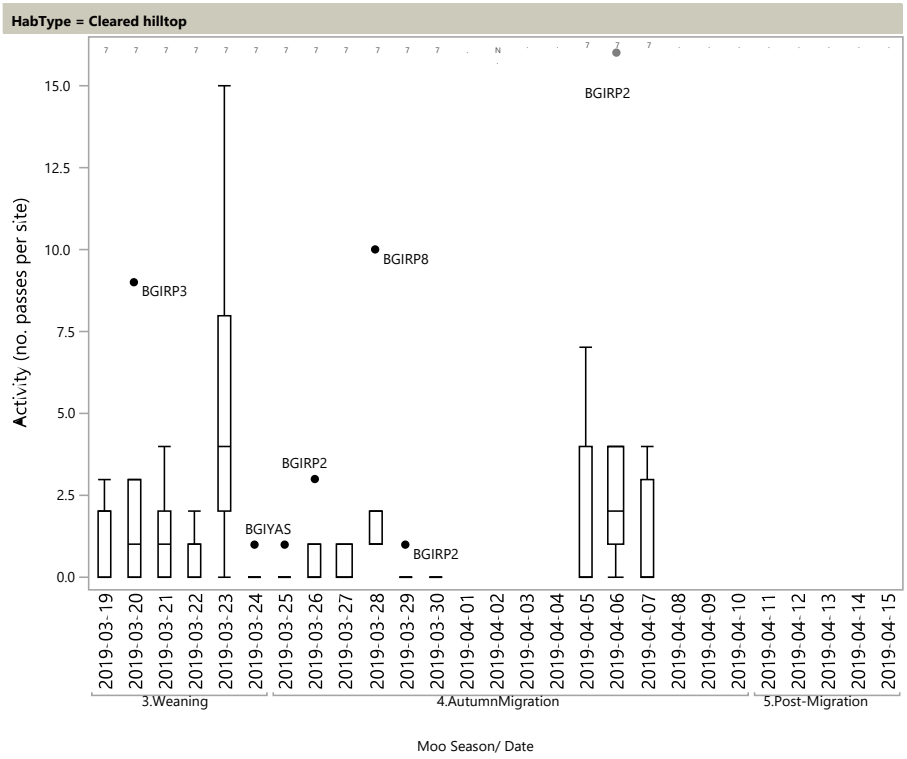

Figure 3-4: Cleared Hilltop Nightly *Moo/Vespadelus* spp. activity surrounding the Moo Autumn Migration season by habitat type. All sites pooled, cleared hilltop habitat only and 45m sites excluded. n is shown at the top of the graph and all outliers are labelled with site name

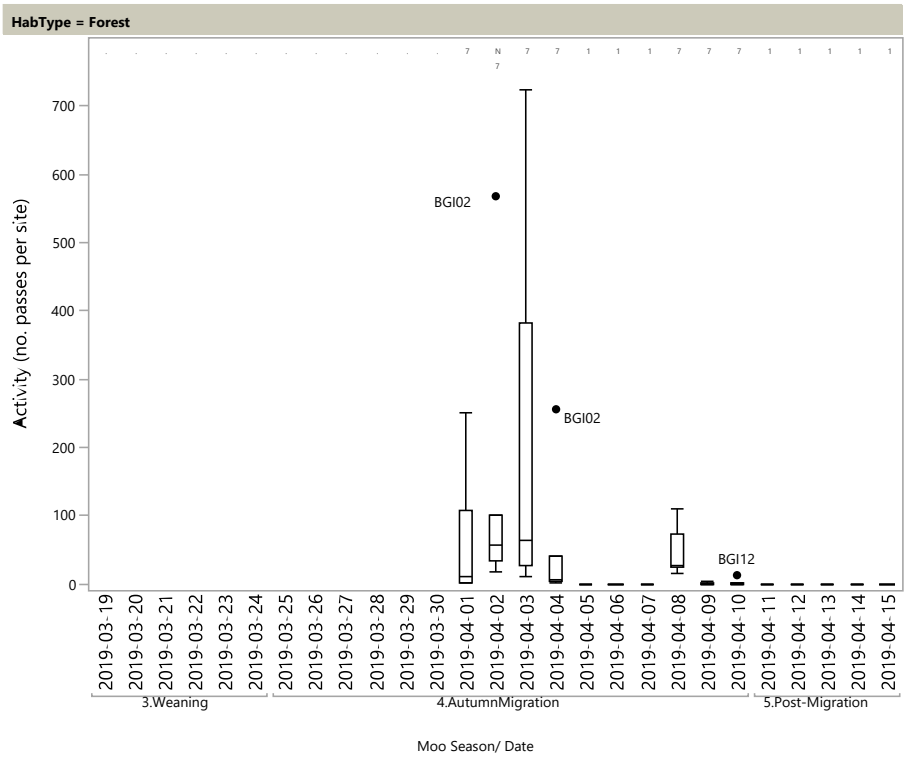

Figure 3-5: Forest Nightly *Moo/Vespadelus* spp. activity surrounding the Moo Autumn Migration season by habitat type. All sites pooled, forest habitat only and 45m sites excluded. n is shown at the top of the graph and all outliers are labelled with site name

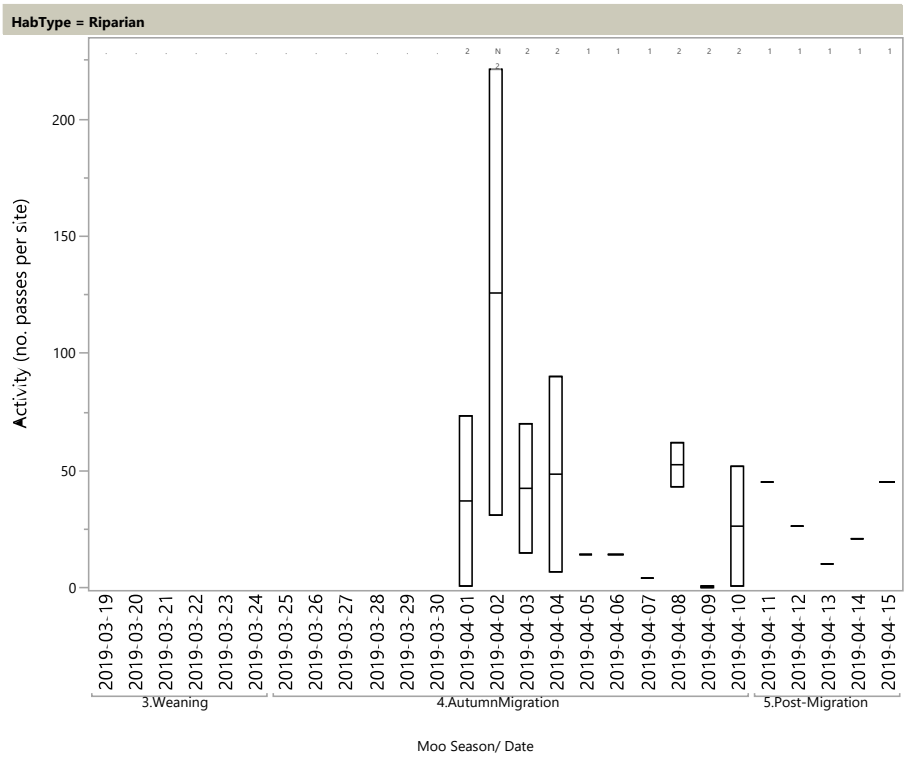

Figure 3-6: Riparian Nightly *Moo/Vespadelus* spp. activity surrounding the Moo Autumn Migration season by habitat type. All sites pooled, riparian habitat only and 45m sites excluded. n is shown at the top of the graph and all outliers are labelled with site name

3.2.2 Other Bat Species

Total bat activity was variable among sites, with April showing less activity overall than all other months (Figure 3-7)

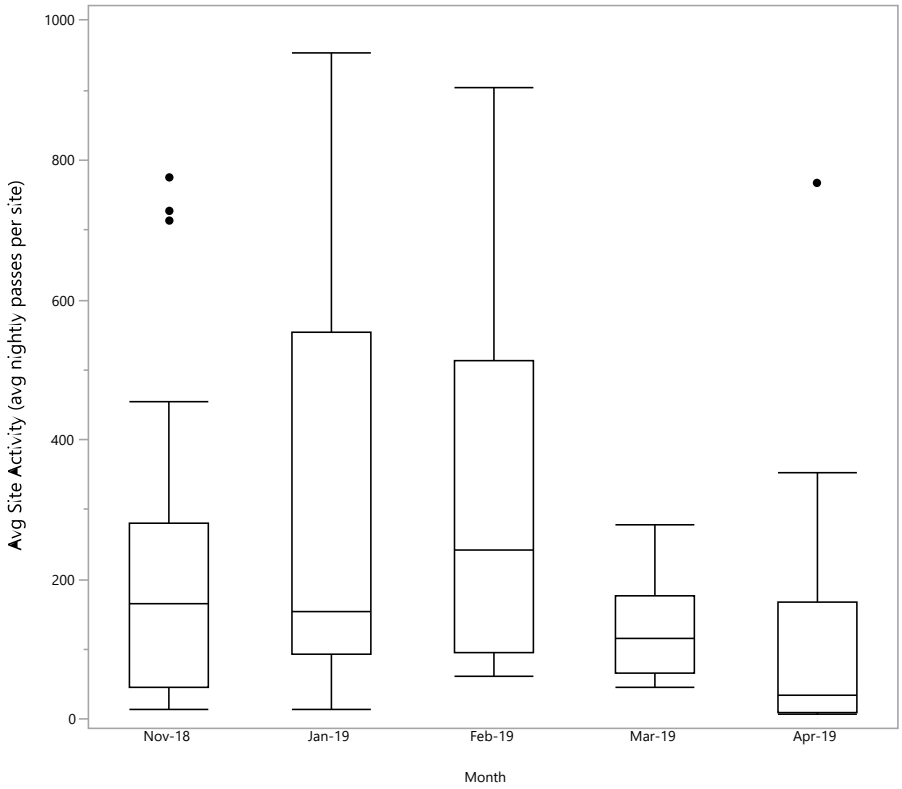

Figure 3-7: Average Total Bat Activity (average nightly passes per site) by month.

Direct comparison of activity levels among species is not recommended due to differences in detection and identification probabilities for each species. However, exploring whether there are seasonal changes in activity for each species may be useful for wind turbine operation.

Austronomus australis displayed the most obvious seasonal trend, showing high summer activity which decreased in spring and autumn in all habitat types (Figure 3-8). It is speculated by some researchers that *Austronomus australis* may migrate during winter in southern Australia and this may explain this activity pattern. However, other factors may also be responsible for this pattern such as maternity roost location, insect abundance or young beginning to fly.

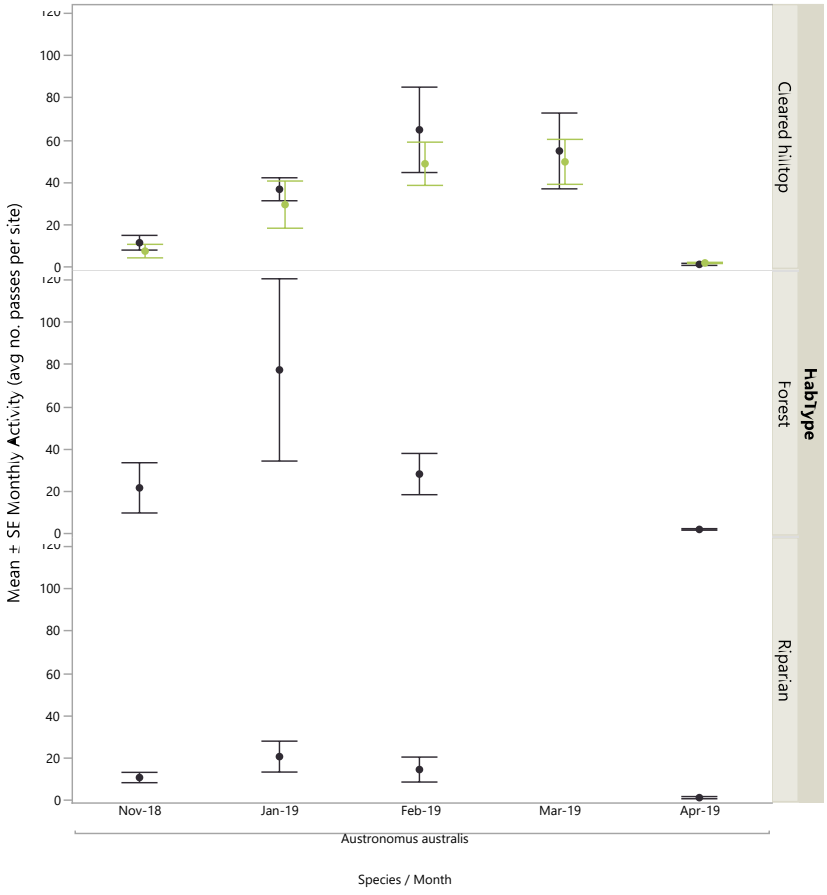

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Figure 3-8: Mean ± SE *Austronomus australis* Average nightly activity by month and habitat type.

The seasonal trend of other species is presented below in Figure 3-9, Figure 3-10 and Figure 3-11.

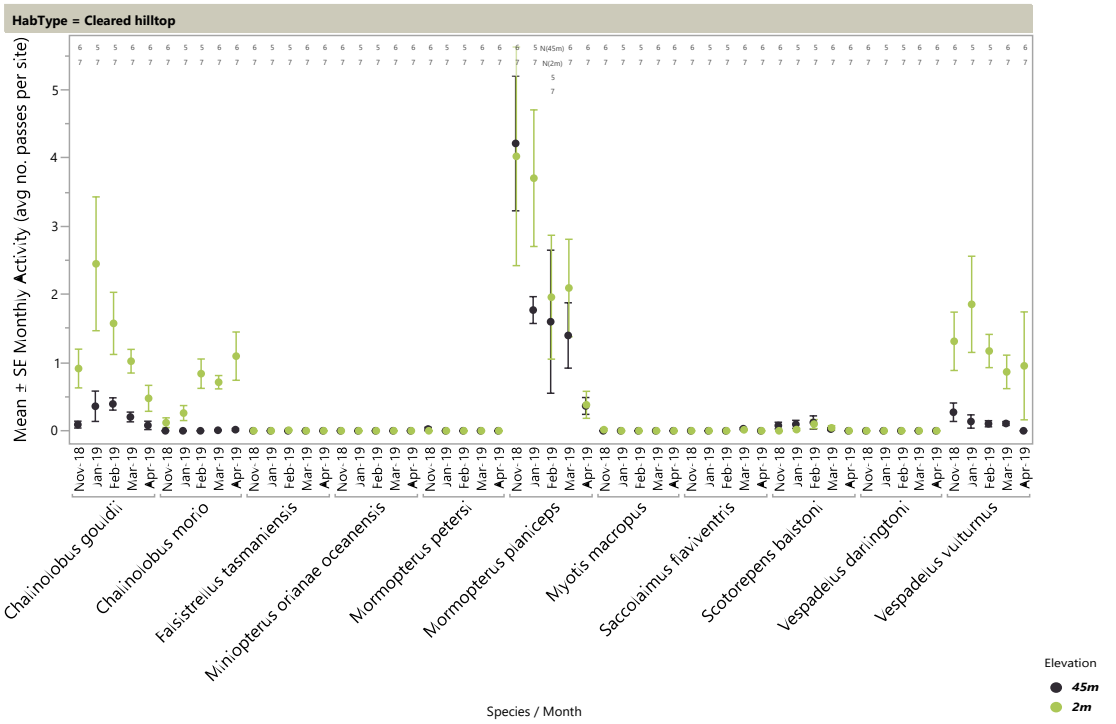


Figure 3-9: Cleared Hilltop Mean ± SE bat average nightly activity by month and habitat type.. Cleared hilltop habitat only. *Austronomus australis* excluded. n shown at top of graph.

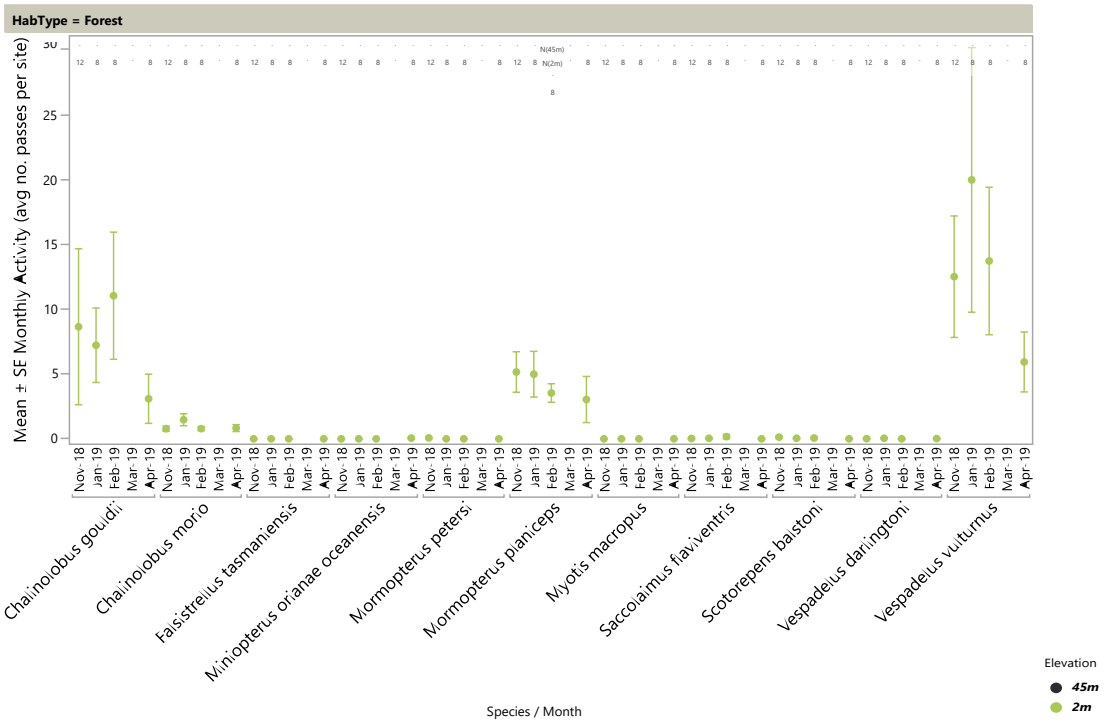


Figure 3-10: Forest Mean ± SE bat average nightly activity by month and habitat type. Forest habitat only. *Austronomus australis* excluded. n shown at top of graph.

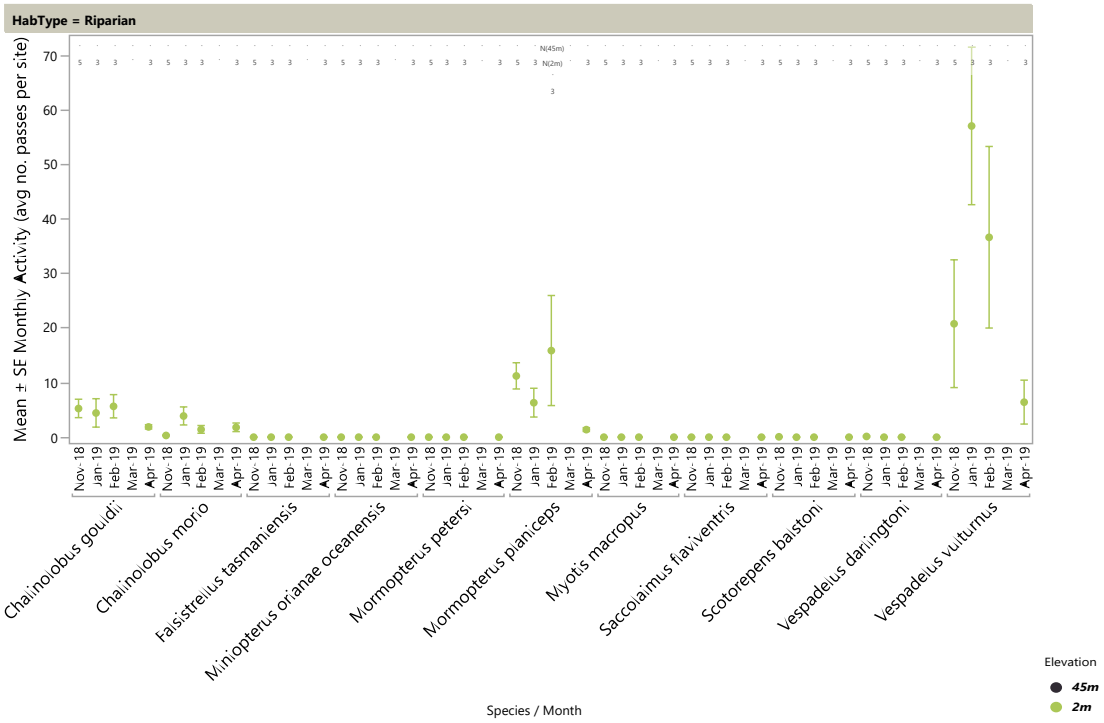


Figure 3-11: Riparian Mean ± SE bat average nightly activity by month and habitat type.. Riparian habitat only. *Austronomus australis* excluded. n shown at top of graph.

3.3 Elevational Activity Patterns

3.3.1 *Miniopterus orianae oceanensis*

A similar trend in seasonal Moo/Vespadelus and Vespadelus spp. activity is found at both 2m and 45m above ground elevation sites (Figure 3-12).

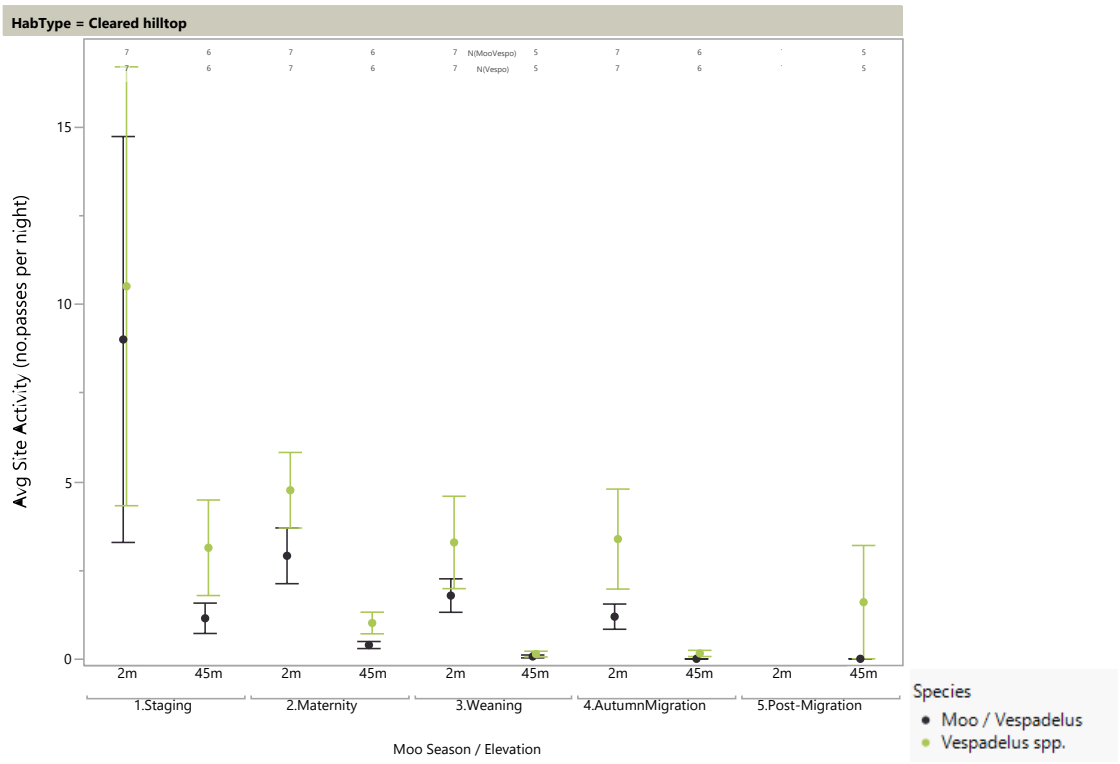


Figure 3-12: Mean ± SE average nightly *Moo / Vespadelus* spp. and *Vespadelus* spp. activity by Moo season and elevation from ground. Cleared Hilltop sites only. n is shown at the top of the graph

3.3.2 Other Bat Species

A total of eight species were confidently recorded (Definite and Probable identifications) at the 45m elevation above ground sites (Figure 3-9), being:

- *Austronomus australis;*
- *Chalinolobus gouldii;*
- *Chalinolobus morio;*
- *Mormopterus petersi;*
- *Mormopterus planiceps;*
- *Saccolaimus flaviventris;*
- *Scotorepens balstoni; and*
- *Vespadelus vulturnus*.

Only *Austronomus australis* and *Mormopterus planiceps* showed consistent activity at the 45 m elevation sites (Figure 3-8; Figure 3-9);. *Chalinolobus gouldii, Scotorepens balstoni* and *Vespadelus vulturnus* showed occasional low activity (Figure 3-9) and the remaining species (*Chalinolobus morio, Mormopterus petersi* and *Saccolaimus flaviventris*) had only 1-2 passes on 1-2 separate nights.

Austronomus australis showed only slightly lower activity levels at the 45m sites as the 2m sites (Figure 3-8). *Chalinolobus gouldii* and *Vespadelus vulturnus* were much more active at the 2m above ground sites, than the 45m sites (Figure 3-9).

3.4 Nightly Activity Patterns

3.4.1 *Miniopterus orianae oceanensis*

The nightly activity patterns of Moo/Vespadelus calls by *M.o.oceanensis* season are presented in Figure 3-13, Figure 3-14 and Figure 3-15 below.

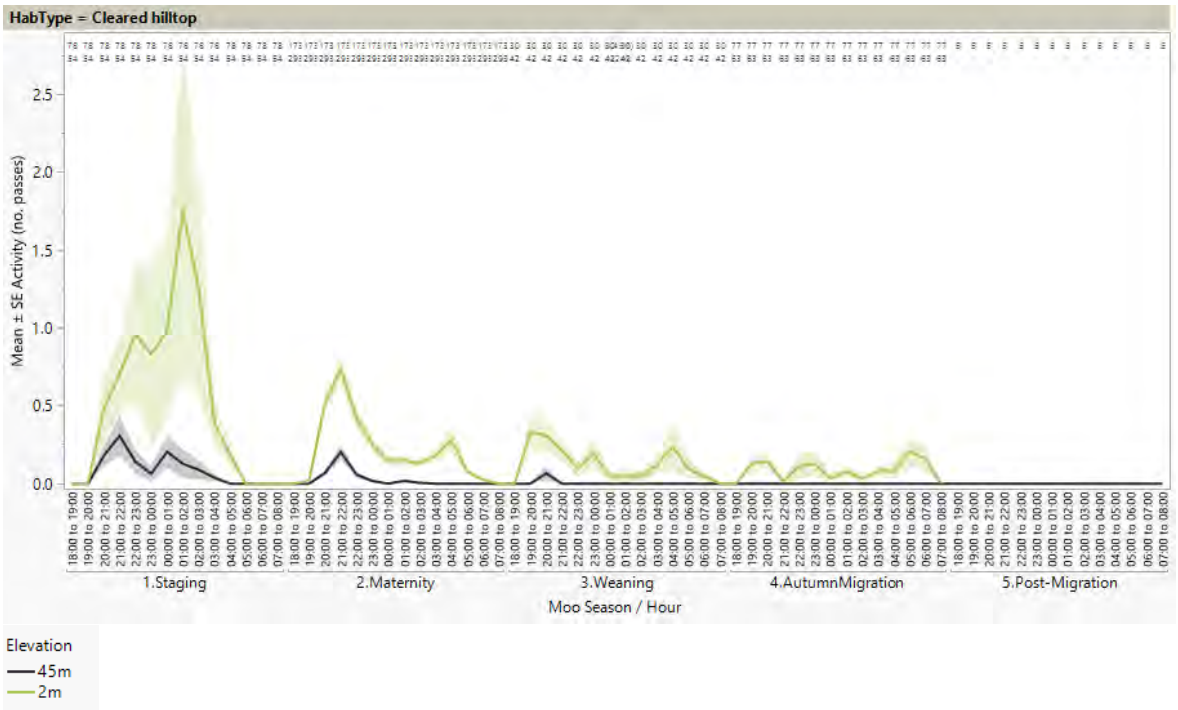


Figure 3-13: Mean ± SE hourly *Moo/Vespadelus* spp. activity by hour, Moo season and elevation from ground. Cleared Hilltop sites only. All sites pooled. n is shown at the top of the graph. Times have not been converted to time since sunset.

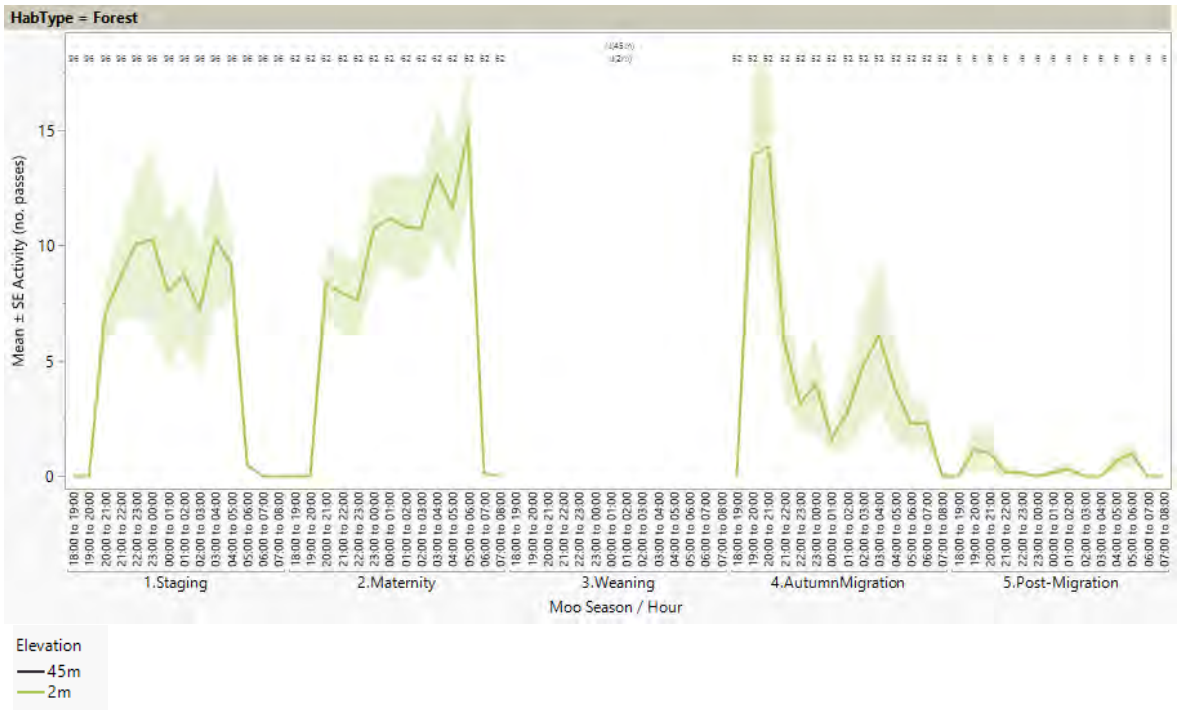


Figure 3-14: Mean ± SE hourly *Moo/Vespadelus* spp. activity by hour, Moo season and elevation from ground. Forest sites only. All sites pooled. n is shown at the top of the graph. Times have not been converted to time since sunset.

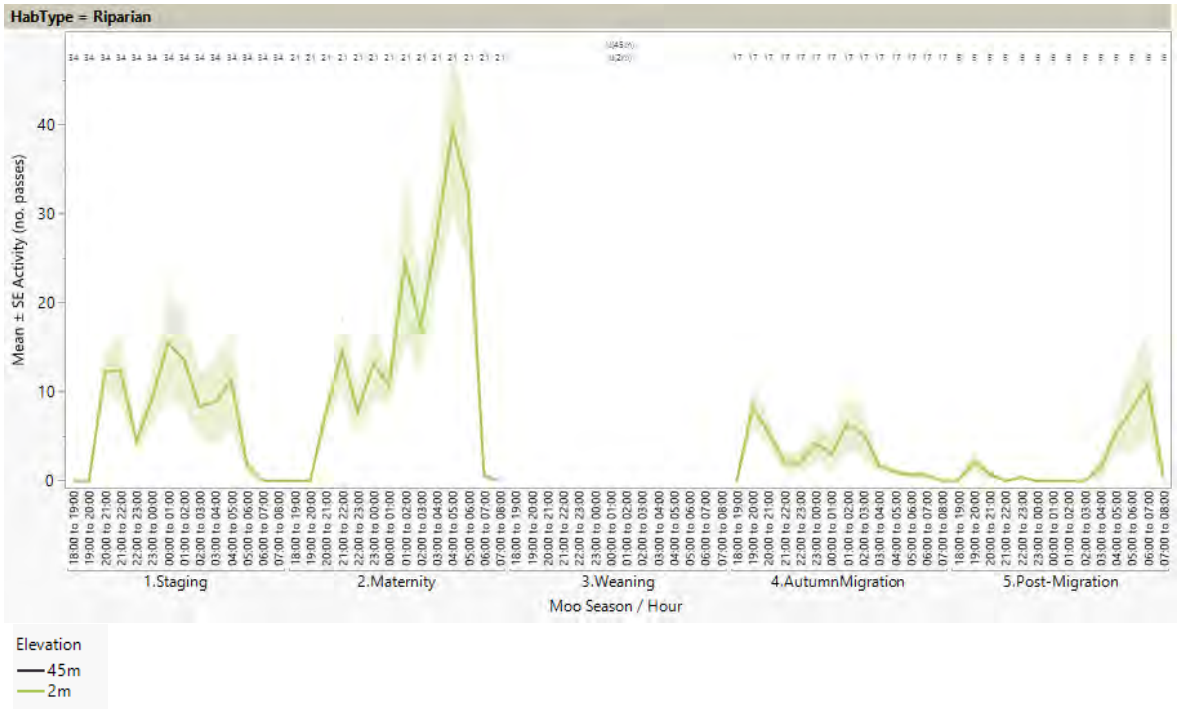


Figure 3-15: Mean ± SE hourly *Moo/Vespadelus* spp. activity by hour, Moo season and elevation from ground. Riparian sites only. All sites pooled. n is shown at the top of the graph. Times have not been converted to time since sunset.

3.4.2 Other Bat Species

During warmer months total bat activity peaked on dusk and then gradually dropped off after midnight (Figure 3-16). However, in April, when conditions are often cooler, bat activity peaks on dusk and drops off much more steeply after the first 2-3 hours (Figure 3-16).

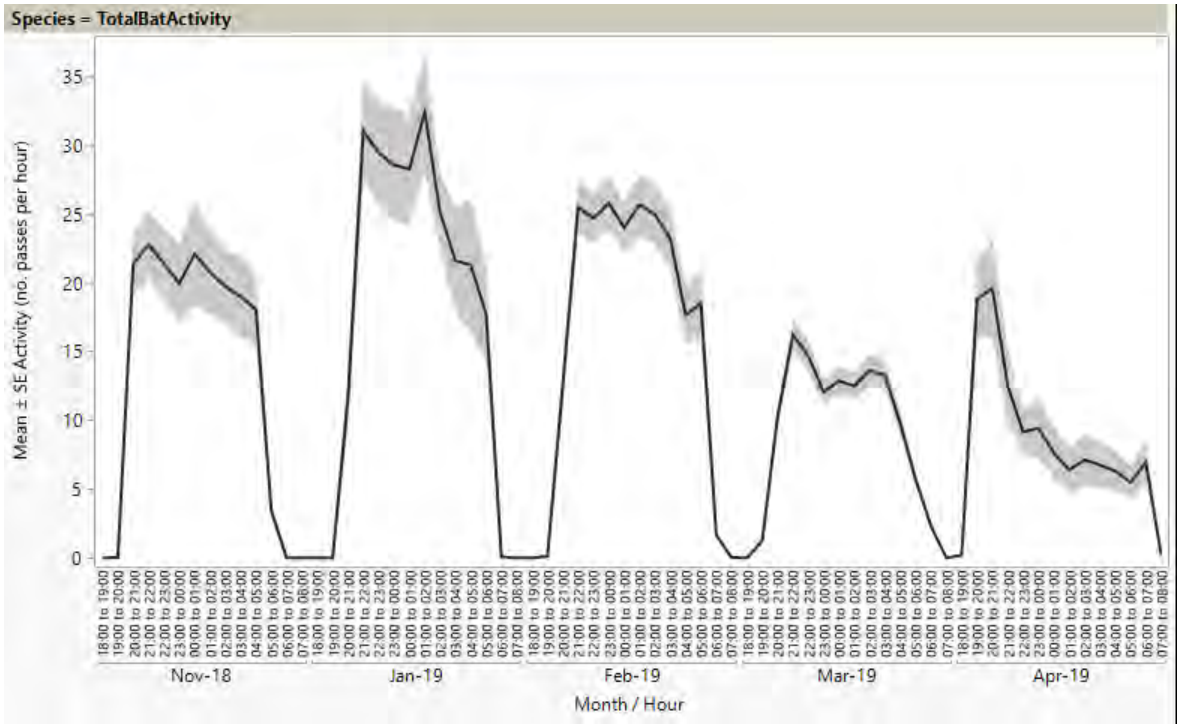


Figure 3-16: Mean ± SE hourly total bat activity by month. All sites pooled. Times have not been converted to time since sunset.

The nightly activity patterns for other bat species (only species with > 0.5 average passes per hour have been included in graphs) are shown below in Figure 3-17, Figure 3-18, Figure 3-19 and Figure 3-20.

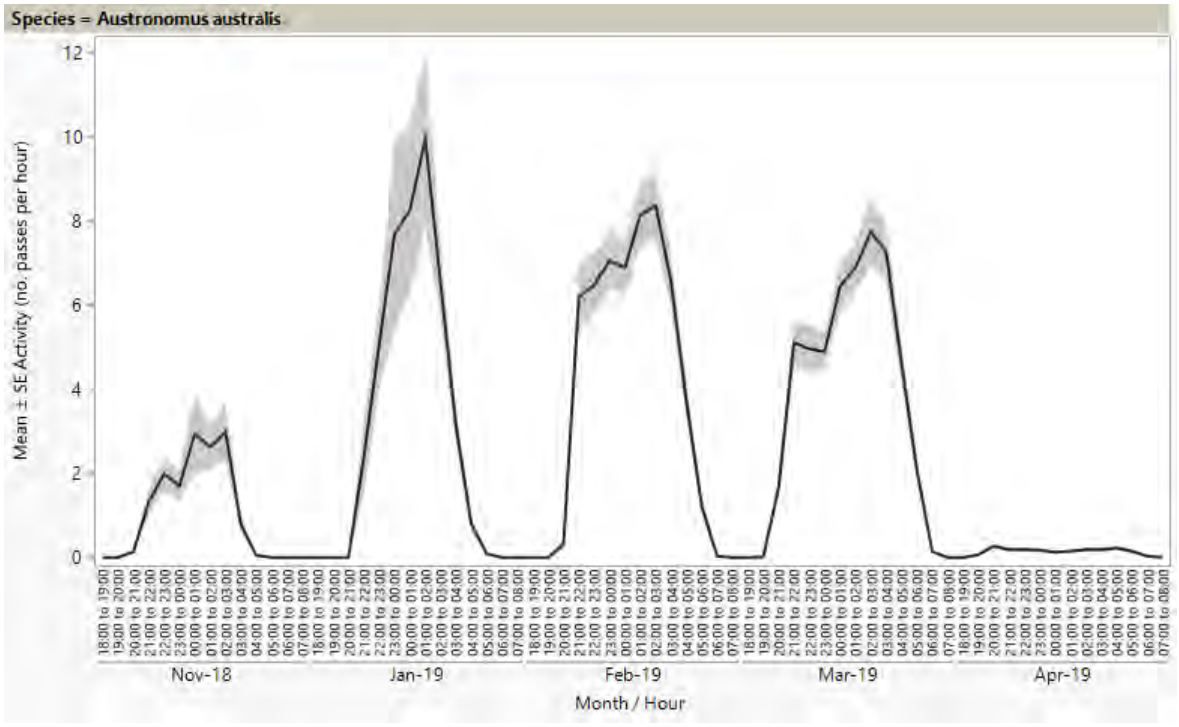


Figure 3-17: Mean ± SE hourly *Austronomus australis* activity by month. All sites pooled. Times have not been converted to time since sunset.

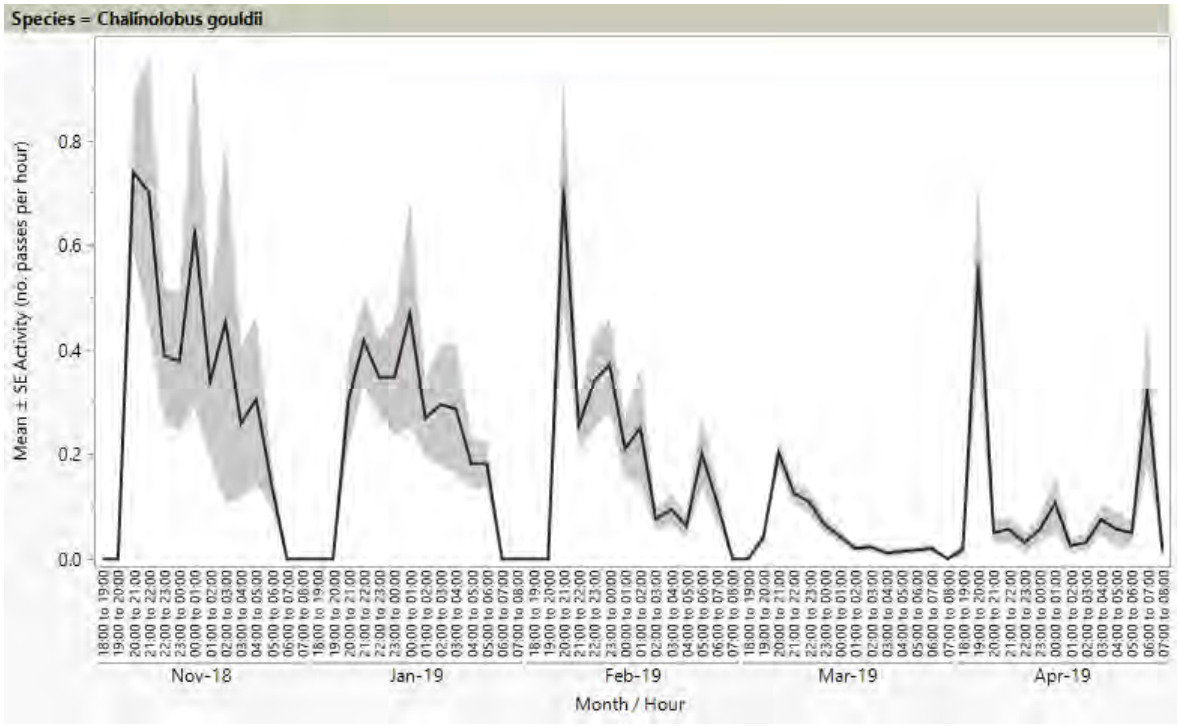


Figure 3-18: Mean ± SE hourly *Chalinolobus gouldii* activity by month. All sites pooled. Times have not been converted to time since sunset.

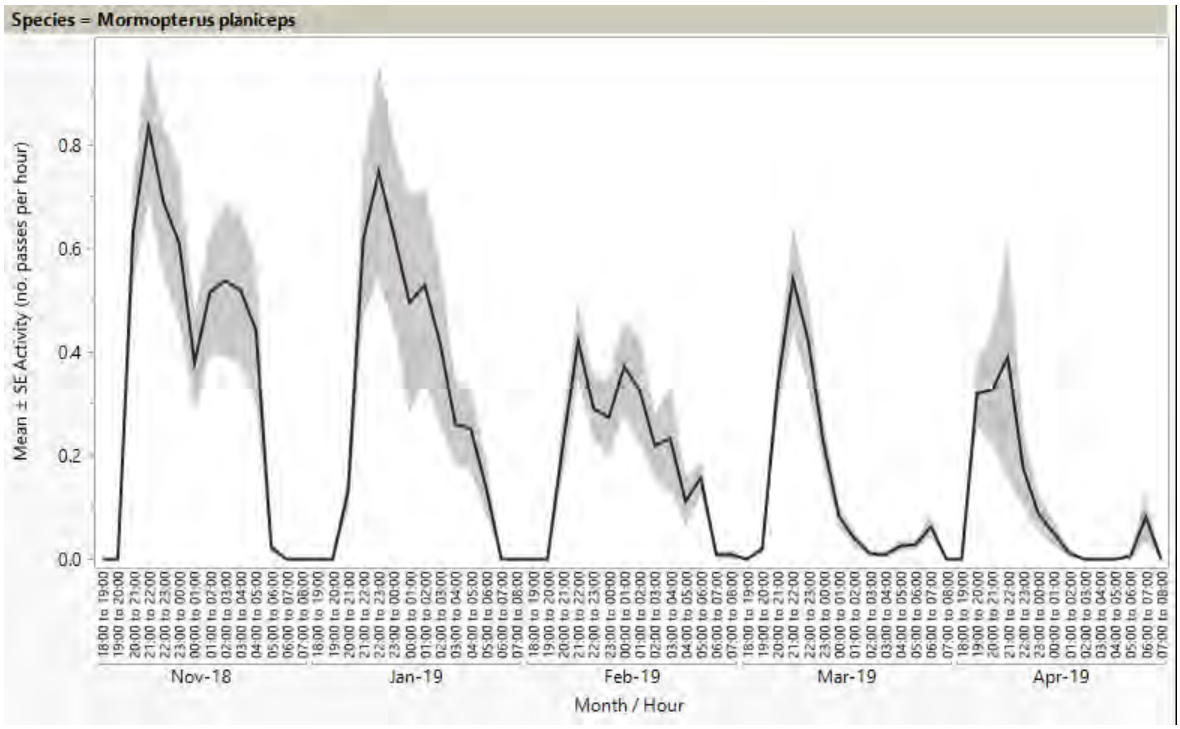


Figure 3-19: Mean ± SE hourly *Mormopterus planiceps* activity by month. All sites pooled. Times have not been converted to time since sunset.

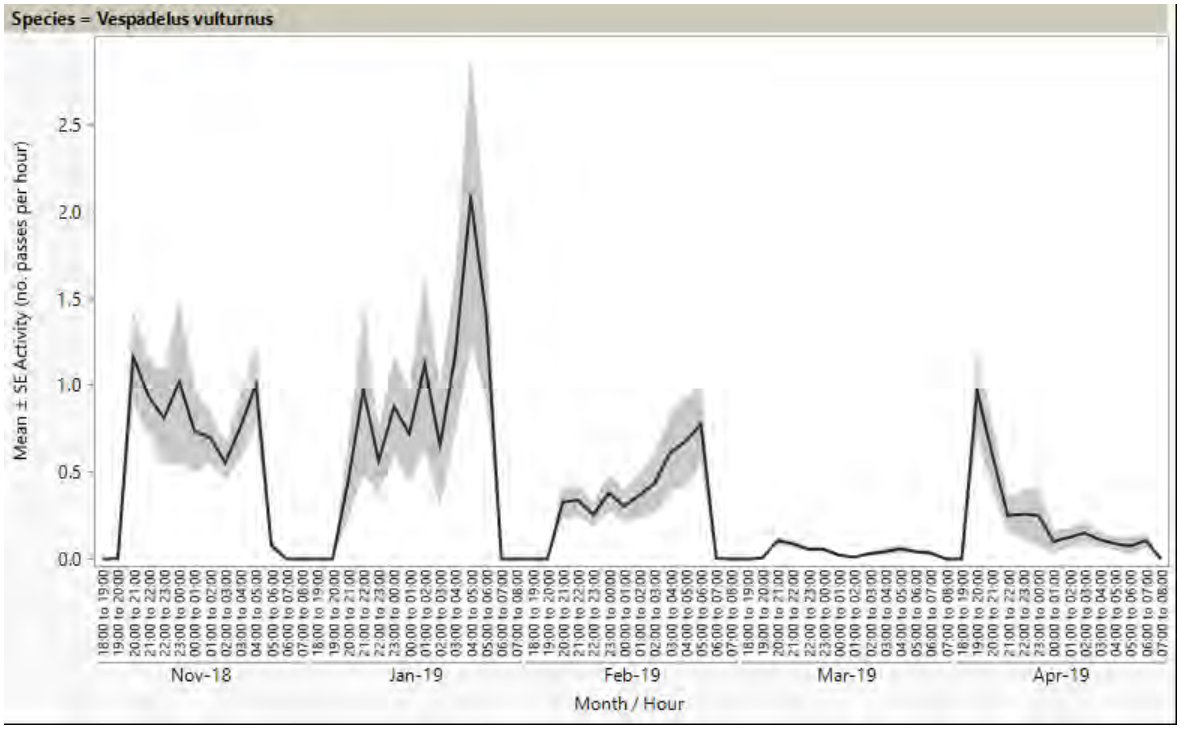


Figure 3-20: Mean ± SE hourly *Vespadelus vulturnus* activity by month. All sites pooled. Times have not been converted to time since sunset.

4.0 REFERENCES

Echo Ecology and Surveying 2020 *Bat Call Identification: Rye Park Wind Farm, NSW*, prepared for Umwelt (Australia) Pty Ltd.

APPENDIX A SITE DETAILS

Site	HabType	Elevation	Description
BGC01	Riparian	2m	Paddock tree amongst scattered E. melliodora, water in minor creek approx. 30 m from detector.
BGC02	Riparian	2m	Paddock tree amongst scattered E. melliodora, water in minor creek approx. 30 m from detector.
BGC03	Riparian	2m	On box-gum woodland edge, over shallow gully with dense Typha.
BGC04	Forest	2m	On edge of open box-gum woodland and *E. rossii/ E. macrorhyncha* dry sclerophyll forest.
BGC05	Forest	2m	In dense shrubland.
BGCRP4	Cleared hilltop	2m	Located on bare hilltop
BGI01	Riparian	2m	On box-gum woodland edge, over gully containing occasional small pools.
BGI02	Forest	2m	On edge of small clearing in *E. rossii/ E. macrorhyncha* dry sclerophyll forest.
BGI03	Forest	2m	In patch of *E. rossii/ E. macrorhyncha* dry sclerophyll forest. No water nearby.
BGI04	Forest	2m	Dense *rossii/ E. macrorhyncha* dry sclerophyll forest on hill slope near top of ridge.
BGI05	Forest	2m	Dense *rossii/ E. macrorhyncha* dry sclerophyll forest on hill slope near top of ridge.
BGI06	Forest	2m	In patch of *E. rossii/ E. macrorhyncha* dry sclerophyll forest.
BGI07	Riparian	2m	Paddock tree amongst scattered E. melliodora, water in minor creek approx. 30 m from detector.
BGI08	Forest	2m	In patch of *E. rossii/ E. macrorhyncha* dry sclerophyll forest. No water nearby.
BGI09	Forest	2m	On edge of *E. rossii/ E. macrorhyncha* dry sclerophyll forest near shrubland.
BGI10	Forest	2m	In very small patch of *E. rossii/ E. macrorhyncha* dry sclerophyll forest. Surrounded by shrubland.

Site	HabType	Elevation	Description
BGI11	Forest	2m	In patch of *E. rossii/ E. macrorhyncha* dry sclerophyll forest.
BGI12	Forest	2m	On edge of *E. rossii/ E. macrorhyncha* dry sclerophyll forest above dry gully.
BGIRP2	Cleared hilltop	2m	Located on bare hilltop
BGIRP3	Cleared hilltop	2m	Located on bare hilltop
BGIRP5	Cleared hilltop	2m	Located on bare hilltop
BGIRP6	Cleared hilltop	2m	Located on bare hilltop
BGIRP8	Cleared hilltop	2m	Located on bare hilltop
BGIYAS	Cleared hilltop	2m	Located on bare hilltop
BMCRP 4	Cleared hilltop	45m	Located on bare hilltop
BMIRP2	Cleared hilltop	45m	Located on bare hilltop
BMIRP3	Cleared hilltop	45m	Located on bare hilltop
BMIRP5	Cleared hilltop	45m	Located on bare hilltop
BMIRP6	Cleared hilltop	45m	Located on bare hilltop
BMIRP8	Cleared hilltop	45m	Located on bare hilltop

APPENDIX B PER SITE GRAPHS

Autumn Migration Moo/Vespadelus Activity Per Night Per Site

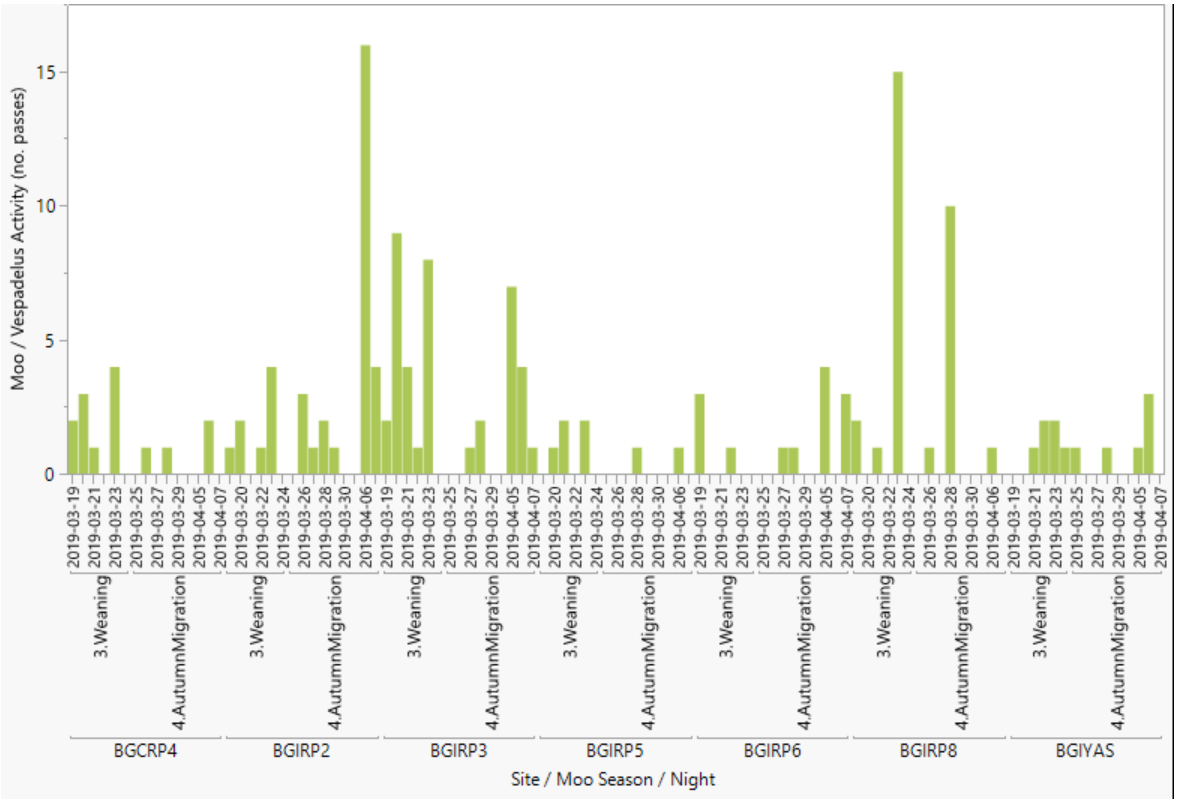


Figure A1: Cleared Hilltop 2m Nightly Moo/Vespadelus activity during the Autumn migration period (including immediately before and after) by site for 2m above ground sites on cleared hilltops only.

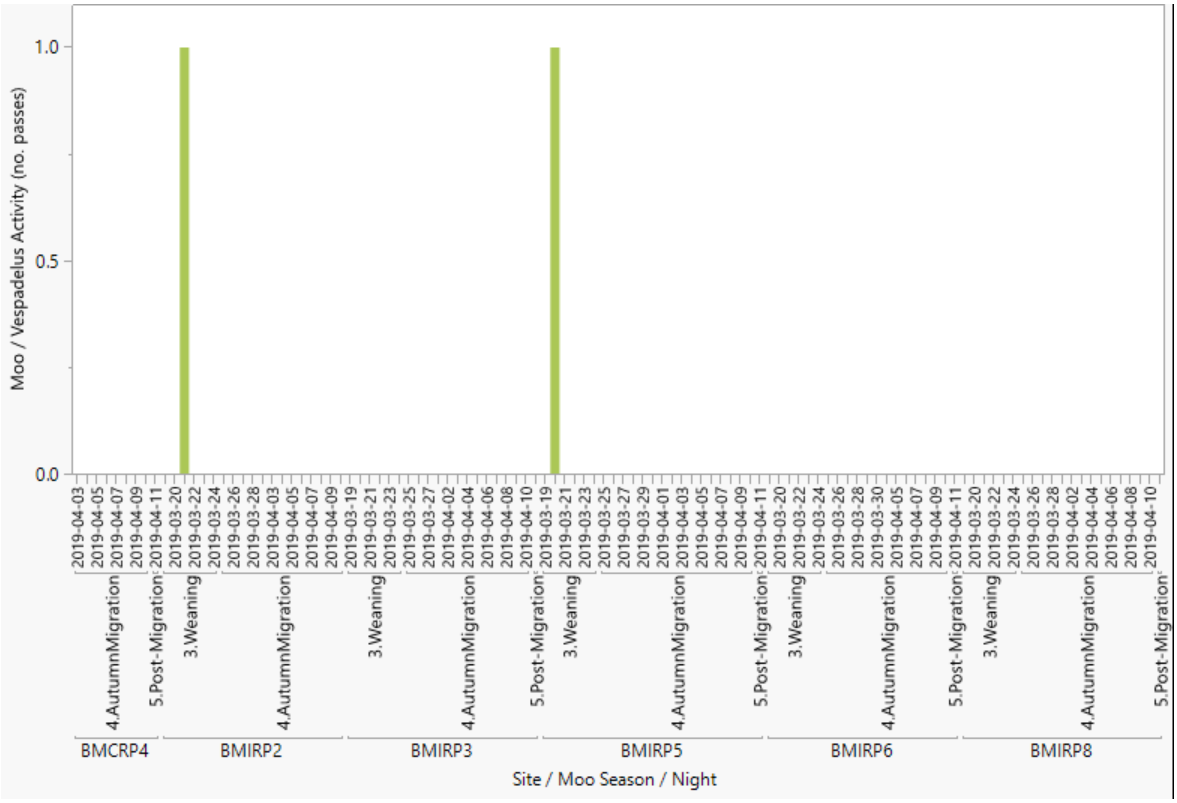


Figure A2: Cleared Hilltop 45m Nightly Moo/Vespadelus activity during the Autumn migration period (including immediately before and after) by site for 45m above ground sites on cleared hilltops only.

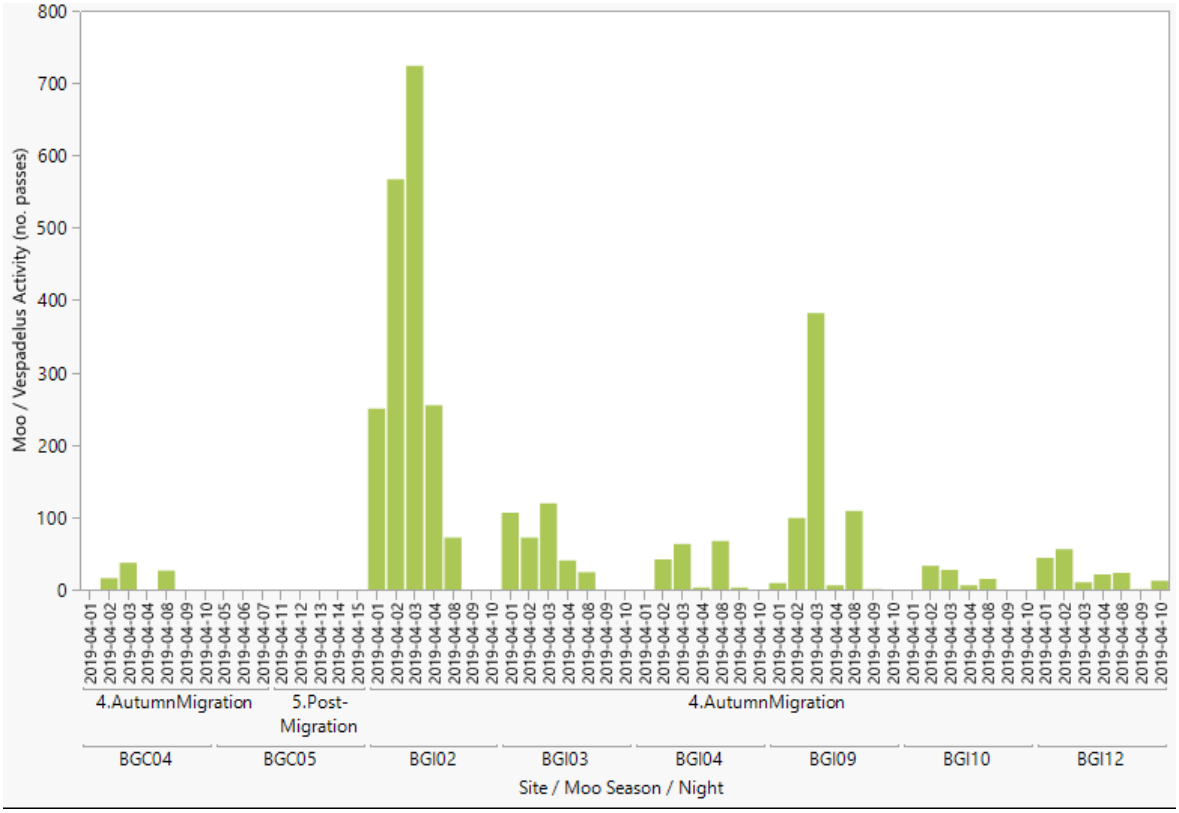


Figure A3: Forest 2m Nightly Moo/Vespadelus activity during the Autumn migration period (including immediately before and after) by site and including forested sites only.

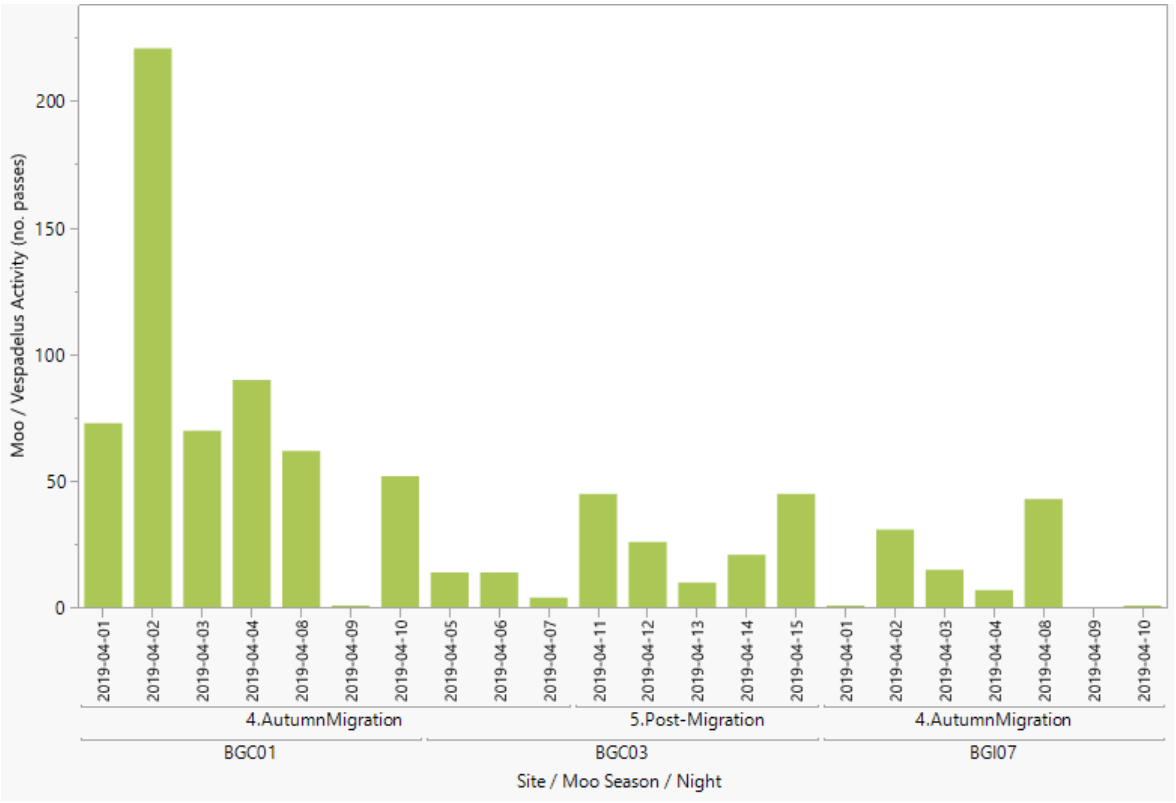
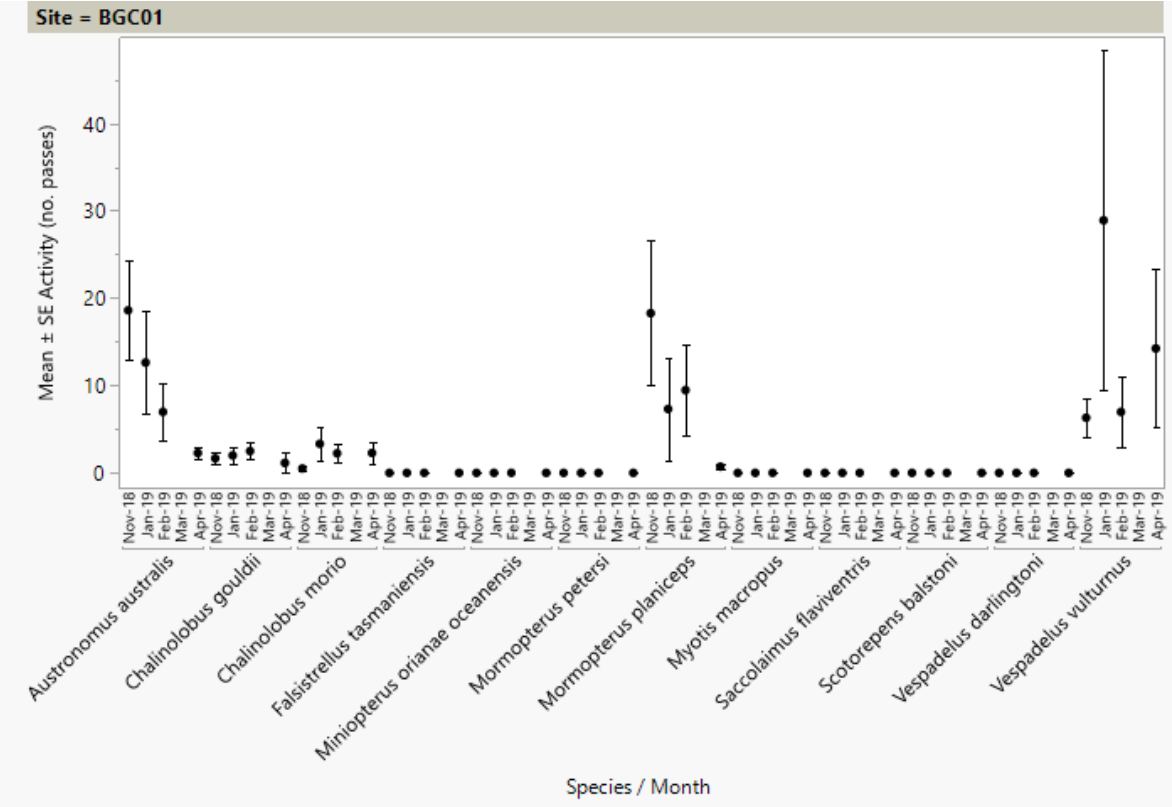
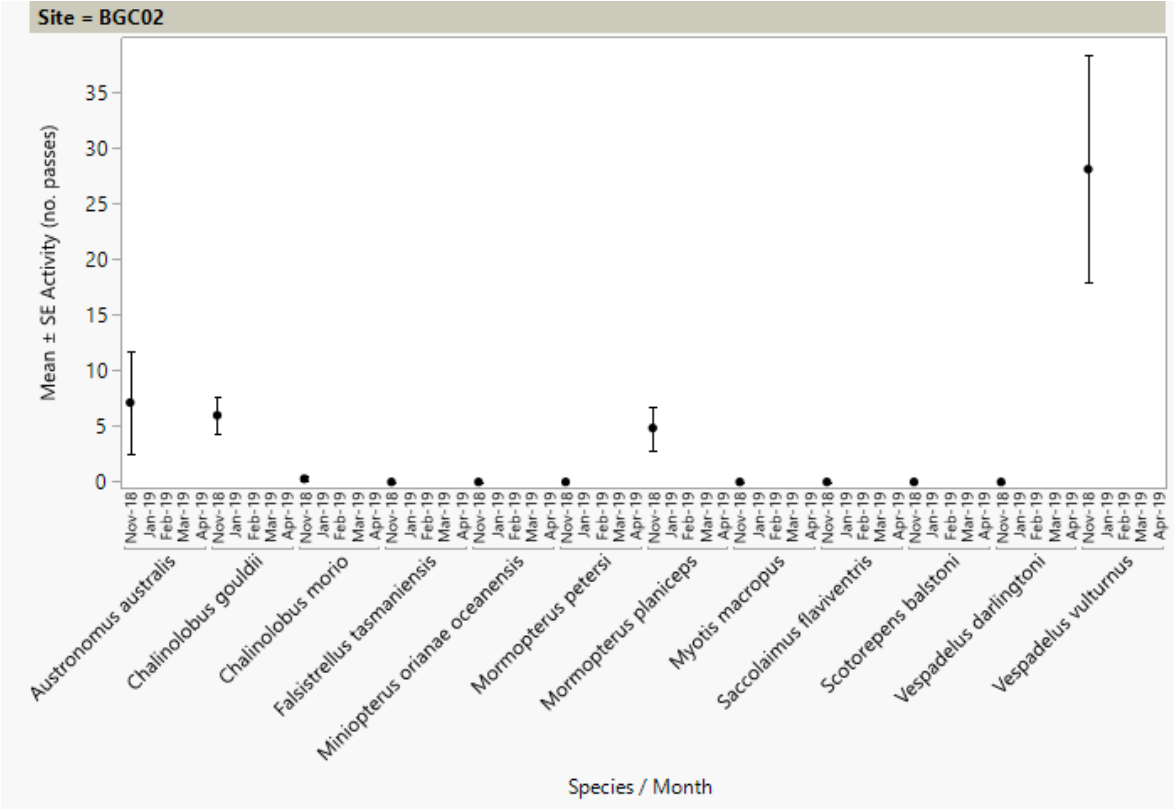


Figure A4: Riparian 2m Nightly Moo/Vespadelus activity during the Autumn migration period (including immediately before and after) by site and including riparian sites only.

All Species Activity

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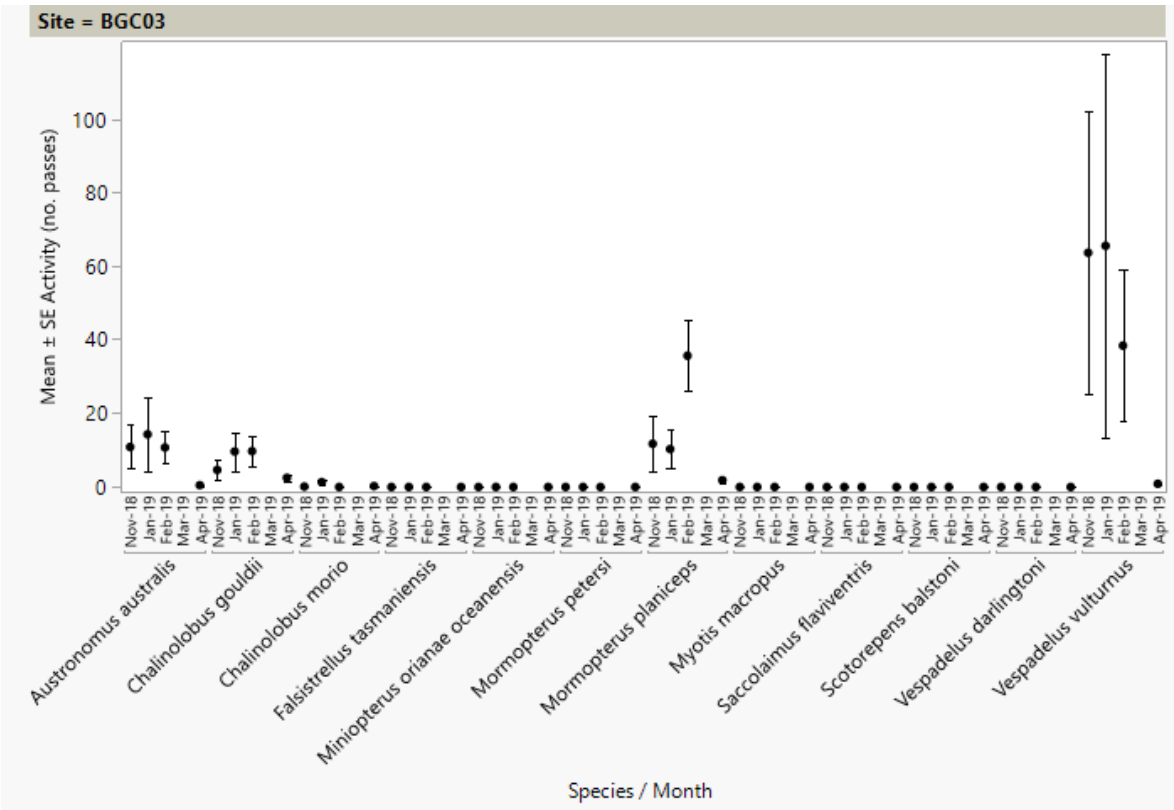
10
15
20
25
30
35
Nov-18
Jan-19
Feb-19
Mar-19
Apr-19
Austronomus australis
Chalinolobus gouldii
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
Myotis macropus
Saccolaimus flaviventris
Scotorepens balstoni
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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60
80
100
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Jan-19
Feb-19
Mar-19
Apr-19
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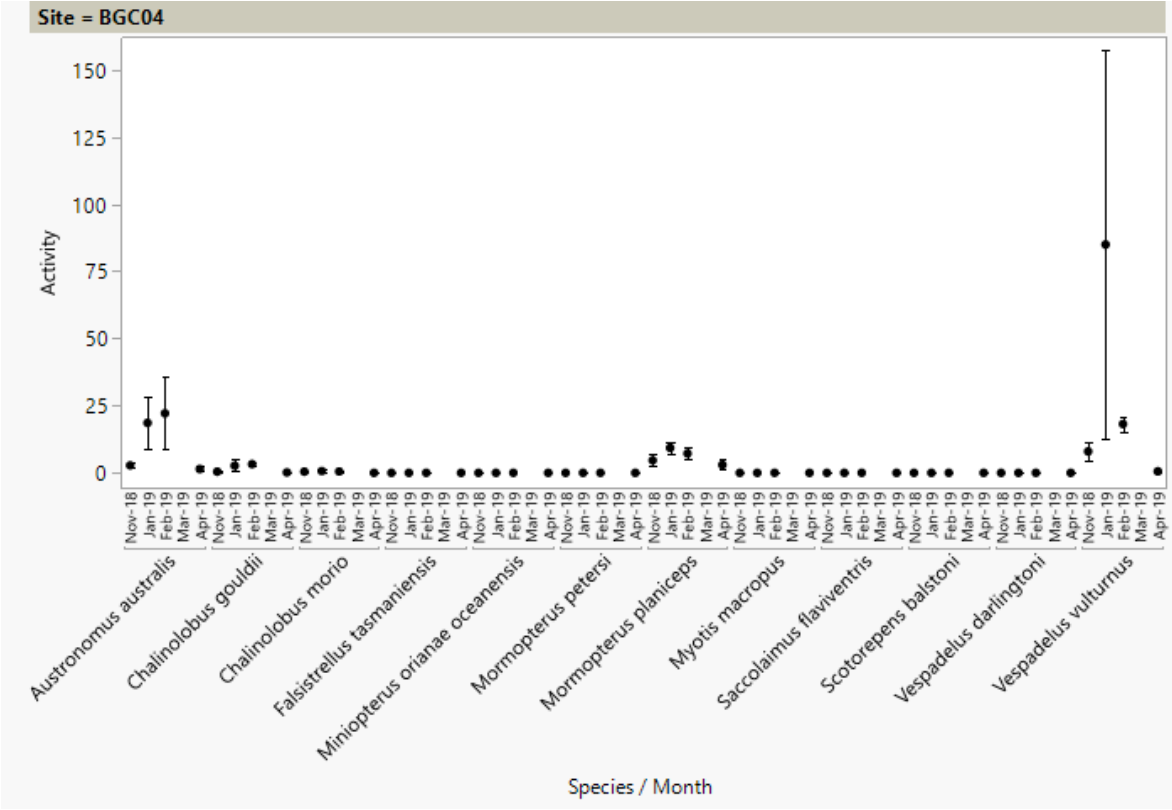
Chalinolobus gouldii
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
Myotis macropus
Saccolaimus flaviventris
Scotorepens balstoni
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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25
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Jan-19
Feb-19
Mar-19
Apr-19
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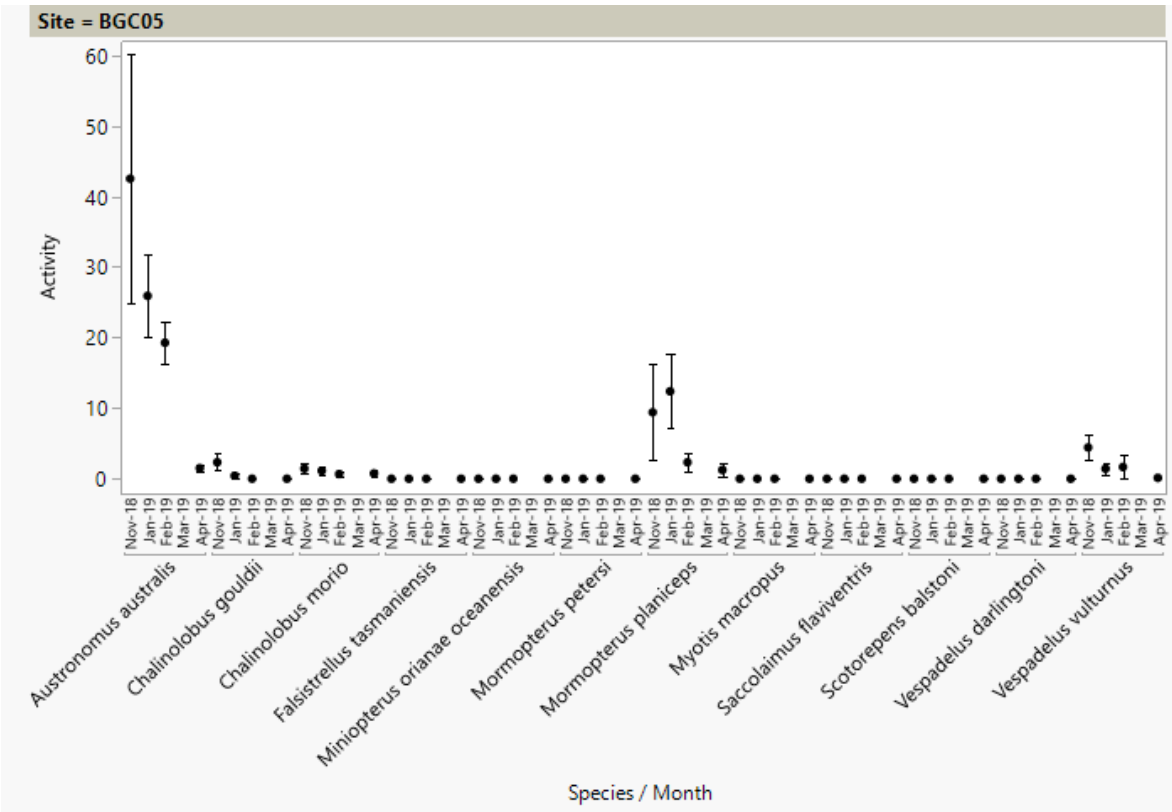
Chalinolobus gouldii
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
Myotis macropus
Saccolaimus flaviventris
Scotorepens balstoni
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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Jan-19
Feb-19
Mar-19
Apr-19
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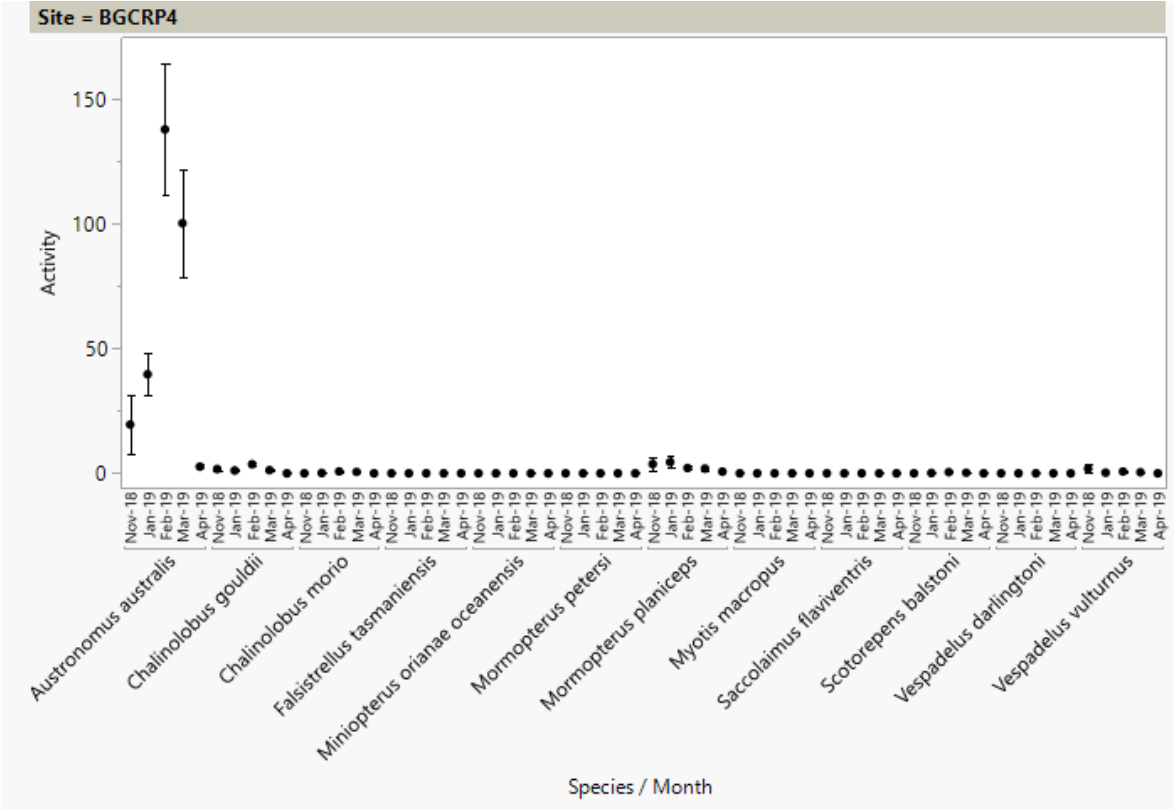
Chalinolobus gouldii
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
Myotis macropus
Saccolaimus flaviventris
Scotorepens balstoni
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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Jan-19
Feb-19
Mar-19
Apr-19
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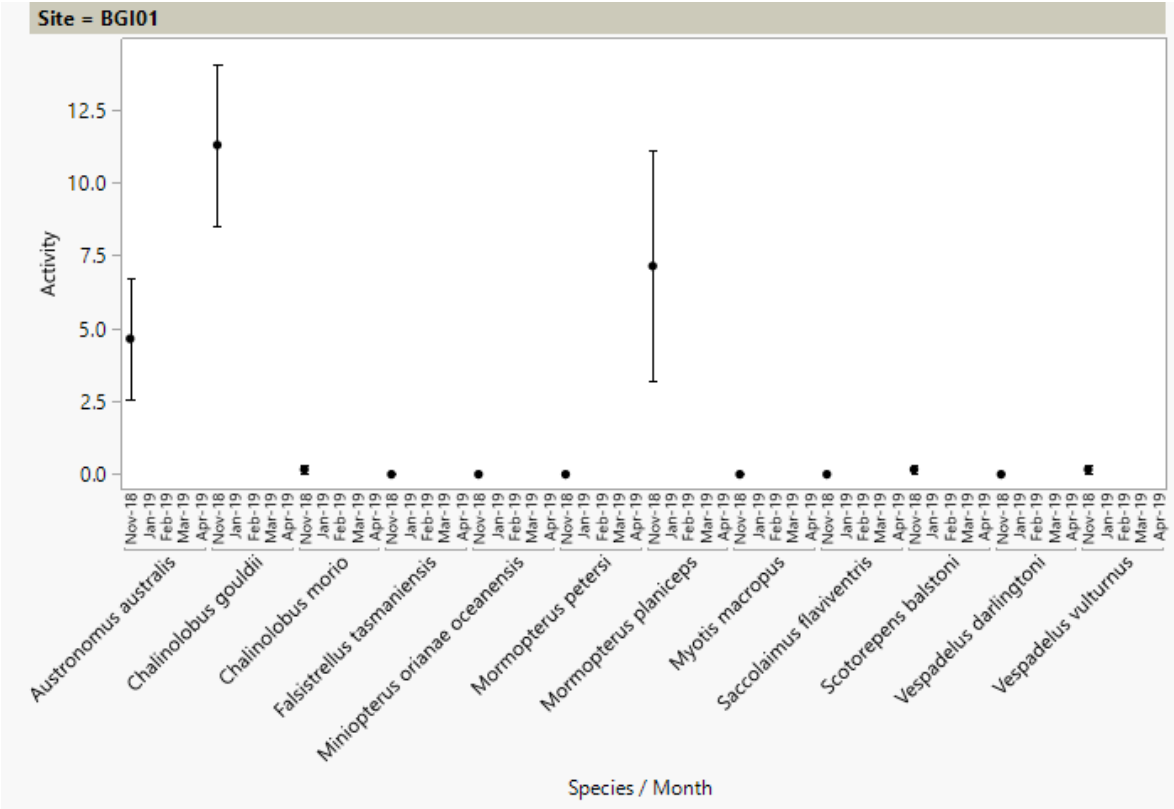
Chalinolobus gouldii
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
Myotis macropus
Saccolaimus flaviventris
Scotorepens balstoni
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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5.0
2.5
0.0
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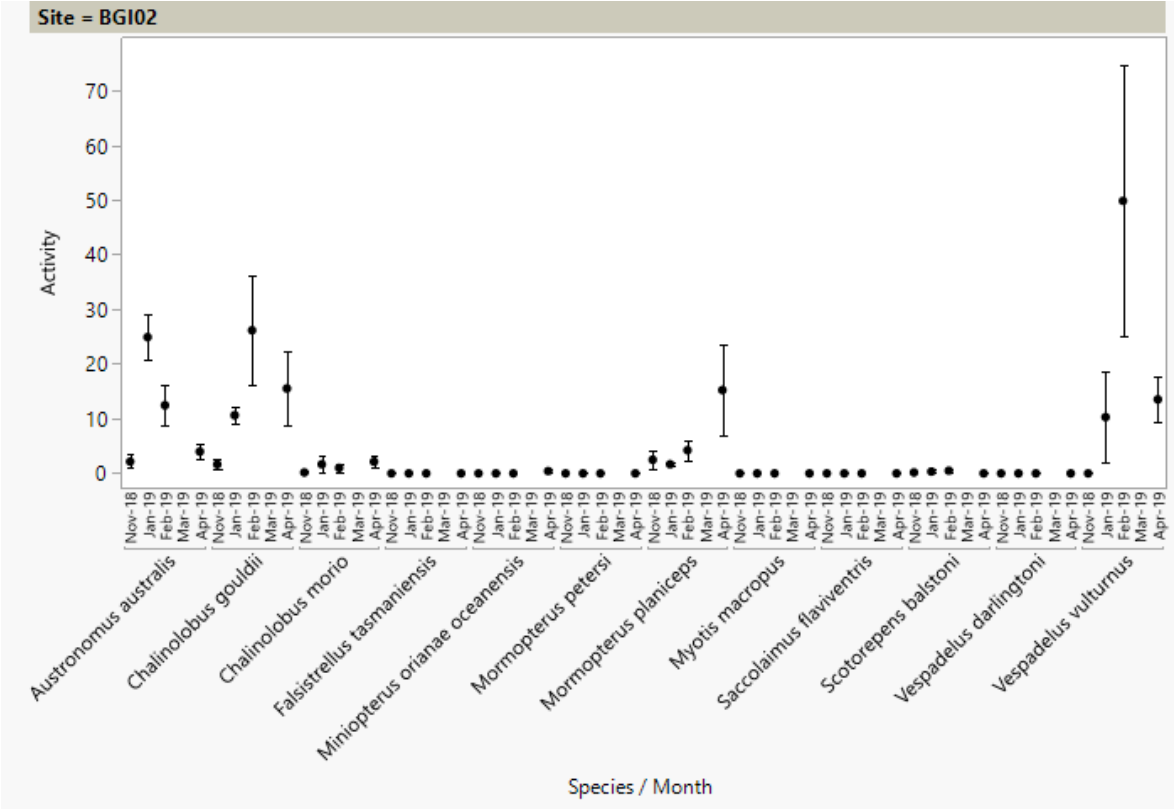
Jan-19
Feb-19
Mar-19
Apr-19
Austronomus australis
Chalinolobus gouldii
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
Myotis macropus
Saccolaimus flaviventris
Scotorepens balstoni
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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30
40
50
60
70
Nov-18
Jan-19
Feb-19
Mar-19
Apr-19
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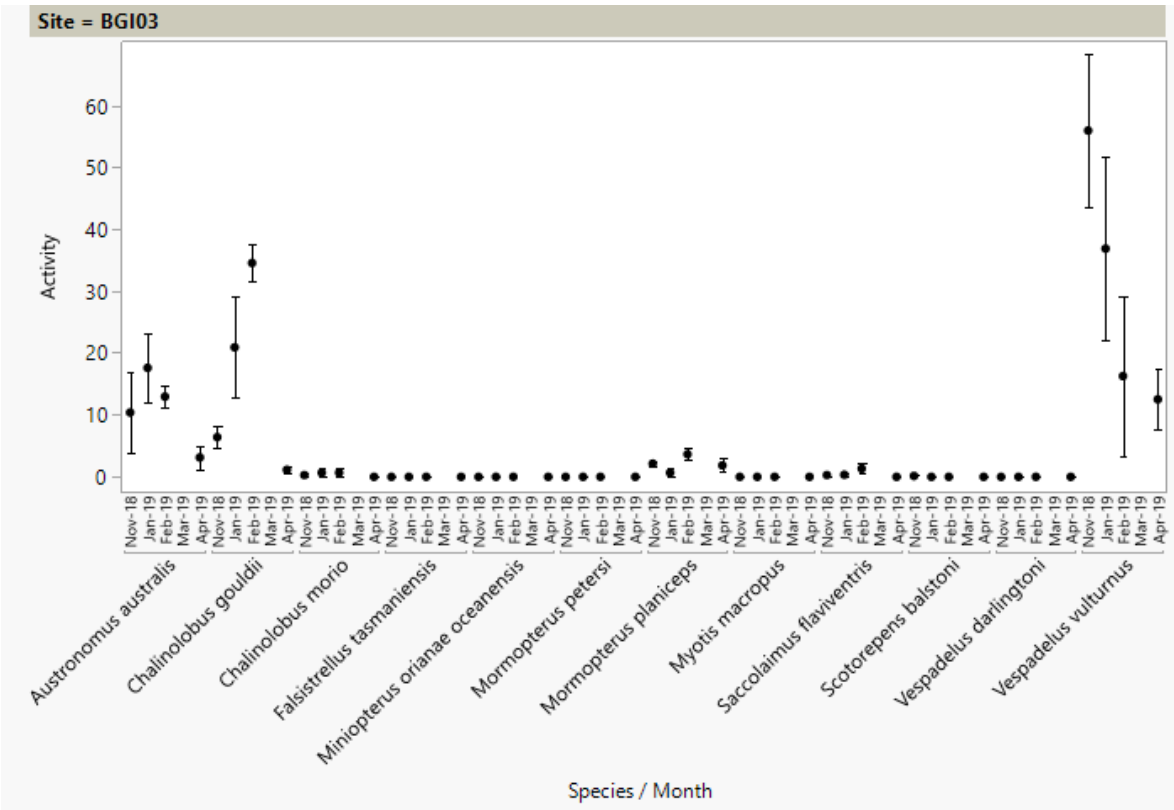
Chalinolobus gouldii
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
Myotis macropus
Saccolaimus flaviventris
Scotorepens balstoni
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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30
40
50
60
Nov-18
Jan-19
Feb-19
Mar-19
Apr-19
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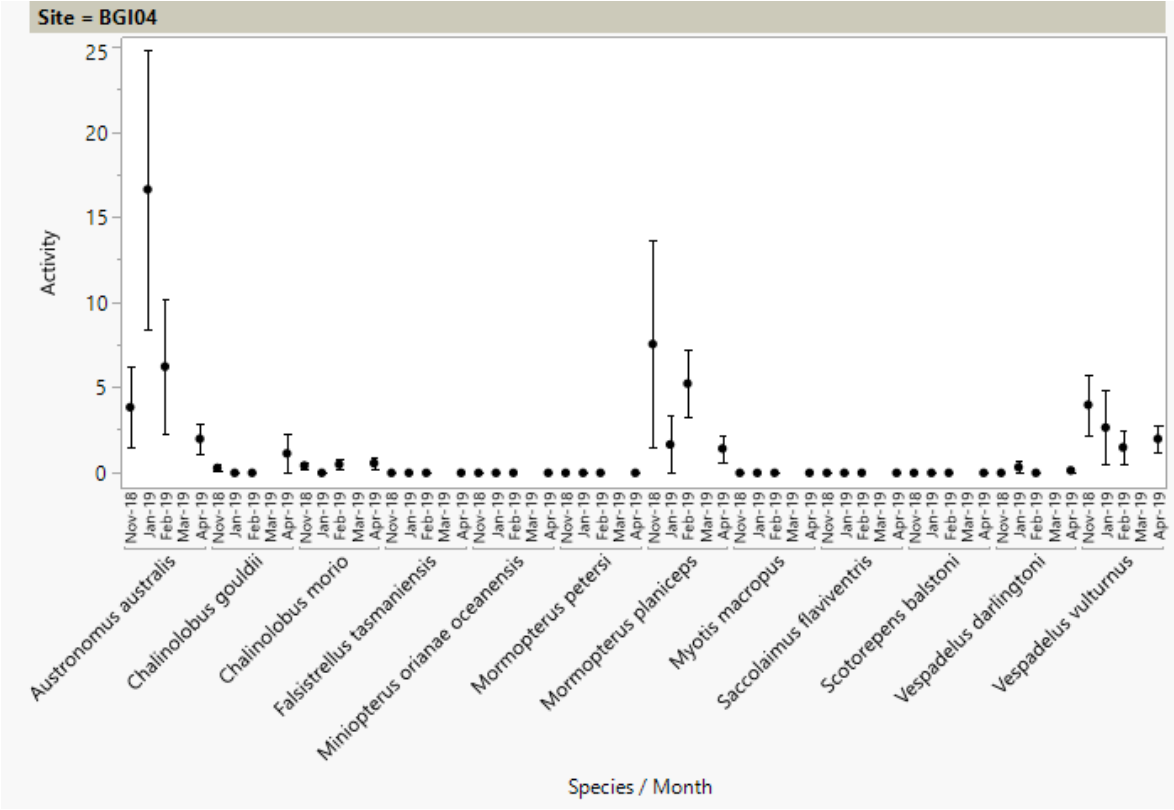
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
Myotis macropus
Saccolaimus flaviventris
Scotorepens balstoni
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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20
15
10
5
0
Nov-18
Jan-19
Feb-19
Mar-19
Apr-19
Austronomus australis
Chalinolobus gouldii
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
Myotis macropus
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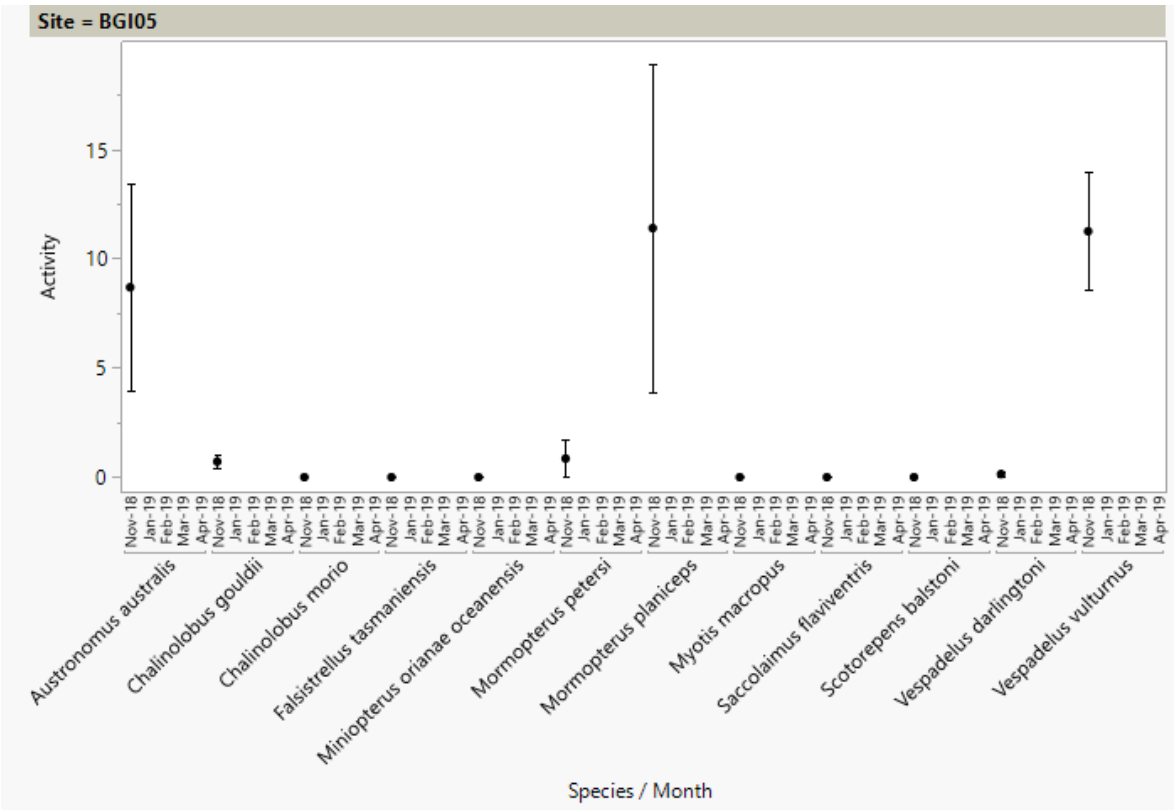
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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10
5
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Jan-19
Feb-19
Mar-19
Apr-19
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Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
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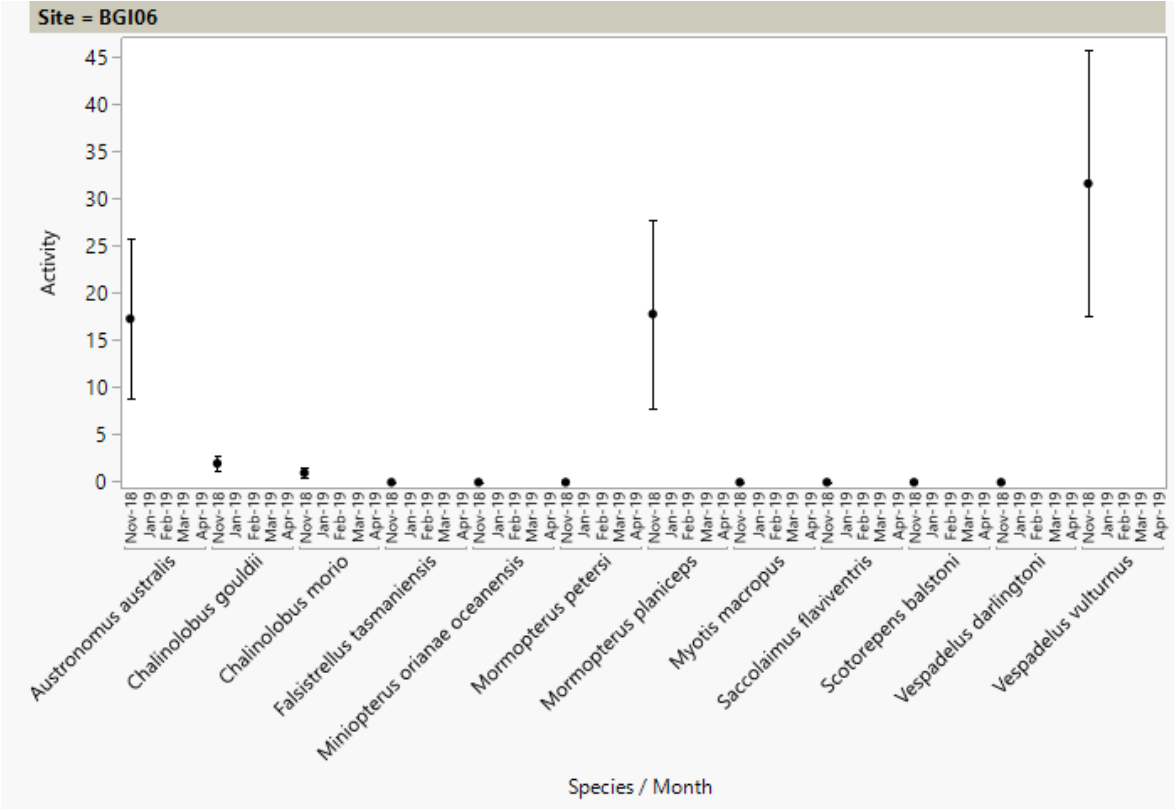
Saccolaimus flaviventris
Scotorepens balstoni
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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30
35
40
45
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Feb-19
Mar-19
Apr-19
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Chalinolobus gouldii
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
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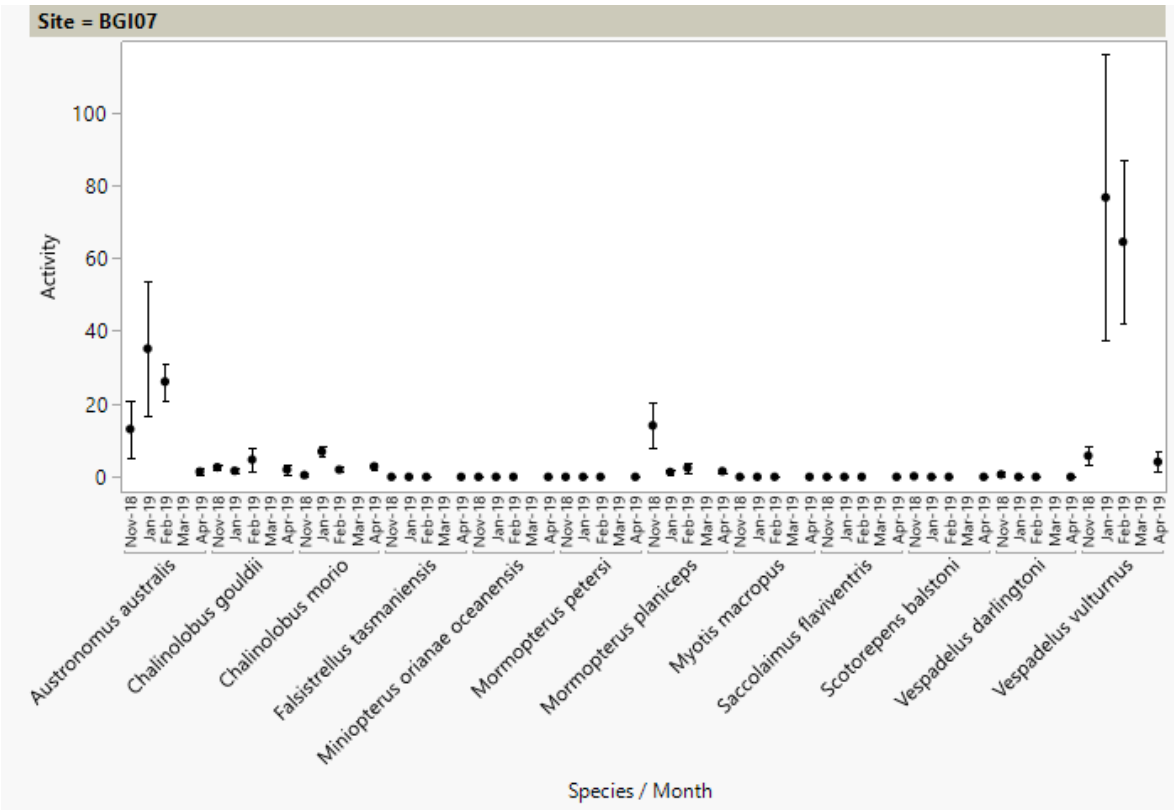
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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40
60
80
100
Nov-18
Jan-19
Feb-19
Mar-19
Apr-19
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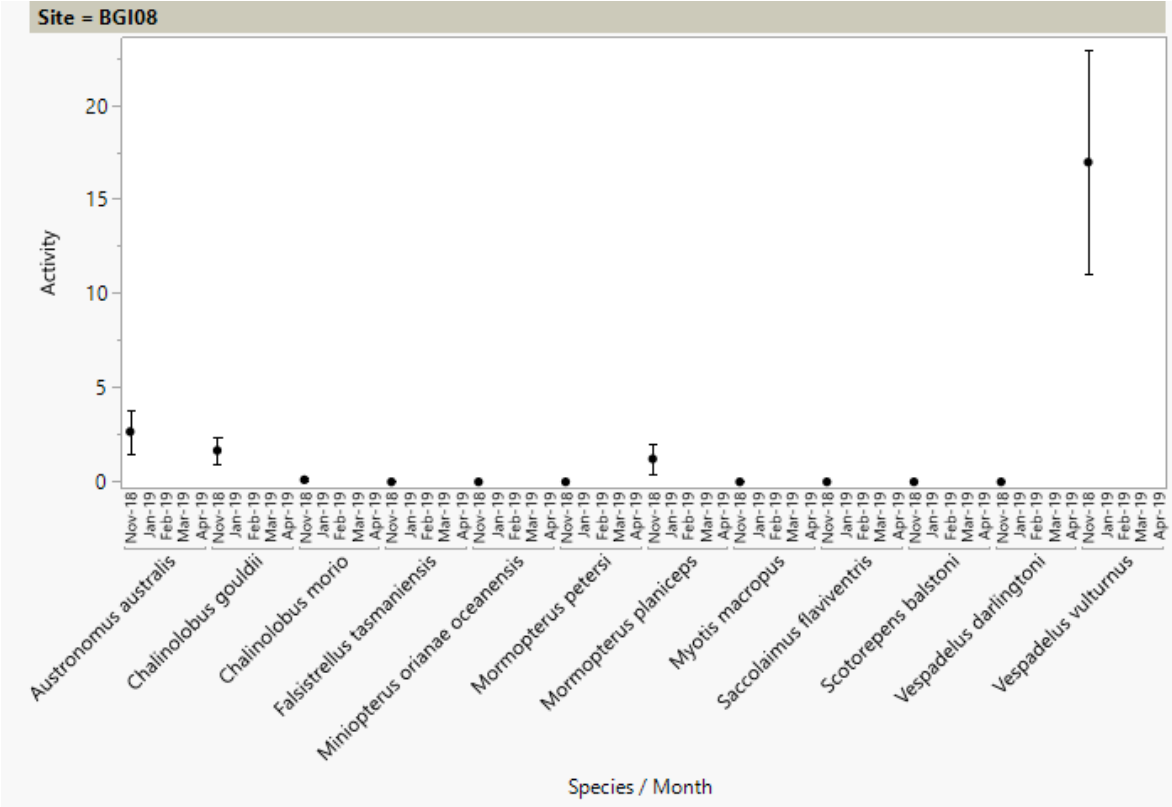
Chalinolobus gouldii
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
Myotis macropus
Saccolaimus flaviventris
Scotorepens balstoni
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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20
Nov-18
Jan-19
Feb-19
Mar-19
Apr-19
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Chalinolobus gouldii
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
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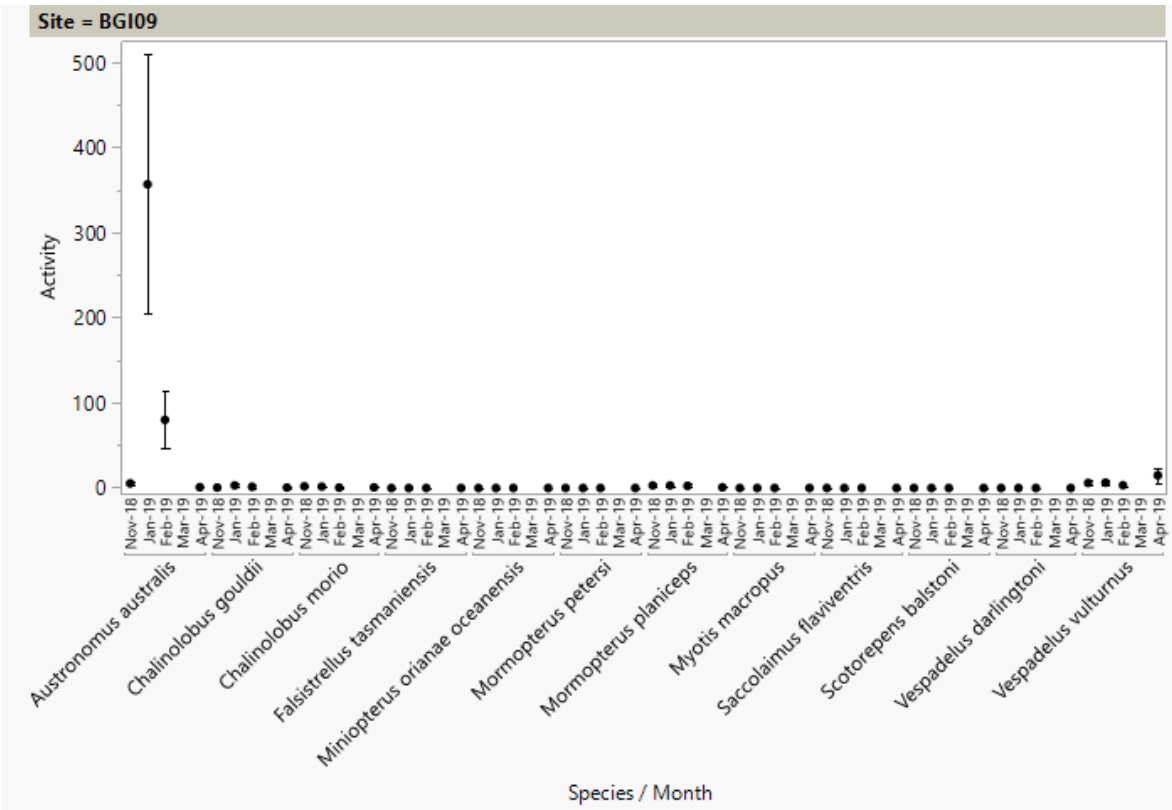
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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300
400
500
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Jan-19
Feb-19
Mar-19
Apr-19
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Chalinolobus gouldii
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
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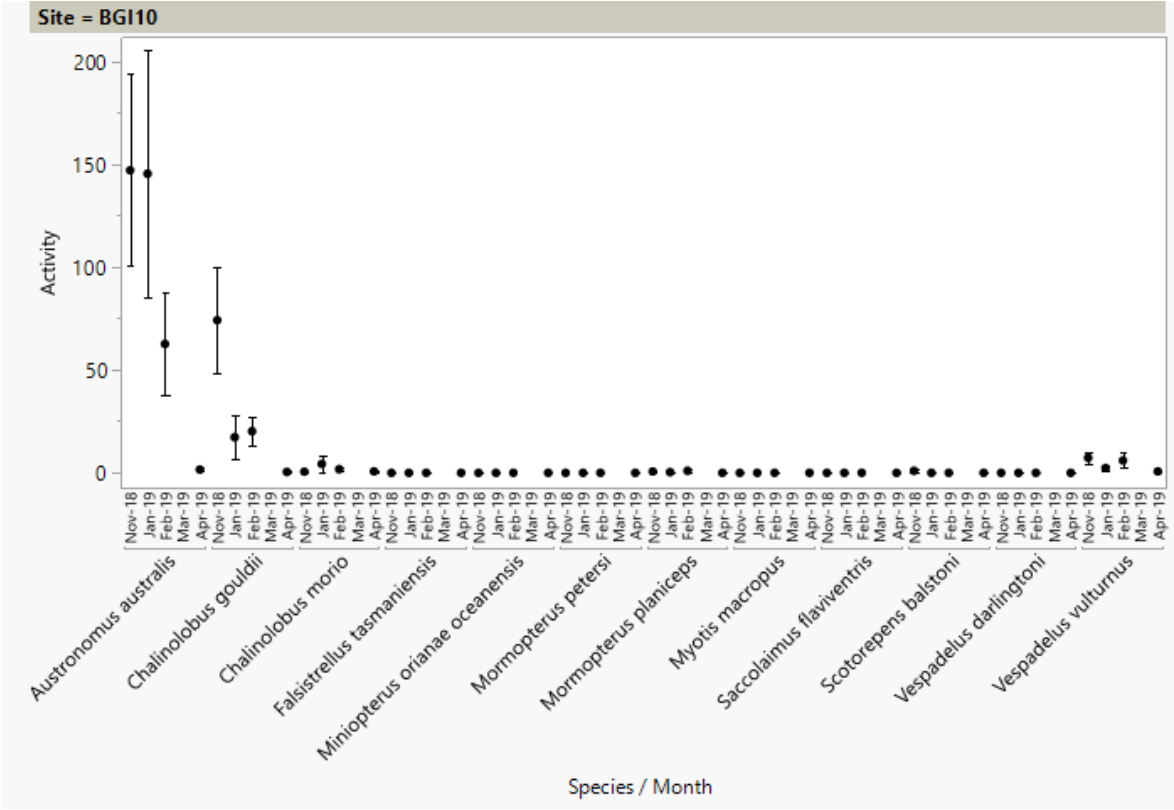
Saccolaimus flaviventris
Scotorepens balstoni
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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Jan-19
Feb-19
Mar-19
Apr-19
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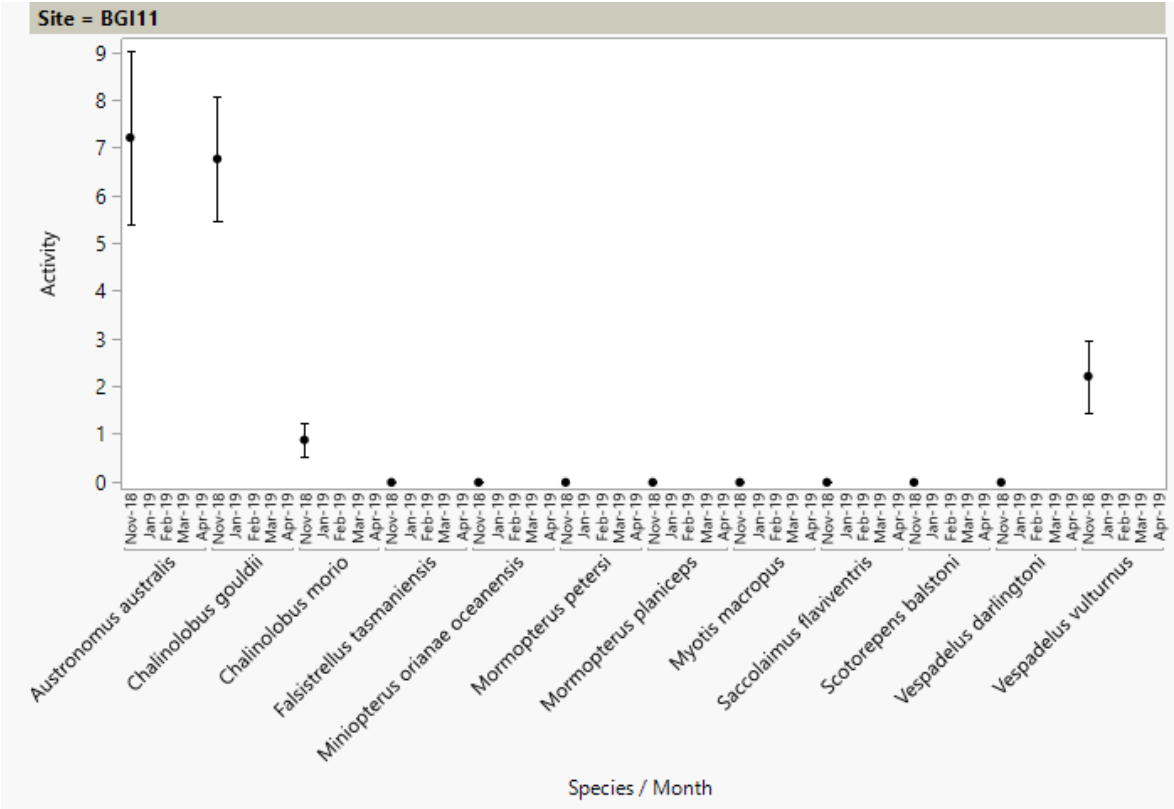
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
Myotis macropus
Saccolaimus flaviventris
Scotorepens balstoni
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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7
6
5
4
3
2
1
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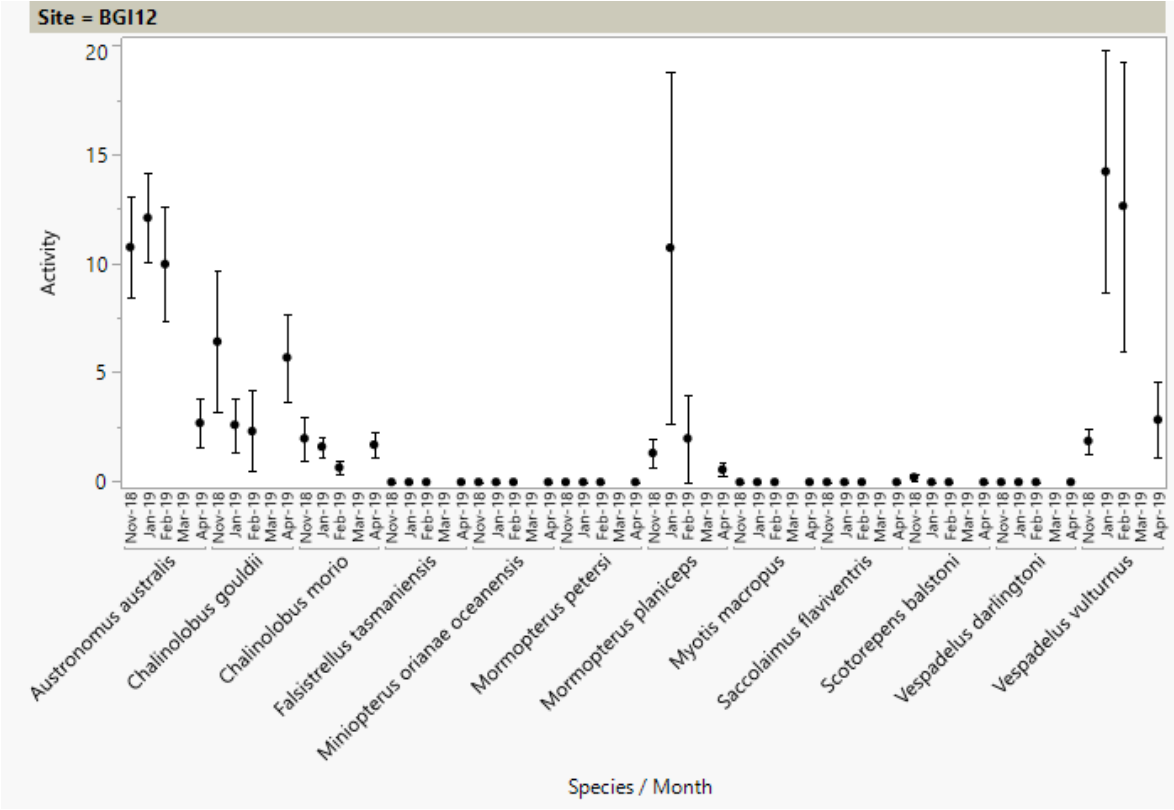
Nov-18
Jan-19
Feb-19
Mar-19
Apr-19
Austronomus australis
Chalinolobus gouldii
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
Myotis macropus
Saccolaimus flaviventris
Scotorepens balstoni
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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Jan-19
Feb-19
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Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
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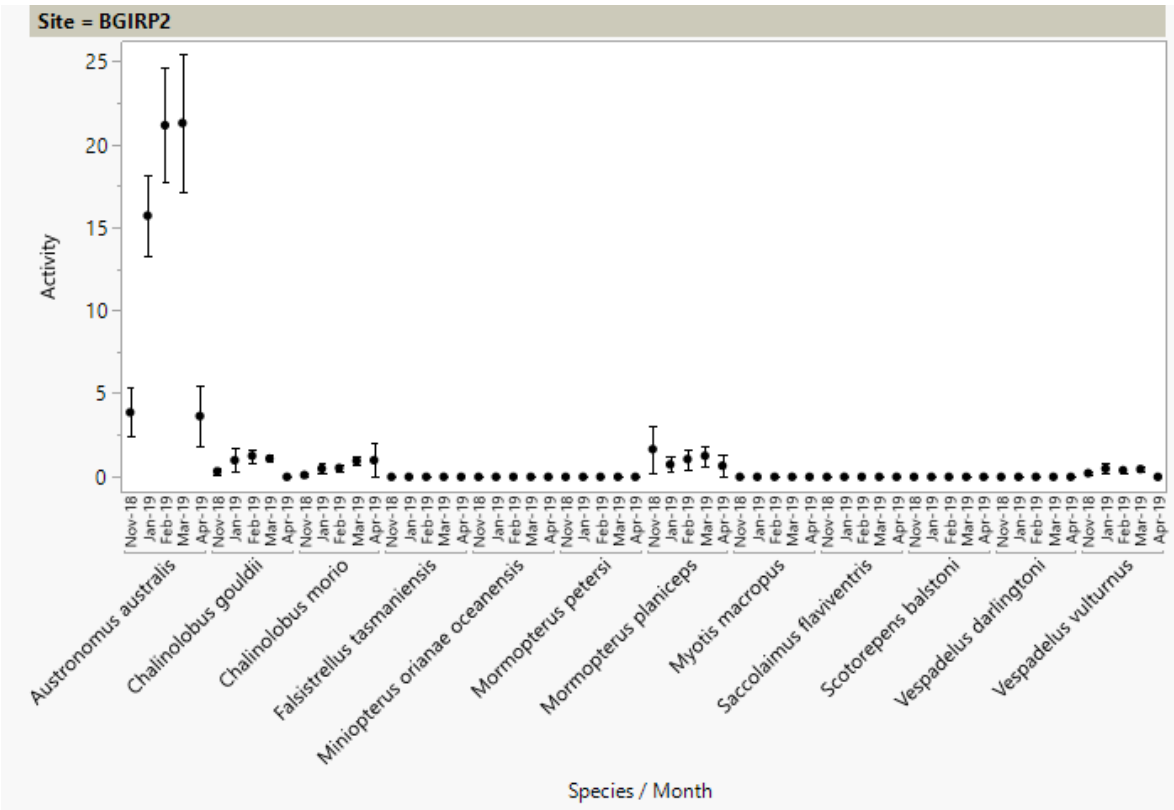
Saccolaimus flaviventris
Scotorepens balstoni
Vespadelus darlingtoni
Vespadelus vulturnus
Species / Month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Nov-18
Jan-19
Feb-19
Mar-19
Apr-19
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Chalinolobus gouldii
Chalinolobus morio
Falsistrellus tasmaniensis
Miniopterus orianae oceanensis
Mormopterus petersi
Mormopterus planiceps
Myotis macropus
Saccolaimus flaviventris
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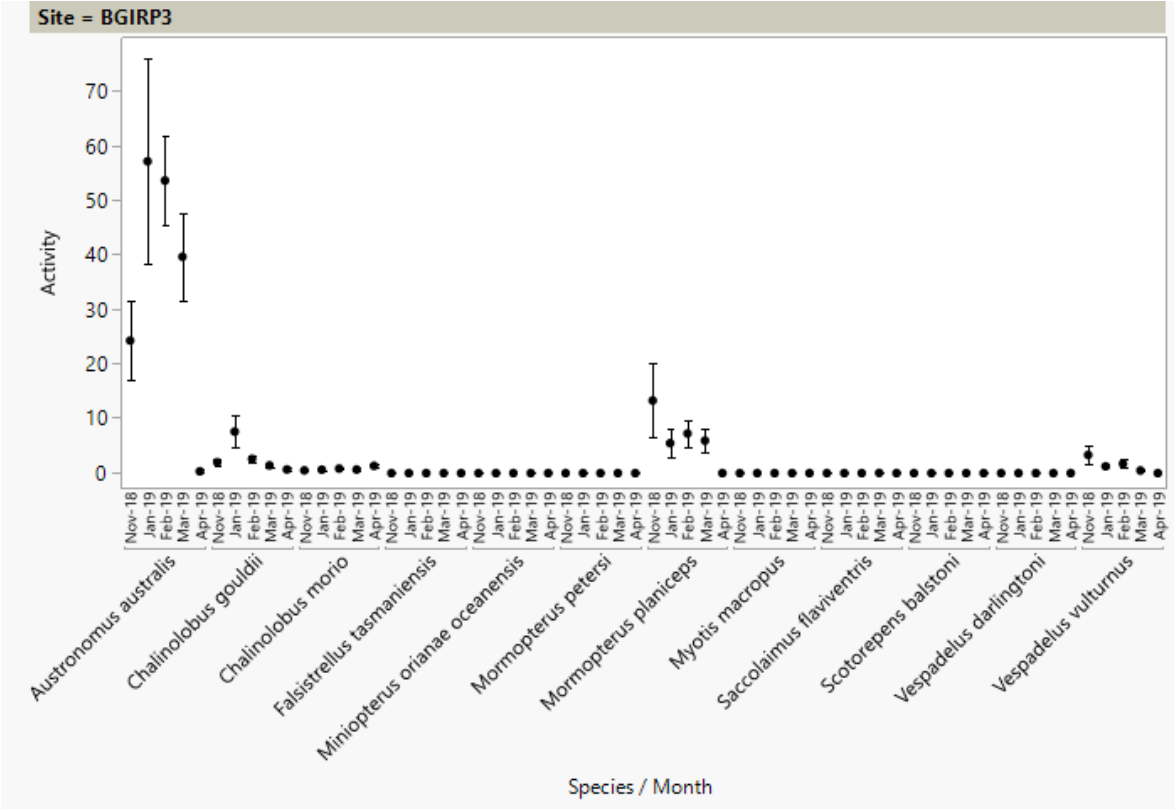
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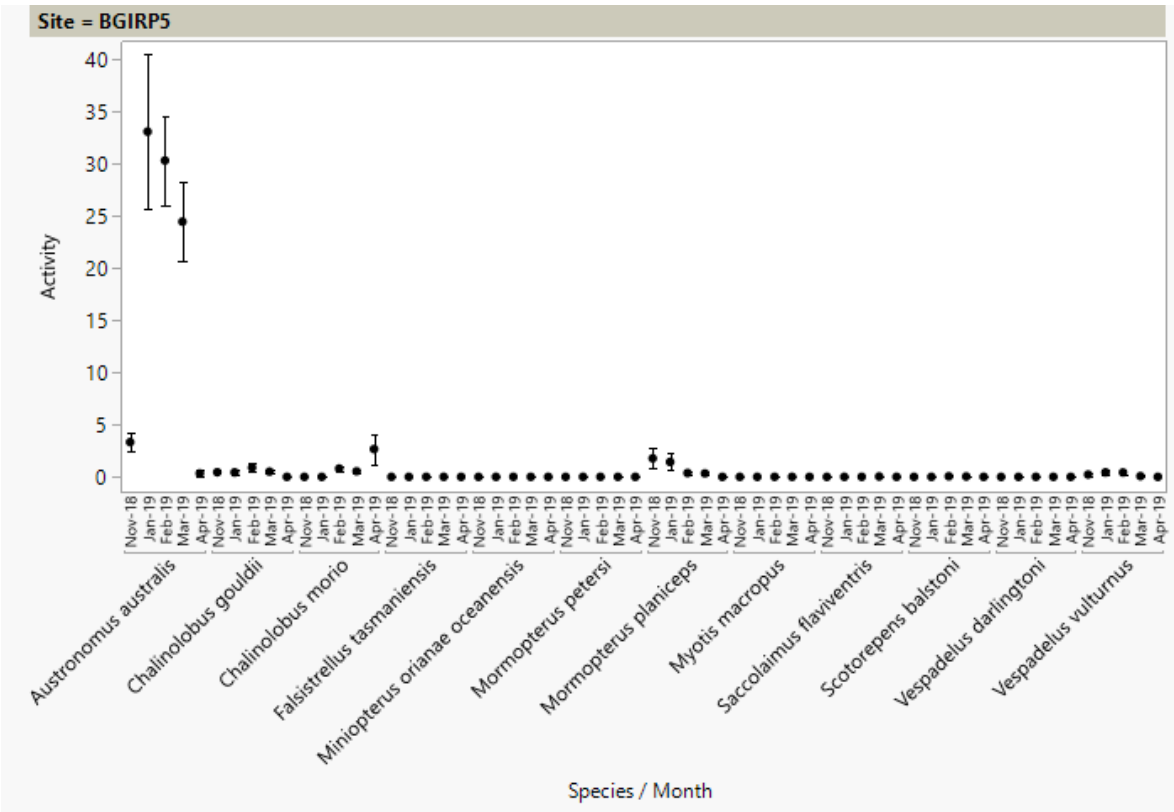
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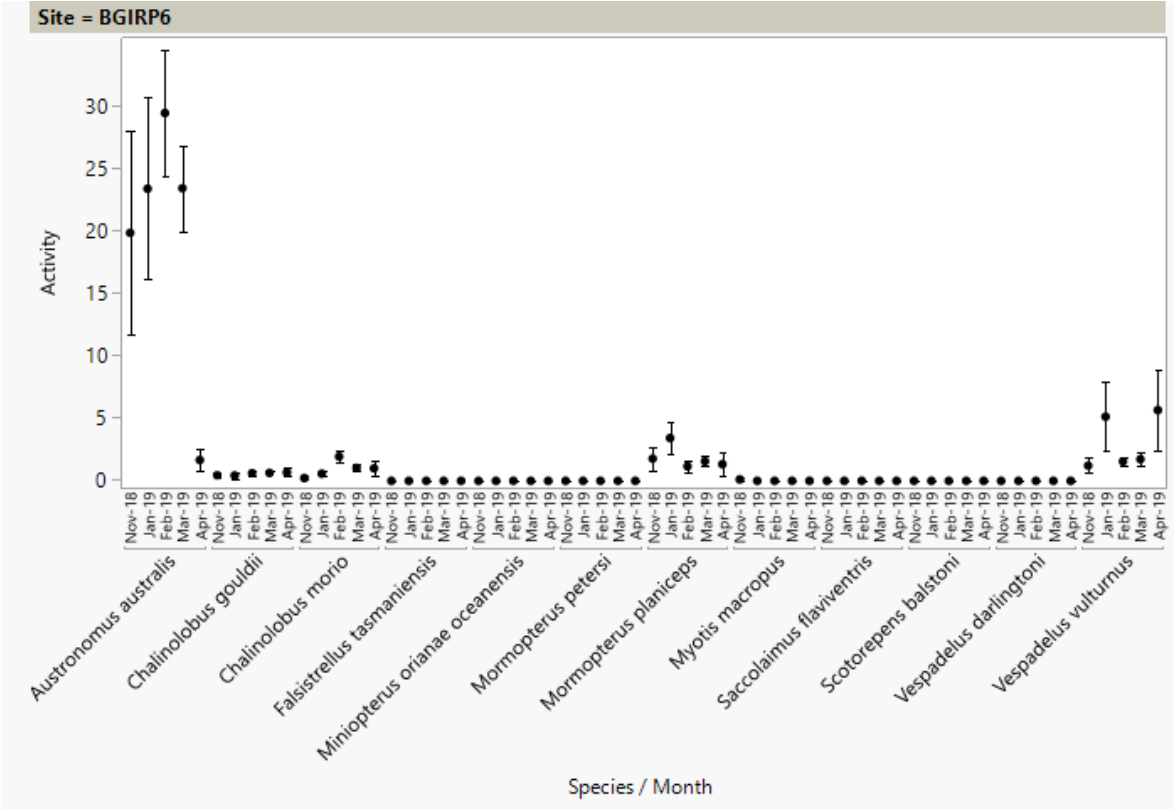
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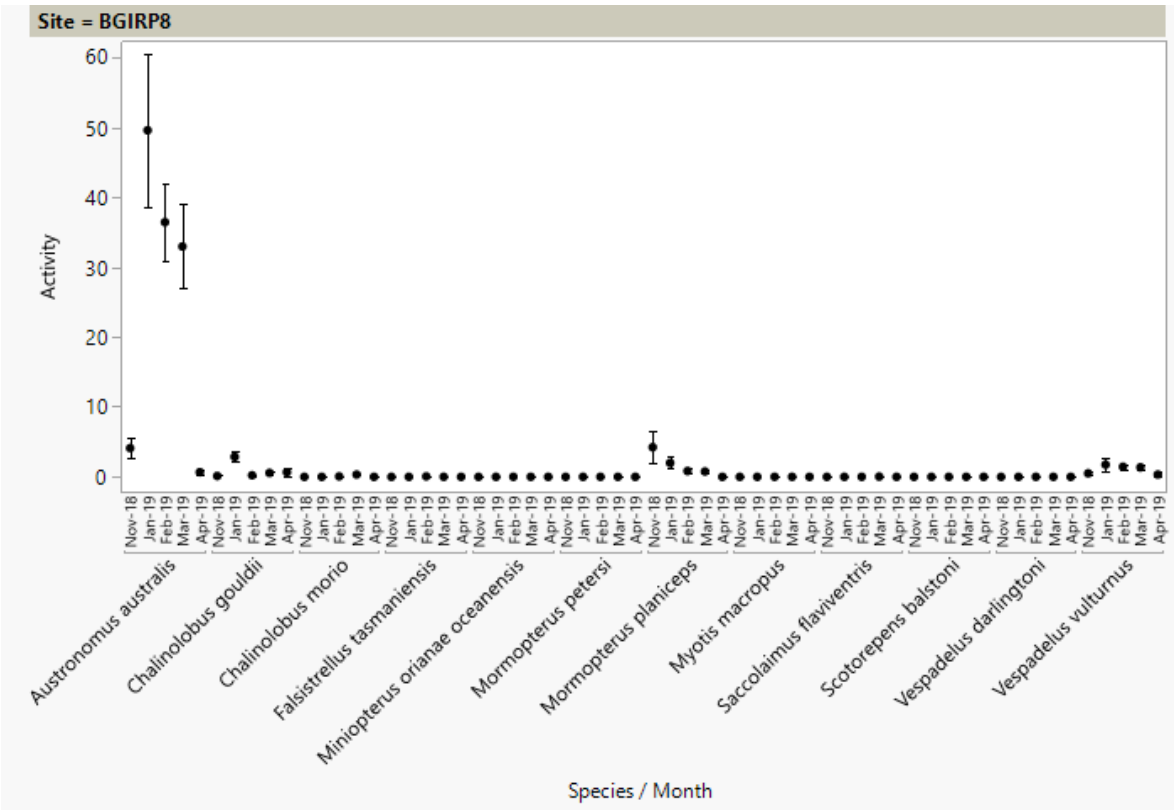
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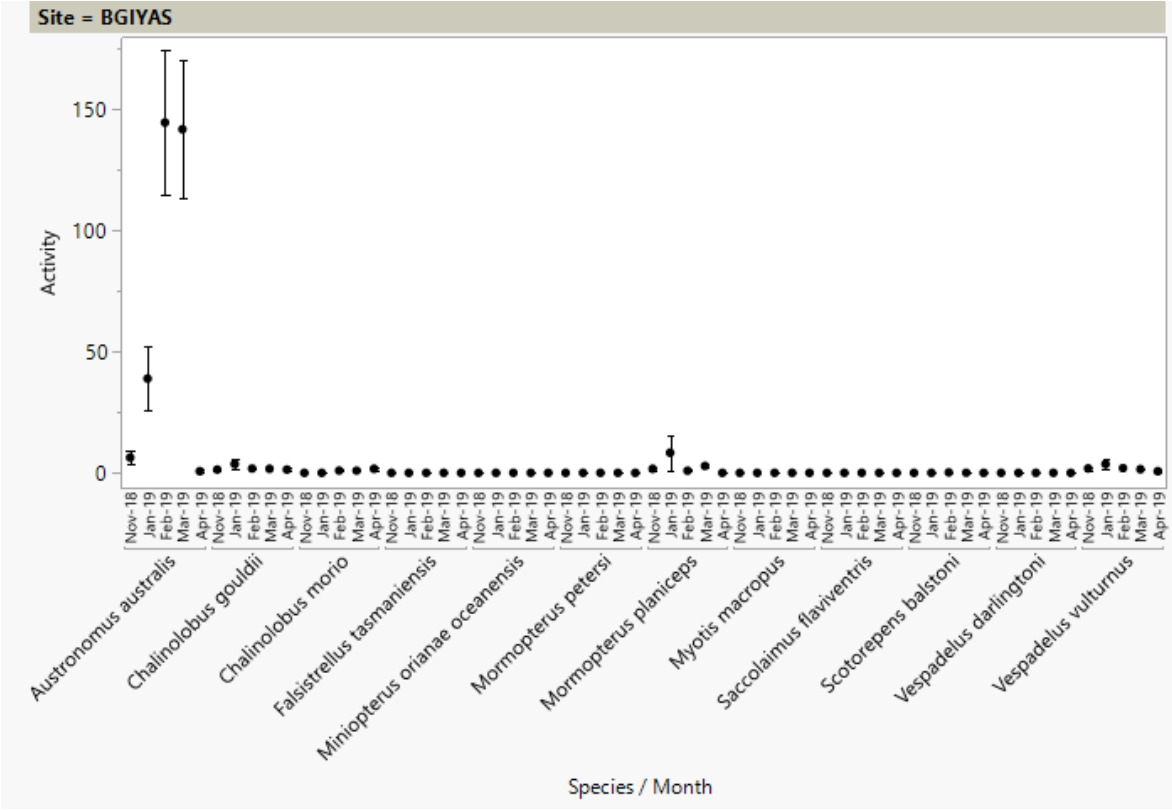
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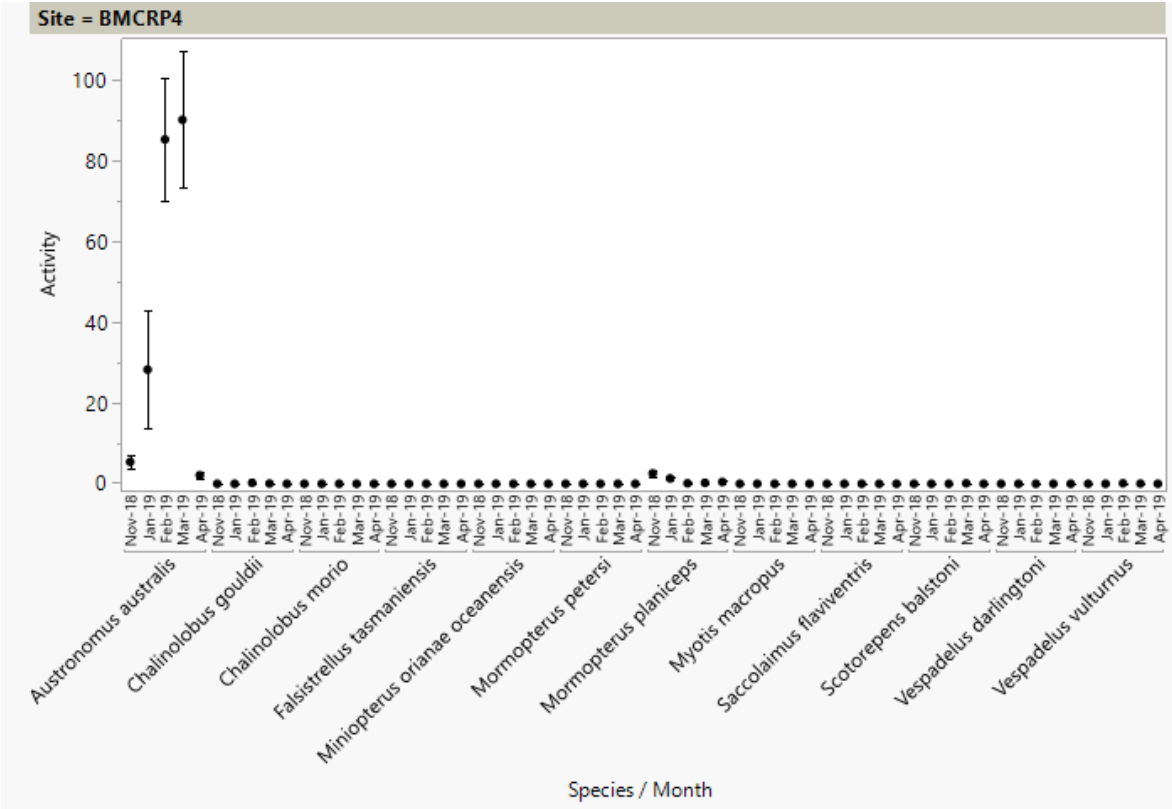
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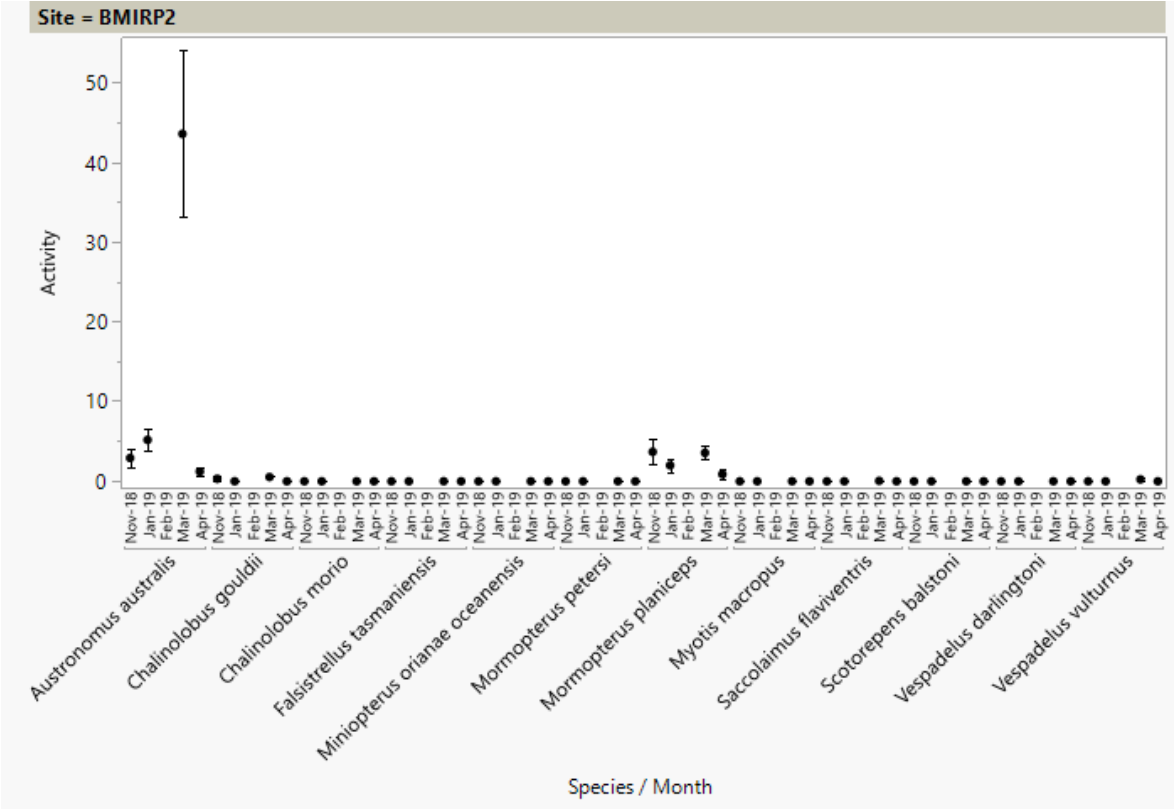
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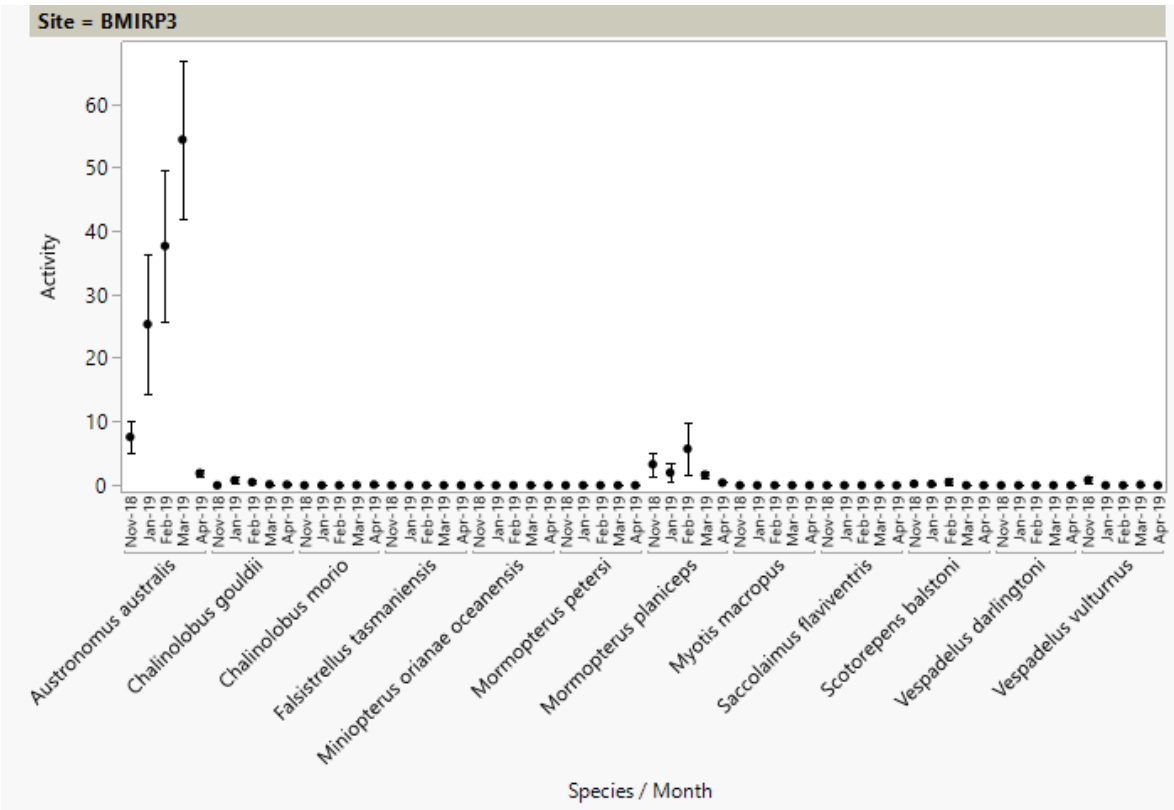
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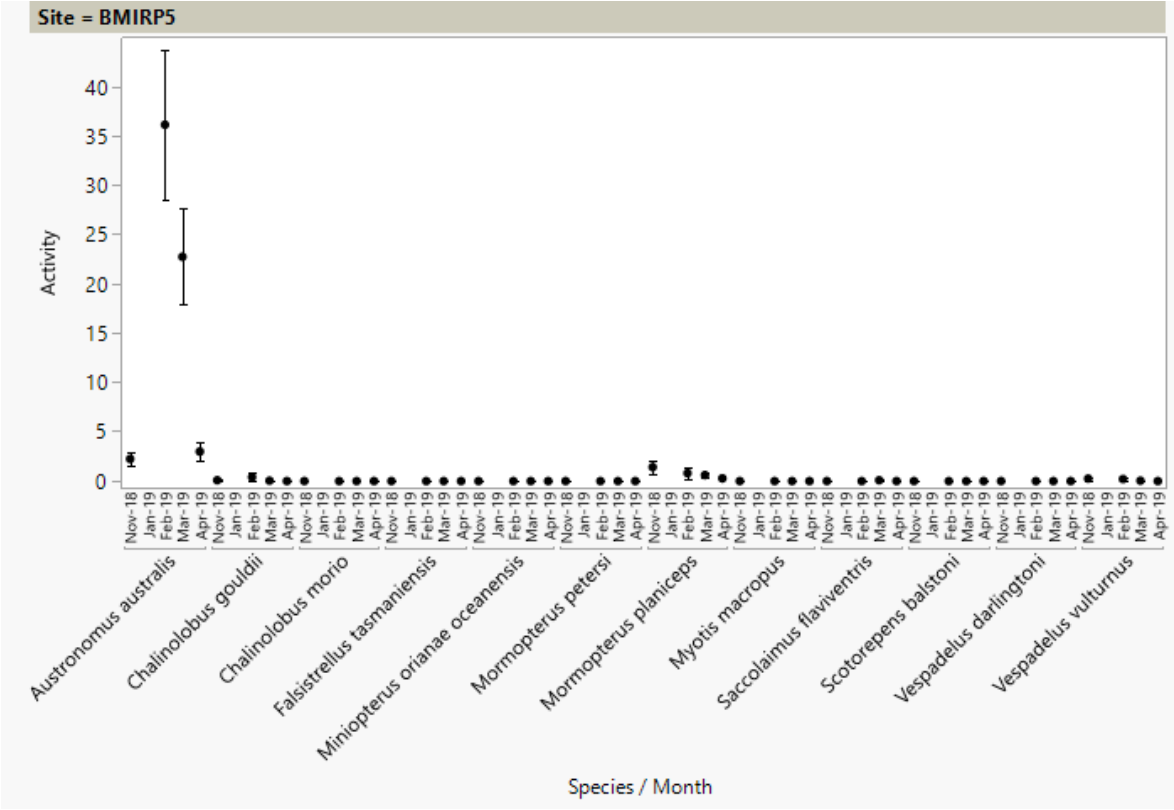
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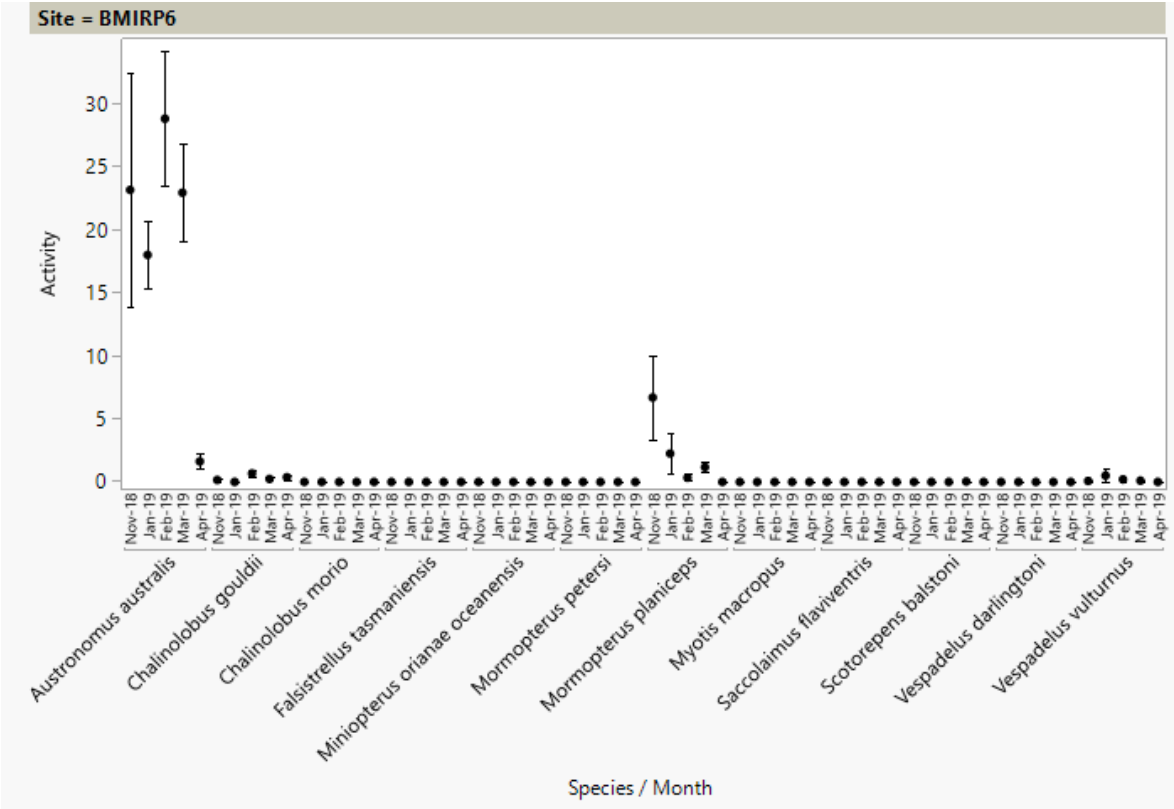
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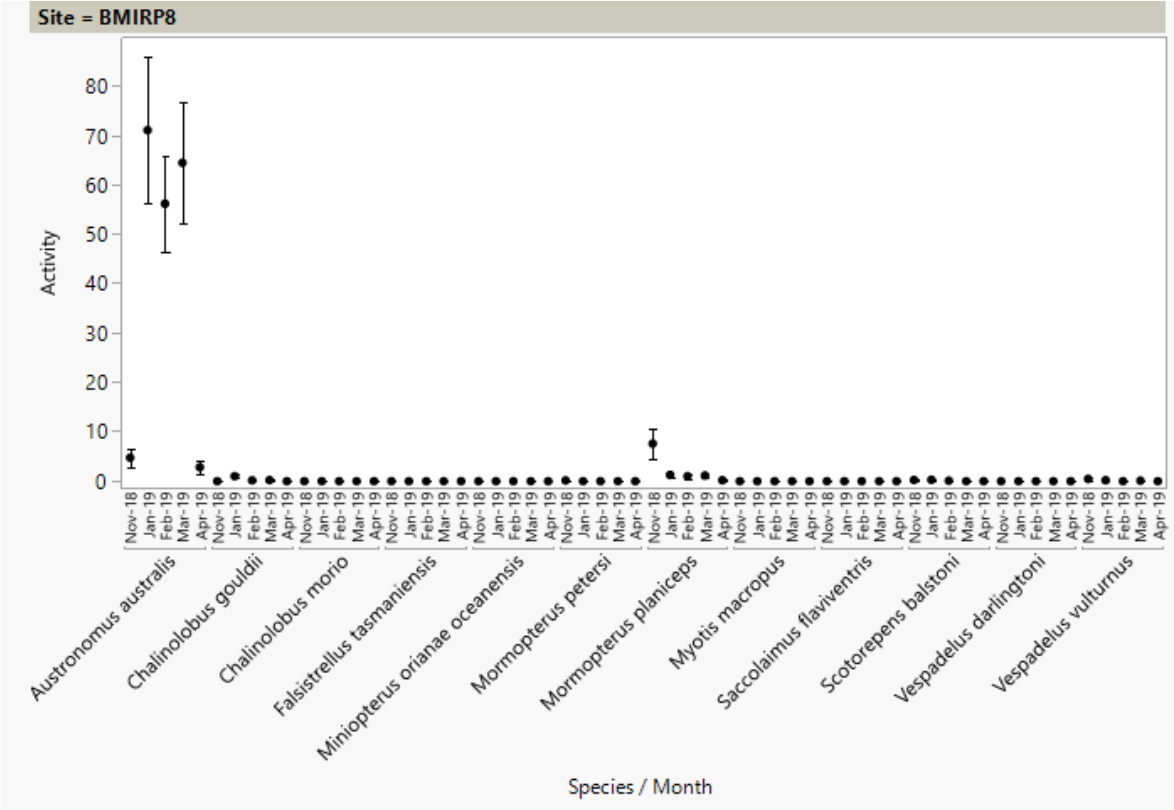
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Species / Month

umwelt
Environmental & Social Consultants

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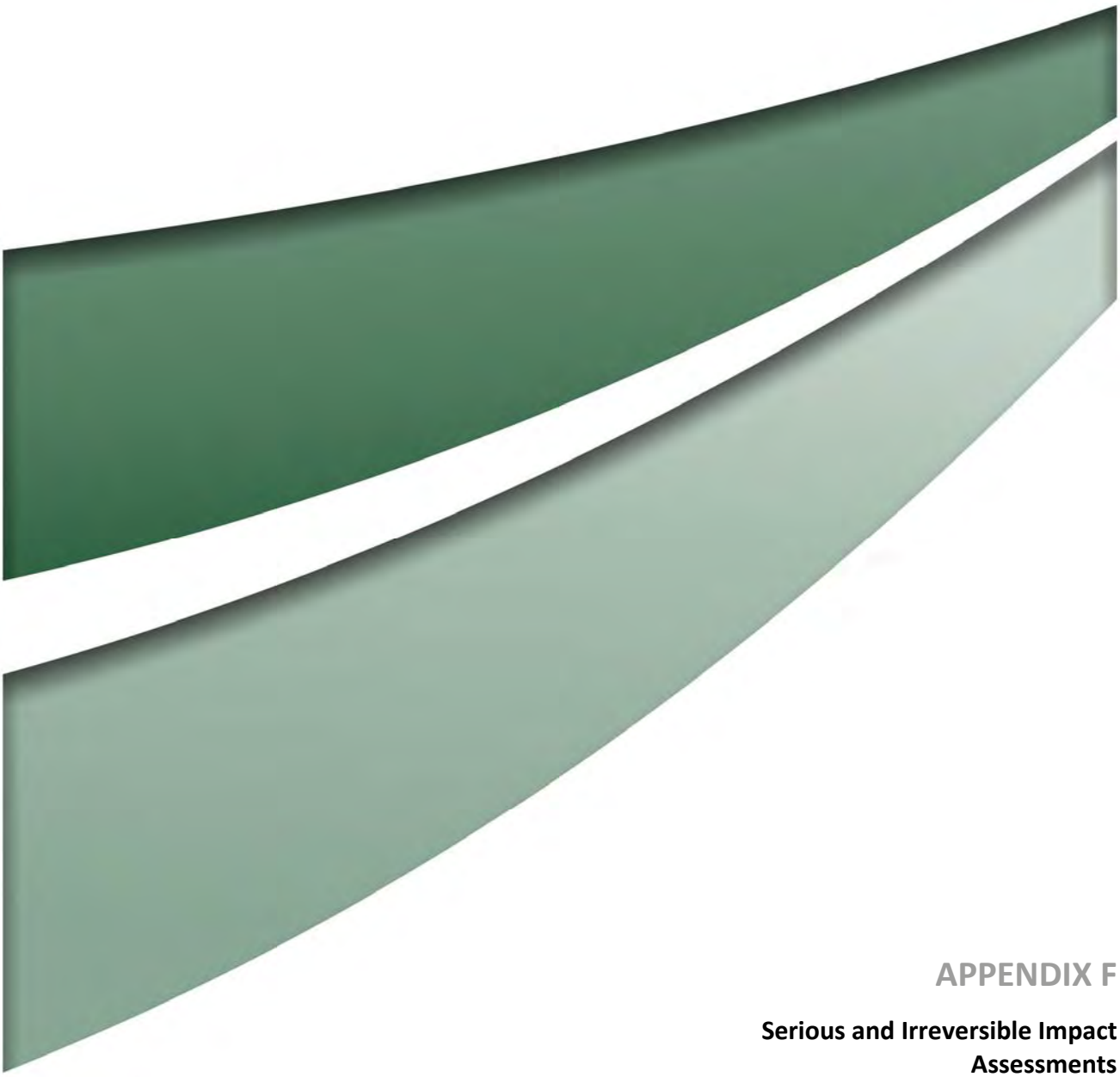


APPENDIX F

Serious and Irreversible Impact Assessments

Assessments have been conducted for three serious and irreversible impact (SAII) entities recorded within the Indicative Development Footprints, being:

- White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC, BC Act
- large bent-winged bat (*Miniopterus orianae oceanensis*)
- golden sun moth (*Synemon plana*).

These assessments have been conducted in accordance with the impact assessment criteria provided in Subsection 10.2.2 (for ecological communities) and 10.2.3 (for threatened species or populations) of the BAM.

1. White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC	
Criteria	**Assessment**
a) The action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII	The Project has gone through substantial avoidance (and minimisation) measures, through changes to the final design, in relation to the White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act. A total of 31.54 hectares of the CEEC (BC Act) in the Development Corridors has been avoided by the Project through reductions in the number of wind turbines, operation/maintenance facilities, substations, and through changes to access tracks, cabling networks and the preferred transport route. In addition, several mitigation measures will be implemented to contribute to the maintenance of habitat quality adjacent to the final Development Footprint. These avoidance and minimisation measures are described in full within **Section 4.0**.
b) The area (ha) and condition of the TEC to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone	The Indicative Development Footprints supports a total of 37.50 hectares of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act within Vegetation Zones 3 (20.08 hectares) and 4 (17.42 hectares). Impact to this CEEC (BC Act) is less (12.70 hectares) than the impact threshold of 50.2 hectares for this TEC as identified in Consent Condition 19(a) of the existing State Approval (SSD 6693). Umwelt note that 31.54 hectares of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act will persist within the wider Development Corridors, and considerable amounts of the CEEC (BC Act) occur beyond the Development Corridors in the local region. Applicable Vegetation Zones and their vegetation integrity score are presented below: • Vegetation Zone 3 (Moderate to Good): 76.2 (SWS IBRA)/65.0 (SHE IBRA) • Vegetation Zone 4 (Derived Native Grassland): 34.3 (SWS IBRA)/35.5 (SHE IBRA).
c) A description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the *Guidance to assist a decision-maker to determine a serious and irreversible impact*	No impact thresholds have been made publicly available for candidate SAII.

d) The extent and overall condition of the potential TEC within an area of 1,000ha, and then 10,000ha, surrounding the proposed development footprint	Umwelt used two regional vegetation mapping units to complete this analysis, being VIS Classification Map 1624 (Boorowa) and VIS Classification Map 3858 (Southern Forests). Within an approximate 1,000 hectares area surrounding the Indicative Development Footprints , approximately 100 hectares is likely to align with the CEEC (BC Act) in a similar condition to that recorded in the Indicative Development Footprints . This includes approximately 97 hectares within VIS Map 1624 and 3 hectares within VIS MAP 3858. Within an approximate 10,000 hectares area surrounding the Indicative Development Footprints , a total of 1,207 hectares is likely to align with the CEEC (BC Act) in a similar condition to that recorded in the Indicative Development Footprints . This includes approximately 1,188 hectares within VIS Map 1624 and 19 hectares within VIS MAP 3858.
e) An estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration	This CEEC (BC Act) is known to occur within the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands and NSW South Western Slopes IBRA Bioregions. There is no publicly available information to determine which IBRA subregions the CEEC (BC Act) occurs in. The similarly aligned CEEC listed under the EPBC Act was described as comprising 6,721 hectares within the Boorowa Shire and a further 55,798 hectares within the South West Slopes (TSSC 2006). It is likely that all of this extant would conform with the BC Act listed CEEC. There is no publicly available information to readily complete the task of calculating the extent of the CEEC (BC Act) that occurs within the IBRA Subregions applicable to the Project.
f) An estimate of the area of the potential TEC that is in the reserve system within the IBRA region and the IBRA subregion	Within the Project IBRA Subregions, this CEEC (BC Act) is known to occur in the Benambra National Park (NP), Brindabella NP, Conimbla NP, Dananbilla Nature Reserve (NR), Ellerslie NR, Flagstaff Memorial Nature Reserve, Goobang NP, Gungewalla NR, Illunie NR, Koorawatha NR, Livingstone NP, Minjary NP, Oak Creek NR, Queanbeyan NR, Tumblong State Conservation Area and Woomargama NP (DoECCW 2010). The National Recovery Plan for the similarly aligned CEEC listed under the EPBC Act (DoECCW 2010) estimates that approximately 8,000 hectares occurs within the South Western Slopes IBRA Subregion national parks and nature reserves. There is no public information readily available to estimate the area of the CEEC (BC Act) in these reserves.

g) The development clearing or biodiversity certification proposal's impact on: i. abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alternation of surface water patterns ii. characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants iii. the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemical or pollutants which may harm or inhibit growth of species in the potential TEC	The Project is not considered likely to impact on abiotic factors critical to the long-term survival of the CEEC (BC Act) . While construction impacts may include localised instances of erosion, dust pollution, noise and vibration, these will be temporary in nature. Operational impacts will include changes to water runoff patterns, however it is not considered that these changes will be so substantial that the long-term survival of the CEEC (BC Act) will be adversely affected. The Project will impact on characteristic species of the CEEC (BC Act) through the direct impacts discussed above (i.e. clearing of vegetation), and in **Sections 5.1.1** and **5.2**. Indirect impacts to the CEEC (BC Act) are discussed in **Section 5.1.2**. They are considered to be manageable with appropriate management and mitigation measures that would be formalised through the required management plans. Furthermore, given the extensive spread of the project design (some 36 kilometres in length from the northern to southern tip) the indirect impacts are likely to be of low magnitude temporally and spatially.
h) Direct or indirect fragmentation and isolation of an important area of the potential TEC	The Indicative Development Footprints support a total of 37.50 hectares of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act within Vegetation Zones 3 (20.08 hectares) and 4 (17.42 hectares). Umwelt note that 31.54 hectares of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the BC Act will persist within the wider Development Corridors, and considerable amounts of the CEEC (BC Act) occur beyond the Development Corridors in the local region. Indirect impacts to the CEEC (BC Act) are discussed in **Section 5.1.2**.
i) The measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion	The biodiversity offset strategy for the Project will address measures of contributing to the recovery of this CEEC (BC Act) in the IBRA subregion through land-based offsets. Five potential offset sites within parcels of land adjacent to the Project have been identified for further investigation. These sites have, based on a range of preliminary surveys, the potential to generate ecosystem and species credits consistent with those impacted by the Project. This includes PCTs 298, 335, 350 and 351 ecosystem credits. This is discussed in full in **Section 8**.

2. Large bent-winged bat (*Miniopterus orianae oceanensis*)	
Criteria	**Assessment**
a) the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII	The Project has gone through substantial avoidance (and minimisation) measures, through changes to the final design, in relation to foraging habitat for this species. Over 300 hectares of open forest habitat suitable for foraging within the Development Corridors has been avoided by the Project. This was done through reductions in the number of wind turbines, operation/maintenance facilities, substations, and through changes to access tracks, cabling networks and the preferred transport route. In addition, several mitigation measures will be implemented to contribute to the maintenance of habitat quality adjacent to the final Development Footprint. These avoidance and minimisation measures are described in full within **Section 4.0**. No breeding habitat for the species will be impacted by the Project. Direct impacts on the large bent-winged bat resulting from the Project will include turbine strikes during the operational phase. Umwelt prepared an updated operational bird and bat impact assessment to analyse the difference in impacts between the original assessment and the proposed relevant modifications to the Project, being less turbines and larger blade lengths. It was found that the level of risk of blade strike to large bent-winged bat may be similar or slightly higher than the level of risk posed by the current design. This impact will be addressed in a Bird and Bat Adaptive Management Plan (BBAMP) for the Project, which will include monitoring requirements, defined impact triggers for the species and a mitigation and management strategy. The strategy will encompass a range of management actions, including the deterrence of bats from turbines. Reporting of outcomes from implementation of the BBAMP will be used to inform ongoing operation of the Project and potentially develop further actions to reduce the extent of direct impacts on the species.
b) the size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification	The large bent-wing bat was recorded within the Development Corridors during echolocation surveys conducted by Umwelt. The closest historic record of the species occurs approximately 8.4 km west of the Development Corridors near Wargeila Road (DPIE 2020). The southern sections of the Indicative Development Footprints occur within 50 km of known roost caves at Wee Jasper (Church Cave and Dip Cave). DPIE recognises that discrete populations are centred around maternity caves, and that dispersals of up to 300 km occur at certain times of the year (DPIE 2020). It has been recorded that the species can forage long distances from the roost site, with some being known to travel up to 65 km in one night (Churchill 2008). While these sites are home to thousands of individuals during periods of roosting, it is unknown how many individuals utilise the Development Corridors for foraging, particularly when the roost migrates.

c) the extent to which the impact exceeds any threshold for the potential entity that is specified in the *Guidance to assist a decision-maker to determine a serious and irreversible impact*	The threshold for the large bent-winged bat in the BioNet TBDC is listed as "breeding habitat to be identified by survey" (DPIE 2020). Breeding habitat for this species constitutes caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding. This includes species records with microhabitat code "IC - in cave;" observation type code "E nest-roost;" with numbers of individuals >500. No habitat conforming to these criteria has been recorded within the Indicative Development Footprints historically or through recent surveys conducted by NGH and Umwelt. The impact does not exceed the listed threshold for this species.
d) the likely impact (including direct and indirect impacts) that the development, clearing or biodiversity certification will have on the habitat of the local population, including but not limited to: i. an estimate of the change in habitat available to the local population as a result of the proposed development ii. the proposed loss, modification, destruction or isolation of the available habitat used by the local population, and iii. modification of habitat required for the maintenance of processes important to the species' life cycle (such as in the case of a plant – pollination, seed set, seed dispersal, germination), genetic diversity and long-term evolutionary development. BioNet Atlas records or other documented, quantifiable means must be used by the assessor to estimate what percentage of the species' population and habitat is likely to be lost in the long term within the IBRA subregion due to the direct and indirect impacts of the development	i. The Project will result in impacts to 106.29 hectares of foraging habitat for the local large bent-winged bat population. There are no recorded breeding habitat locations within the disturbance area. Impacts as a result of clearing and habitat modification are discussed in **Section 5.1**. ii. The modification of large bent-winged bat habitat through vegetation clearing is not likely to lead to a decline in the local population of the species within the Indicative Development Footprints. There are two known maternity roosts approximately 50 km away from the Project area. It is possible that individuals from this area may use habitat within the project area to forage. However as flying is the mode of transport for this species, it is not considered likely that will cause significant loss, modification, destruction, or isolation of the available foraging habitat of the local population. iii. Direct impacts are not likely to separate or fragment the large bent-winged bat habitat areas, within the Indicative Development Footprints, used in this species' life-cycle. Due to the species' high mobility throughout the surrounding landscape, there being no roosting habitat destroyed, and no substantial habitat fragmentation occurring due to the proposed development. A total of 57 BioNet Atlas records of the species occur in the Inland Slopes (NSW – South Western Slopes) IBRA subregion, and 121 in the Murrumbateman (South Eastern Highlands) IBRA subregion. Of these, 16 records occur within 25 km the Development Corridors, constituting 9% of the records in the relevant subregions. There are three confirmed large bent-winged bat calls were recorded during the 2018/19 survey, within the proposed development corridor. This constitutes 1.7 % of known records (if each record is assumed to be a separate individual). The survey method used cannot quantify abundance, only presence or absence. Due to the extensive nature of surveys within the Development Corridors compared to the surrounding region, it is considered likely that this is a reasonable reflection of the species utilisation of the surrounding area and within the Development Corridors.

	As the proposed development is not impacting any known roosting sites it is unlikely that there will be any direct impacts to the local populations. It is difficult to quantify the indirect impacts to the local populations, the most likely of which will be collision with turbines. The BBAMP will include monitoring requirements, defined impact triggers for the species and a mitigation and management strategy. The findings in the BBAMP are likely to provide quantifiable estimates of the indirect impacts.
e) the likely impact on the ecology of the local population. At a minimum, address the following: i. for fauna: – breeding – foraging – roosting, and – dispersal or movement pathways ii. for flora, address how the proposal is likely to affect the ecology and biology of any residual plant population that will remain post development including where information is available: – pollination cycle – seedbanks – recruitment, and – interactions with other species (e.g. pollinators, host species, mycorrhizal associations)	The Project will not impact on any breeding or roosting activities of the large bent-wing bat due to an absence of suitable breeding habitat in the Indicative Development Footprints. Foraging activities of the local population may be affected by the removal of approximately 106.29 hectares of open forest/woodland habitat which comprises potential foraging habitat. It is noted that large amounts (over 300 hectares) of similar or higher quality foraging habitat occur for the species in the surrounding Development Corridors and wider region. It is unlikely that the Project will impact on foraging activities to such an extent that a local population of the species will decline. Movement pathways for the species through the Development Corridors will be impacted by the presence of 80 wind turbines which may change flight behaviour and patterns of individuals migrating through the area. It is considered unlikely that the Project will impact on dispersal activities to such an extent that a local population of the species will decline.
f) a description of the extent to which the local population will become fragmented or isolated as a result of the proposed development	Due to the highly dispersive nature of this species, it is considered unlikely that the Project will result in a local population becoming fragmented or isolated.
g) the relationship of the local population to other population/populations of the species. This must include consideration of the interaction and importance of the local population to other population/populations for factors such as breeding, dispersal and genetic viability/diversity, and whether the local population is at the limit of the species' range	The local population of the species likely interacts with individuals from other populations (the species is known to disperse up to 300 km from the maternity roost (DPE 2020; Churchill 2008)). The local population likely provides valuable genetic diversity to the metapopulation along the east coast. The local population is not at the limit of the species range (the species occurs along the entire east coast of Australia (Churchill 2008)). Due to the highly dispersive nature of the species, it is considered unlikely that the proposed development will impact interactions between the local population and surrounding populations.

h) the extent to which the proposed development will lead to an increase in threats and indirect impacts, including impacts from invasive flora and fauna, that may in turn lead to a decrease in the viability of the local population	The Saving Our Species report for the large bent-winged bat lists three threats to the species. these are: 1. Cave entrances being blocked for human health and safety reasons, or vegetation (particularly blackberries) encroaching on and blocking cave entrances. 2. Predation by feral cat. 3. Disturbance by recreational cavers and general public accessing caves and adjacent areas particularly during winter or breeding. As there are no known roosting sites within the Development Corridors. As such, the proposed development will not lead to an increase in threats 1 and 3. Impacts by feral cats are recognised to occur mostly in modified, fragmented environments and where alternative prey (rabbit and house mouse) fluctuate in abundance (DPIE 2019c). Woodland habitat will be cleared as part of the proposed development. Bionet Atlas records show this species occurring throughout an already fragmented landscape. Due to there being no known roosts within the Indicative Development Footprints and the small amount of vegetation to be cleared, the proposed development will not lead to a decrease in the viability of the local population.
i) an estimate of the area, or number of populations and size of populations that is in the reserve system in NSW, the IBRA region and the IBRA subregion	A total of 57 BioNet Atlas records of the species occur in the Inland Slopes (NSW – South Western Slopes) IBRA subregion, and 121 in the Murrumbateman (South Eastern Highlands) IBRA subregion. Of these, 16 records occur within 25 km the Development Corridors, constituting 9% of the records in the relevant subregions. There are three confirmed records within the Development Corridors, constituting 1.7 % of known records (if each record is assumed to be a separate individual). There are two known roost caves approximately 50 km from the Development Corridors. Generally, roosts are known to support thousands of individuals of one species. No information is known about the exact size of these local populations.
j) the measure/s proposed to contribute to the recovery of the species in the IBRA subregion.	The Saving Our Species report for the large bent-winged bat lists seven priority management sites, two of which (Church Cave and Dip Cave) are located in Wee Jasper approximately 50 km from the Development Corridors. Management activities listed for these sites area heavily focused on ensuring access to maternity caves is maintained and the impacts of pest species are reduced. As there are no known maternity caves within the Development Corridors, there is nothing that can be proposed to contribute to their management. Predation by feral cat is a recognised threat to the species. As part of regular monitoring feral cat populations will be monitored. If there is a recorded increase in feral cat records within the site, this will trigger pest control

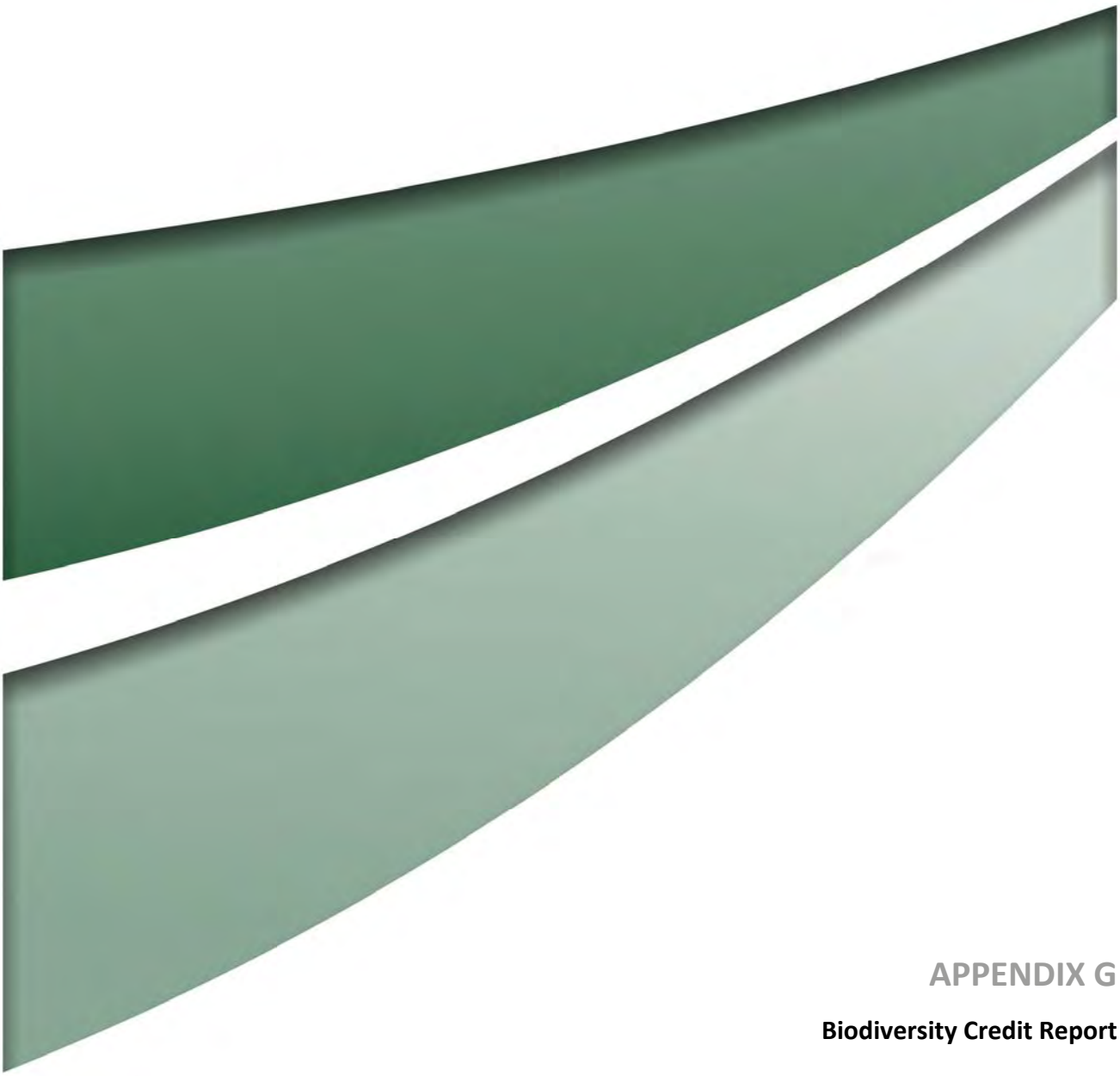
	works.

3. Golden sun moth (*Synemon plana*)	
Criteria	**Assessment**
a) the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII	The Project has gone through substantial avoidance (and minimisation) measures, through changes to the final design, in relation to the removal of known habitat for the golden sun moth. 70.69 hectares of known habitat for the species within the Indicative Development Corridors has been avoided by the Project through reductions in the number operation/maintenance facilities and substations, and through changes to the preferred transport route. In addition, several mitigation measures will be implemented to contribute to the maintenance of habitat quality adjacent to the final Development Footprint. These avoidance and minimisation measures are described in full in **Section 4.0**.
b) the size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification	The limited dispersal ability of the golden sun moth means habitat areas that are separated by >200 m are effectively isolated and should be considered as separate habitat areas (DEWHA, 2009). The Project will result in impacts to 43.20 hectares of golden sun moth habitat across ten main habitat areas within the Indicative Development Footprints. This comprises four habitat areas >10 ha and six habitat areas <10 ha. There will be permanent habitat loss >0.5 ha in all four habitat areas >10 ha, and habitat loss in the remaining six habitat areas <10 ha.
c) the extent to which the impact exceeds any threshold for the potential entity that is specified in the *Guidance to assist a decision-maker to determine a serious and irreversible impact*	The threshold listed in the BioNet TBDC for the golden sun moth is clearing of >10% of identified habitat on site. The Project will impact 43.20 hectares of golden sun moth habitat, which constitutes 38% of the 113.89 hectares of golden sun moth habitat identified within the Development Corridors. This impact exceeds the threshold by 28% , however it falls below the Federal Conditions of Approval for the Project which allows for impacts to a maximum of 66.94 hectares. It is noted that 70.69 hectares will persist beyond the extent of the Indicative Development Footprints within the Development Corridor.
d) the likely impact (including direct and indirect impacts) that the development, clearing or biodiversity certification will have on the habitat of the local population, including but not limited to: i. an estimate of the change in habitat available to the local population as a result of the proposed development ii. the proposed loss, modification, destruction or isolation of the available habitat used by the local population, and iii. modification of habitat required for the maintenance of processes	i. The Project will result in impacts to 43.20 hectares of habitat for local golden sun moth populations across ten main habitat areas within the Indicative Development Footprints. This comprises four habitat areas >10 ha and six habitat areas <10 ha. There will be permanent habitat loss >0.5 ha in all four habitat areas >10 ha, and habitat loss in the remaining six habitat areas <10 ha. Impacts as a result of clearing and habitat modification are discussed in **Section 5.1**. ii. The modification of golden sun moth habitat through vegetation clearing is likely to lead to a decline in the local population of the species within the Indicative Development

important to the species' life cycle (such as in the case of a plant – pollination, seed set, seed dispersal, germination), genetic diversity and long-term evolutionary development. BioNet Atlas records or other documented, quantifiable means must be used by the assessor to estimate what percentage of the species' population and habitat is likely to be lost in the long term within the IBRA subregion due to the direct and indirect impacts of the development	Footprints The species is not known to travel more than 200 metres, and removal of habitat areas will likely result in a direct loss of both adults and larvae during construction. Given the context of several thousand hectares of similar golden sun moth habitat being present in the broader landscape (Gellie 2005) the anticipated loss is only expected to affect local populations, and will result in negligible change to habitat availability for the wider regional population. iii. Direct impacts are likely to separate or fragment the golden sun moth habitat areas within the Indicative Development Footprints, but are unlikely to cause large barriers or isolate populations such as breaks of 200 m or more that will restrict dispersal and long-term evolutionary development. A total of 49 BioNet Atlas records of the species occur in the Inland Slopes (NSW – South Western Slopes) IBRA subregion, and 230 in the Murrumbateman (South Eastern Highlands) IBRA subregion. Of these, eight records occur within the Development Corridors, constituting 2.9% of the records in the relevant subregions. Due to the extensive nature of surveys within the Development Corridors compared to the surrounding region, this percentage is considered likely to be a reasonable estimate, if not over-estimate, of the proportion of golden sun moth population to be impacted by the Project.
e) the likely impact on the ecology of the local population. At a minimum, address the following: i. for fauna: – breeding – foraging – roosting, and – dispersal or movement pathways ii. for flora, address how the proposal is likely to affect the ecology and biology of any residual plant population that will remain post development including where information is available: – pollination cycle – seedbanks – recruitment, and – interactions with other species (e.g. pollinators, host species, mycorrhizal associations)	Project impacts are likely to lead to a decline in a small percentage (up to 2.9%) of the known population recorded in the surrounding region. This is associated with a direct loss of individuals (including mortality during the construction phase of both adults and underground larvae) and removal of habitat. Areas of habitat within the Indicative Development Footprints will be fragmented during construction and operation, but are unlikely to cause large barriers or isolate populations such as breaks of 200 metres or more that will restrict dispersal and movement pathways. There are extensive areas (i.e. several thousand hectares) of suitable habitat for the species mapped as Yellow Box-Apple Box Grassy Woodlands, which have groundcovers dominated by wallaby grass (*Rytidosperma racemosum* var. *racemosum*), kangaroo grass (*Themeda australis*), weeping grass (*Microlaena stipoides* var. *stipoides*) and speargrass (*Austrostipa scabra*) (Gellie 2005) in the surrounding landscape. These are likely to be similar to golden sun moth habitat areas found in the Development Corridors, and would continue to facilitate the maintenance of important life cycle processes for the species including both foraging and breeding for the species in the wider region.

f) a description of the extent to which the local population will become fragmented or isolated as a result of the proposed development	The Project will result in impacts to 43.20 hectares of known habitat for golden sun moth habitat across ten main habitat areas within the Development Corridors. Direct impacts likely to separate or fragment these areas, but are unlikely to cause large barriers or isolate populations such as breaks of 200 metres or more that will restrict dispersal. The quality of similar adjacent habitat areas which may be utilised have potential to change due to edge effects such as shading, wind, altered hydrology and weed invasion. However, given the already disturbed nature of the Indicative Development Footprints, edge effects are unlikely to cause a decline in remaining habitats.
g) the relationship of the local population to other population/populations of the species. This must include consideration of the interaction and importance of the local population to other population/populations for factors such as breeding, dispersal and genetic viability/diversity, and whether the local population is at the limit of the species' range	Studies of golden sun moth across the species' range show genetic variation increasing with the geographic distance between populations (CPR 2017). Five key genetic clusters have been identified, one encompassing the populations from the ACT and nearby NSW and the remainder in Victoria. Populations in the ACT/NSW cluster are likely to have recently undergone further genetic differentiation as a result of habitat fragmentation associated with the introduction of agriculture. Due to limited information of the distribution of the species in the immediately surrounding landscape, however, it is difficult to draw strong conclusions regarding relationships to other populations. The Development Corridors is located in the approximate centre of the distribution of the NSW/ACT population, and is unlikely to have any specific importance for maintaining genetic viability or represent a distinct genetic unit. The Development Corridors is not at the limit of the species' range, however on the whole the ACT/NSW local population is the northernmost population of the species.
h) the extent to which the proposed development will lead to an increase in threats and indirect impacts, including impacts from invasive flora and fauna, that may in turn lead to a decrease in the viability of the local population	A principal threat to golden sun moth is weed invasion, particularly introduced pasture grasses that compete with native *Austrostipa* spp. and *Rytidosperma* spp., grasses. This excludes the exotic Chilean needlegrass (*Nassella nessiana*) which provides habitat for the golden sun moth. The associated indirect impacts of this are well documented and include increased potential for the proliferation of invasive species. Most of the Development Corridors is exposed to historical and ongoing disturbances from grazing and other agricultural pressures. Given the occurrence of existing weeds in habitat areas, the Project is unlikely to introduce invasive species such as weeds that are harmful to the golden sun moth or its habitat. Measures to minimise invasion of weeds during construction and operation would be implemented to mitigate increases of weed invasion into golden sun moth habitat, and are described in full within **Section 4.0**.
i) an estimate of the area, or number of populations and size of populations that is in the reserve system in NSW, the IBRA region and the IBRA subregion	A total of 49 BioNet Atlas records of golden sun moth occur in the Inland Slopes (NSW – South Western Slopes) IBRA subregion, and 230 in the Murrumbateman (South Eastern Highlands) IBRA subregion. Criteria for dividing golden sun moths into distinct populations is unclear, however species records within the wider NSW – South Western Slopes IBRA bioregion are grouped into approximately 24 distinct localities, and South Eastern Highlands IBRA bioregion are grouped into

	approximately 26 distinct localities (BCD 2020a). Data is not available on the population areas protected in reserves in NSW; however, golden sun moth are found, or considered likely to occur, in Goorooyarroo Nature Reserve, Bango Nature Reserve, McLeod's Creek Nature Reserve, Oakdale Nature Reserve (OEH 2015) and the Yass River Gorge Council reserve (Yass Valley Council 2017).
j) the measure/s proposed to contribute to the recovery of the species in the IBRA subregion.	There is currently no specific recovery plan for the golden sun moth, but the following regional priority recovery and threat abatement actions relevant to the Project are recommended in the conservation advice (DoE, 2013) for the species: • Minimise disturbance in areas where the golden sun moth occurs, excluding necessary actions to manage the conservation of the species. Retain and protect natural grassland remnants within the known distribution of the species. • Ensure remnant populations remain connected or linked to each other; in cases where remnants have become isolated, consider revegetation to re-establish links and aid dispersal. • Manage any changes to hydrology that may result in changes to water table levels and/or increased run-off, salinity, or pollution. • Identify populations of high conservation priority. Search for the species in suitable habitat in areas that are proposed for development. • Control invasions of weeds and pasture species, and consider the impact of herbicide use in habitat; where possible use methods that directly target weeds such as spot spraying and hand removal to minimise the adverse impact on the golden sun moth. The Proponent is committed to implementing the hierarchy of avoidance measures through the final design phase of the Indicative Development Footprints. It is expected that additional avoidance and disturbance minimisation will be possible for the Project. Environmental management during construction will include weed control and hygiene protocols to minimise weed dispersal, and will be designed to minimise risks associated with herbicide use. The offset package for the Project may provide opportunities for linking, enhancing or establishing additional populations, and are discussed in **Section 8.0**.



APPENDIX G

Biodiversity Credit Report

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00010359/BAAS17068/18/00012903	Rye Park Development SEH IBRA	18/06/2020
Assessor Name	Assessor Number	BAM Data version *
Bill Wallach	BAAS17068	29
Proponent Name(s)	Report Created	BAM Case Status
Tilt Renewables	12/08/2020	Open
Assessment Revision	Assessment Type	Date Finalised
6	Major Projects	To be finalised

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box Yellow Box Blakely's Red Gum Woodland	Endangered Ecological Community	350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion

Species
Synemon plana / Golden Sun Moth
Synemon plana / Golden Sun Moth

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
335-Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Not a TEC	0.7	11.00
350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	15.8	371.00
351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	Not a TEC	134.7	1700.00

335-Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion	**Like-for-like credit retirement options**			
	Class	Trading group	HBT	IBRA region
	Inland Floodplain Swamps This includes PCT's: 66, 204, 205, 335, 360, 447, 465, 1291	Inland Floodplain Swamps >=70% and <90%	No	Murrumbateman,Bondo, Crookwell, Inland Slopes, Monaro, Murrumbateman and Snowy Mountains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options			
	Formation	Trading group	HBT	IBRA region
	Freshwater Wetlands	Tier 4 or higher	No	IBRA Region: South Eastern Highlands, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion	**Like-for-like credit retirement options**			
	Name of offset trading group	Trading group	HBT	IBRA region

	White Box Yellow Box Blakely's Red Gum Woodland This includes PCT's: 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698	-	Yes	Murrumbateman,Bondo, Crookwell, Inland Slopes, Monaro, Murrumbateman and Snowy Mountains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options			
	Formation	Trading group	HBT	IBRA region
	Grassy Woodlands	Tier 3 or higher	Yes (including artificial)	IBRA Region: South Eastern Highlands, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	**Like-for-like credit retirement options**			
	Class	Trading group	HBT	IBRA region
	Southern Tableland Dry Sclerophyll Forests This includes PCT's: 299, 349, 351, 352, 653, 701, 727, 728, 730, 888, 957, 1093, 1177	Southern Tableland Dry Sclerophyll Forests >=50% and <70%	Yes	Murrumbateman,Bondo, Crookwell, Inland Slopes, Monaro, Murrumbateman and Snowy Mountains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options			
	Formation	Trading group	HBT	IBRA region
	Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 6 or higher	Yes (including artificial)	IBRA Region: South Eastern Highlands, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Area	Credits
Petaurus norfolcensis / Squirrel Glider	40.8	1365.00
Polytelis swainsonii / Superb Parrot	10.2	271.00
Synemon plana / Golden Sun Moth	21.6	381.00

Petaurus norfolcensis/ Squirrel Glider	350_Moderate	**Like-for-like options**		
		Spp	IBRA region	
		Petaurus norfolcensis/Squirrel Glider	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
		Fauna	Vulnerable	Murrumbateman, Bondo, Crookwell, Inland Slopes, Monaro, Murrumbateman and Snowy Mountains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	351_ModerateGood_ Remnant	**Like-for-like options**		
		Spp	IBRA region	
		Petaurus norfolcensis/Squirrel Glider	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act	IBRA region

			shown below	
		Fauna	Vulnerable	Murrumbateman, Bondo, Crookwell, Inland Slopes, Monaro, Murrumbateman and Snowy Mountains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Polytelis swainsonii/ Superb Parrot	350_Moderate	**Like-for-like options**		
		Spp	IBRA region	
		Polytelis swainsonii/Superb Parrot	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

		Fauna	Vulnerable	Murrumbateman, Bondo, Crookwell, Inland Slopes, Monaro, Murrumbateman and Snowy Mountains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Synemon plana/ Golden Sun Moth	350_DNG	**Like-for-like options**		
		Spp	IBRA region	
		Synemon plana/Golden Sun Moth	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
		Fauna	Endangered	Murrumbateman, Bondo, Crookwell, Inland Slopes, Monaro, Murrumbateman and Snowy Mountains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Synemon plana/ Golden Sun Moth	351_DNG	**Like-for-like options**		
		Spp	IBRA region	
		Synemon plana/Golden Sun Moth	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
		Fauna	Endangered	Murrumbateman, Bondo, Crookwell, Inland Slopes, Monaro, Murrumbateman and Snowy Mountains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id 00010359/BAAS17068/18/00012903	Proposal Name Rye Park Development SEH IBRA	BAM data last updated * 18/06/2020
Assessor Name Bill Wallach	Assessor Number BAAS17068	BAM Data version * 29
Proponent Names Tilt Renewables	Report Created 12/08/2020	BAM Case Status Open
Assessment Revision 6	Assessment Type Major Projects	Date Finalised To be finalised

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Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box Yellow Box Blakely's Red Gum Woodland	Endangered Ecological Community	350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion

Species
Synemon plana / Golden Sun Moth
Synemon plana / Golden Sun Moth

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
335-Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Not a TEC	0.7	11.00
350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	15.8	371.00
351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	Not a TEC	134.7	1700.00

335-Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion	**Like-for-like credit retirement options**			
	Class	Trading group	HBT	IBRA region
	Inland Floodplain Swamps This includes PCT's: 66, 204, 205, 335, 360, 447, 465, 1291	Inland Floodplain Swamps >=70% and <90%	No	Murrumbateman, Bondo, Crookwell, Inland Slopes, Monaro, Murrumbateman and Snowy Mountains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion	**Like-for-like credit retirement options**			
	Name of offset trading group	Trading group	HBT	IBRA region

	White Box Yellow Box Blakely's Red Gum Woodland This includes PCT's: 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698	-	Yes	Murrumbateman, Bondo, Crookwell, Inland Slopes, Monaro, Murrumbateman and Snowy Mountains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	**Like-for-like credit retirement options**			
	Class	Trading group	HBT	IBRA region

	Southern Tableland Dry Sclerophyll Forests This includes PCT's: 299, 349, 351, 352, 653, 701, 727, 728, 730, 888, 957, 1093, 1177	Southern Tableland Dry Sclerophyll Forests >=50% and <70%	Yes	Murrumbateman, Bondo, Crookwell, Inland Slopes, Monaro, Murrumbateman and Snowy Mountains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Area	Credits
Petaurus norfolcensis / Squirrel Glider	40.8	1365.00
Polytelis swainsonii / Superb Parrot	10.2	271.00
Synemon plana / Golden Sun Moth	21.6	381.00

Petaurus norfolcensis/ Squirrel Glider	350_Moderate	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Petaurus norfolcensis/Squirrel Glider	Any in NSW

Petaurus norfolcensis/ Squirrel Glider	350_Moderate	
	351_ModerateGood_ Remnant	**Like-for-like credit retirement options**
		Spp / IBRA region
		Petaurus norfolcensis/Squirrel Glider / Any in NSW
Polytelis swainsonii/ Superb Parrot	350_Moderate	**Like-for-like credit retirement options**
		Spp / IBRA region
		Polytelis swainsonii/Superb Parrot / Any in NSW
Synemon plana/ Golden Sun Moth	350_DNG	**Like-for-like credit retirement options**
		Spp / IBRA region
		Synemon plana/Golden Sun Moth / Any in NSW
	351_DNG	**Like-for-like credit retirement options**

		Spp	IBRA region
		Synemon plana/Golden Sun Moth	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00010359/BAAS17068/18/00012902	Rye Park SWS IBRA	18/06/2020
Assessor Name	Assessor Number	BAM Data version *
Bill Wallach	BAAS17068	29
Proponent Name(s)	Report Created	BAM Case Status
Tilt Renewables	12/08/2020	Open
Assessment Revision	Assessment Type	Date Finalised
6	Major Projects	To be finalised

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Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box Yellow Box Blakely's Red Gum Woodland	Endangered Ecological Community	350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion

Species
Synemon plana / Golden Sun Moth
Synemon plana / Golden Sun Moth

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Not a TEC	0.8	26.00
335-Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Not a TEC	4.8	114.00
350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	21.8	512.00
351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	Not a TEC	322.6	3653.00

289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion	**Like-for-like credit retirement options**			
	Class	Trading group	HBT	IBRA region
	Upper Riverina Dry Sclerophyll Forests This includes PCT's: 269, 285, 289, 290, 298, 302, 304, 314, 338, 340, 342, 353, 1088, 1094, 1095	Upper Riverina Dry Sclerophyll Forests >=50% and <70%	Yes	Inland Slopes,Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options			
	Formation	Trading group	HBT	IBRA region
	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Tier 6 or higher	Yes (including artificial)	IBRA Region: NSW South Western Slopes, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

335-Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion

Like-for-like credit retirement options

Class	Trading group	HBT	IBRA region
Inland Floodplain Swamps This includes PCT's: 66, 204, 205, 335, 360, 447, 465, 1291	Inland Floodplain Swamps >=70% and <90%	No	Inland Slopes,Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	HBT	IBRA region

	Freshwater Wetlands	Tier 4 or higher	No	IBRA Region: NSW South Western Slopes, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion	**Like-for-like credit retirement options**			
	Name of offset trading group	Trading group	HBT	IBRA region
	White Box Yellow Box Blakely's Red Gum Woodland This includes PCT's: 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695, 1698	-	Yes	Inland Slopes,Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion	**Variation options**			
	Formation	Trading group	HBT	IBRA region
	Grassy Woodlands	Tier 3 or higher	Yes (including artificial)	IBRA Region: NSW South Western Slopes, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	**Like-for-like credit retirement options**			
	Class	Trading group	HBT	IBRA region
	Southern Tableland Dry Sclerophyll Forests This includes PCT's: 299, 349, 351, 352, 653, 701, 727, 728, 730, 888, 957, 1093, 1177	Southern Tableland Dry Sclerophyll Forests >=50% and <70%	Yes	Inland Slopes,Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options			
	Formation	Trading group	HBT	IBRA region

	Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 6 or higher	Yes (including artificial)	IBRA Region: NSW South Western Slopes, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Area	Credits
Delma impar / Striped Legless Lizard	3.6	27.00
Myotis macropus / Southern Myotis	0.0	1.00
Petaurus norfolcensis / Squirrel Glider	62.2	2270.00
Polytelis swainsonii / Superb Parrot	9.9	308.00
Synemon plana / Golden Sun Moth	21.6	335.00

Delma impar/ Striped Legless Lizard	351_DNG	**Like-for-like options**		
		Spp	IBRA region	
		Delma impar/Striped Legless Lizard	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

		Fauna	Vulnerable	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Myotis macropus/ Southern Myotis	350_Moderate	**Like-for-like options**		
		Spp	IBRA region	
		Myotis macropus/Southern Myotis	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

		Fauna	Vulnerable	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Petaurus norfolcensis/ Squirrel Glider	289_ModerateGood	**Like-for-like options**		
		Spp	IBRA region	
		Petaurus norfolcensis/Squirrel Glider	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

		Fauna	Vulnerable	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	350_Moderate	**Like-for-like options**		
		Spp	IBRA region	
		Petaurus norfolcensis/Squirrel Glider	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

		Fauna	Vulnerable	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	351_ModerateGood_Remnant	**Like-for-like options**		
		Spp	IBRA region	
		Petaurus norfolcensis/Squirrel Glider	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

		Fauna	Vulnerable	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Polytelis swainsonii/ Superb Parrot	350_Moderate	**Like-for-like options**		
		Spp	IBRA region	
		Polytelis swainsonii/Superb Parrot	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

		Fauna	Vulnerable	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Synemon plana/ Golden Sun Moth	350_DNG	**Like-for-like options**		
		Spp	IBRA region	
		Synemon plana/Golden Sun Moth	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

		Fauna	Endangered	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	351_DNG	**Like-for-like options**		
		Spp	IBRA region	
		Synemon plana/Golden Sun Moth	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

		Fauna	Endangered	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00010359/BAAS17068/18/00012902

Proposal Name
Rye Park SWS IBRA

BAM data last updated *
18/06/2020

Assessor Name
Bill Wallach

Assessor Number
BAAS17068

BAM Data version *
29

Proponent Names
Tilt Renewables

Report Created
12/08/2020

BAM Case Status
Open

Assessment Revision
6

Assessment Type
Major Projects

Date Finalised
To be finalised

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box Yellow Box Blakely's Red Gum Woodland	Endangered Ecological Community	350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion

Species
Synemon plana / Golden Sun Moth
Synemon plana / Golden Sun Moth

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Not a TEC	0.8	26.00
335-Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Not a TEC	4.8	114.00
350-Candlebark - Blakely's Red Gum - Long-leaved Box grassy woodland in the Rye Park to Yass region of the NSW South Western Slopes Bioregion and South Eastern Highland Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	21.8	512.00
351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	Not a TEC	322.6	3653.00

BAM Biodiversity Credit Report (Like for like)

289-Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion

Like-for-like credit retirement options

Class	Trading group	HBT	IBRA region
Upper Riverina Dry Sclerophyll Forests This includes PCT's: 269, 285, 289, 290, 298, 302, 304, 314, 338, 340, 342, 353, 1088, 1094, 1095	Upper Riverina Dry Sclerophyll Forests >=50% and <70%	Yes	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

335-Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South Western Slopes Bioregion	**Like-for-like credit retirement options**			
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	Name of offset trading group	Trading group	HBT	IBRA region

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351-Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	**Like-for-like credit retirement options**			
	Class	Trading group	HBT	IBRA region

	Southern Tableland Dry Sclerophyll Forests This includes PCT's: 299, 349, 351, 352, 653, 701, 727, 728, 730, 888, 957, 1093, 1177	Southern Tableland Dry Sclerophyll Forests >=50% and <70%	Yes	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

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Polytelis swainsonii / Superb Parrot	9.9	308.00
Synemon plana / Golden Sun Moth	21.6	335.00

Delma impar/ Striped Legless Lizard	351_DNG	**Like-for-like credit retirement options**	
		Spp	IBRA region

		Delma impar/Striped Legless Lizard	Any in NSW
Myotis macropus/ Southern Myotis	350_Moderate	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Myotis macropus/Southern Myotis	Any in NSW
Petaurus norfolcensis/ Squirrel Glider	289_ModerateGood	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Petaurus norfolcensis/Squirrel Glider	Any in NSW
	350_Moderate	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Petaurus norfolcensis/Squirrel Glider	Any in NSW

Petaurus norfolcensis/ Squirrel Glider	350_Moderate	
	351_ModerateGood_ Remnant	**Like-for-like credit retirement options**
		Spp / IBRA region
		Petaurus norfolcensis/Squirrel Glider / Any in NSW
Polytelis swainsonii/ Superb Parrot	350_Moderate	**Like-for-like credit retirement options**
		Spp / IBRA region
		Polytelis swainsonii/Superb Parrot / Any in NSW
Synemon plana/ Golden Sun Moth	350_DNG	**Like-for-like credit retirement options**
		Spp / IBRA region
		Synemon plana/Golden Sun Moth / Any in NSW

Synemon plana/ Golden Sun Moth	351_DNG	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Synemon plana/Golden Sun Moth	Any in NSW

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