Appendix N: Rye Park wind farm Preliminary Documentation – Biodiversity Attachment

RYE PARK WIND FARM –
BIODIVERSITY ATTACHMENT

*Environment Protection and Biodiversity
Conservation Act 1999 Referral*

FINAL

November 2020

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Environment Protection and Biodiversity Conservation Act 1999 Referral

FINAL

Document Status

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1.0   Introduction

The proposed Rye Park Wind Farm involves the installation of 80 wind turbines and associated infrastructure including a transmission line (33kV and up to 330kV), creation of internal access tracks, installation of underground cabling, collector substation, connection substation, temporary operation and maintenance facilities, temporary laydown areas and concrete batch plants. The Project also involves upgrades to public roads around the Project boundary.

The original project approval considered a Site Perimeter within which all proposed project infrastructure was contained within a 200 metre wide corridor, or 'Project Corridor' (NGH 2014). This Project Corridor totalled approximately 4,850 hectares (NGH 2014). The total area of the wider Site Perimeter or 'Project Area' covered the extent of involved landholding lot boundaries and therefore totalled some 14,000 hectares. As part of the original Biodiversity Assessment, this considered a proposed 126 turbine footprint layout (and associated infrastructure).

The EPBC Act Referral (Epuron 2013) considered the proposed 126 turbine footprint layout (and associated infrastructure).

As part of the Biodiversity Assessment Addendum, the proposed turbine footprint layout (and associated infrastructure) was reduced from 126 turbines to 109 turbines. The proposed project footprint assessed as part of the addendum totalled 256.8 hectares (NGH 2016). The proposed 109 turbine footprint was also assessed as part of the Preliminary Documentation (Epuron 2017).

It is important to note however that neither the Biodiversity Assessment (NGH 2014), the Biodiversity Assessment Addendum (NGH 2016), EPBC Act Referral (Epuron 2013) or Preliminary Documentation (Epuron 2017) assessed the ecological impacts associated with the external transport route.

As part of the re-referral and project modification, a detailed project footprint has been subject to the ecological assessment. There are two Development Corridors, totalling approximately 1,327 hectares, being the Development Corridor – Wind Farm and Development Corridor – Permanent Met Masts. The Development Corridors include the extent of wind farm specific work in its entirety, as well as adjoining land, however it excludes the external roads.

The Indicative Development Footprints will be subject to a range of project disturbances. 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).

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

Consent Condition 20b of the existing state approval for the project (SSD 6693) stated that the Applicant must "*update the baseline mapping of the vegetation and key habitat within the final disturbance area*". The approved project involved vegetation and key habitat mapping which was completed at a regional scale. As a result of implementing this consent condition Umwelt were required to undertake substantial GIS mapping refinements, where vast areas mapped as 'woodland' were revised to comprise woodlands and derived native grasslands, similarly where vast areas mapped as 'derived native grasslands' were revised to also include remnant woodlands.

As a result of completing this extensive 'update' to baseline mapping and key habitat, in combination with a substantially different project design, it is not possible to present a direct comparison of the extent of impacts to MNES considered in the original EPBC Act Referral and Preliminary Documentation (Epuron 2017) with that to the modified re-referral for the proposed modification. Instead, this re-referral aims to present, as far as possible, both the information and methodology previously presented and the information and methodology presented in the current modified project. Where a consistent assessment approach has been taken this has been presented, while where an assessment approach differs to the original assessment this has also been presented.

1.1   The Project

As part of the re-referral and project modification, a detailed project footprint has been subject to the ecological assessment. There are two Development Corridors, totalling approximately 1,327 hectares, being the Development Corridor – Wind Farm and Development Corridor – Permanent Met Masts. The Development Corridors include the extent of wind farm specific work in its entirety, as well as adjoining land, however it excludes the external roads.

The Indicative Development Footprints will be subject to a range of project disturbances. 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).

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

2.0 Matters of National Environmental Significance

2.1 Listed Species and Threatened Ecological Communities

Several detailed biodiversity assessments completed for the Rye Park Wind Farm project have been considered as part of this re-referral document to determine whether or not the proposed action is likely to have any direct or indirect impact on the members of any listed species or any threatened ecological community, or their habitat. This includes the Biodiversity Assessment (NGH Environmental 2014) and Biodiversity Assessment Addendum (NGH Environmental 2016) that were completed prior to the existing State (SSD 6693) and Federal (EPBC 2014/7163) approvals for the project. In addition to this, an updated and comprehensive biodiversity assessment was completed by Umwelt in accordance with the NSW Biodiversity Assessment Method (BAM) to facilitate the project modification. A Biodiversity Development Assessment Report (BDAR) was prepared as part of the BAM, this is provided in **Appendix G.**

The Indicative Development Footprints are 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. The Indicative Development Footprint – Wind Farm includes the total indicative impact zone associated with the wind farm specific components of the Project, excluding the external road upgrades. The Indicative Development Footprint – Permanent Met Masts includes the indicative impact zone for six permanent meteorological masts for the Project. The Indicative Development Footprint – External Roads includes the total indicative impact zone of the external road upgrades associated with the Wind Farm, excluding all wind farm specific components of the Project. The *Indicative Development Footprints* provides for additional detailed design that may be undertaken by RPRE once specific turbine specifications and contractor(s) are established.

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

The Project Area broadly defines the extent of landholdings involved in the project, encapsulating the Development Corridor. Due to the long history of this project, extensive survey effort has occurred for this project but not specifically within the Indicative Development Footprints or Development Corridor. The Project Area is used to describe the broader context of the project extent.

The threatened species and ecological communities listed under the EPBC Act that have been considered for the proposed Project are presented in **Table 1**.

Table 1   Species and Ecological Communities Identified by the EPBC Act Protected Matters Report

Species	BC Act	EPBC Act	Likelihood
Ecological Communities			
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	EEC	EEC	**Not present (surveyed), not assessed further.** No stands of vegetation identified in the Indicative Development Footprints were identified as having the potential to conform with this ecological community. This ecological community has not been considered further.
Natural Temperate Grassland of the South Eastern Highlands	-	CEEC	**Not present (surveyed), not assessed further.** No stands of vegetation identified in the Indicative Development Footprints were identified as having the potential to conform with this ecological community. Umwelt completed preliminary analysis of PCT 335 against this CEEC and determined that it did not conform due to lack of species diversity, including lack of indicator species.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	EEC	CEEC	**Present, assessed further in sections below.** This ecological community was identified in the Indicative Development Footprints and impacts associated with the proposed project have been assessed further. Refer to **Section 3.5** for additional information regarding identification of the community and confirmation of its status.

Species	BC Act	EPBC Act	Likelihood
Species			
Regent Honeyeater *Anthochaera phrygia*	CE	CE	**Not detected (surveyed), however assessed further in sections below.** No species records occur within 10 km of the Indicative Development Footprints. The NSW BAM Support Team confirmed on 20 February 2020 that the Indicative Development Footprints is **not within an important area** for this species. Meandering transects were undertaken across the Indicative Development Footprints in September, October and December 2017; January, February and March 2018; April, September, November and December 2019; and January 2020 (Umwelt). These were not restricted to a particular area or length of time. Bird surveys were undertaken in October 2017, January 2018, February 2018 and March 2018 (Umwelt). Bird surveys involved undertaking walked transects 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 and raptor vantage 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 2016). 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. Although raptor vantage surveys focussed on observing raptors, they do involve recording all bird species observed. 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 2016).
Australasian Bittern *Botaurus poiciloptilus*	E	E	**Not present (surveyed), not assessed further.** No species records occur within 10 km of the Indicative Development Footprints. Furthermore, there are no stands of suitable wetland habitat for this species. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016).
Curlew Sandpiper *Calidris ferruginea*	E	CE	**Not present (surveyed), not assessed further.** No species records occur within 10 km of the Indicative Development Footprints. Furthermore, there are no stands of suitable wetland habitat for this species. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016).

Species	BC Act	EPBC Act	Likelihood
Painted Honeyeater *Grantiella picta*	V	V	**Present (surveyed), assessed further in sections below.** No species records occur within 10 km of the Indicative Development Footprints. There is however a recent record north east of Boorowa. This species was previously recorded by NGH Environmental during the original approval for the Project (NGH Environmental 2016). Throughout the remainder of detailed surveys completed by Umwelt, no records of this species were made. Impacts associated with the proposed project have been assessed further.
White-throated Needletail *Hirundapus caudacutus*	-	V, MIG	**Present (surveyed), assessed further in sections below.** This species was identified in the Indicative Development Footprints and impacts associated with the proposed project have been assessed further.
Swift Parrot *Lathamus discolor*	E	CE	**Not detected (surveyed), however assessed further in sections below.** The NSW BAM Support Team confirmed on 20 February 2020 that the Indicative Development Footprints is **not within an important area** for this species. No species records occur within 10 km of the Indicative Development Footprints. However, the species utilises the landscape broadly during migration, and may utilise habitat along the Rye Park range. Meandering transects for opportunistic sightings were undertaken in September, October and December 2017; January, February and March 2018; April, September, November and December 2019; and January 2020 (Umwelt). Call playback and bird surveys were undertaken in October 2017 (Umwelt). Bird surveys involved undertaking a walked 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. Bird utilisation and raptor vantage surveys were undertaken in October 2018, November 2018, January 2019 and February 2019 (Umwelt). Bird Utilisation surveys were also undertaken in November 2013 (NGH Environmental 2014 and 2016). 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. Although raptor vantage surveys focussed on observing raptors, they do involve recording all bird species observed. 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 2016).

Species	BC Act	EPBC Act	Likelihood
Eastern Curlew *Numenius madagascariensis*	-	CE	**Not present (surveyed), not assessed further.** No species records occur within 10 km of the Indicative Development Footprints. Furthermore, there are no stands of suitable wetland habitat for this species. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016).
Superb Parrot *Polytelis swainsonii*	V	V	**Present (surveyed), assessed further in sections below.** 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 Indicative Development Footprints are considered suitable habitat. 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. 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, raptor vantage 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 and raptor vantage surveys involved a visual assessment of the species and habitat (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. Although raptor vantage surveys focussed on observing raptors, they do involve recording all bird species observed. Opportunistic observations were made over all Umwelt survey periods. 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.
Australian Painted Snipe *Rostratula australis*	E	E	**Not present (surveyed), not assessed further.** No species records occur within 10 km of the Indicative Development Footprints. Furthermore, there are no stands of suitable wetland habitat for this species. Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016).
Murray Cod *Maccullochella peelii*	-	V	**Not present (based on habitat), not assessed further.** The Indicative Development Footprints does not support any rivers or creeks that provide suitable habitat for this species.
Macquarie Perch *Macquaria australasica*	-	E	**Not present (based on habitat), not assessed further.** The Indicative Development Footprints does not support any the Freshwater Threatened Species Distribution Map for this species.

Species	BC Act	EPBC Act	Likelihood
Booroolong Frog *Litoria booroolongensis*	E	E	**Not present (surveyed), not assessed further.** 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; 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 2016).
Southern Bell Frog *Litoria raniformis*	E	V	**Not present (surveyed), not assessed further.** 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 2016).
Golden Sun Moth *Synemon plana*	E	CE	**Present (surveyed), assessed further in sections below.** 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. Golden sun moth meandering transects (i.e. not strict parallel transects) to search for potential individuals or habitat were undertaken for the species during October and December 2017, November 2018 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 habitat mapping was also completed in March 2014 (NGH). Opportunistic observations were made throughout all Umwelt survey periods.

Species	BC Act	EPBC Act	Likelihood
Large-eared Pied Bat *Chalinolobus dwyeri*	V	V	**Not present (surveyed), not assessed further.** No species records occur within 10 km of the Indicative Development Footprints. 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 ground 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). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016).
Spotted-tailed Quoll *Dasyurus maculatus*	V	E	**Not present (surveyed), not assessed further.** Remote cameras were installed within the Indicative Development Footprints in March 2018, April 2019 (Umwelt). Bushnell Trophy Cam HD cameras were installed pointing at a bait station containing 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 2016).
Corben's Long-eared Bat *Nyctophilus corbeni*	V	V	**Not present (surveyed), not assessed further.** No species records occur within 10 km of the Indicative Development Footprints. 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 ground and positioned towards potential micro-bat flyways 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). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016).

Species	BC Act	EPBC Act	Likelihood
Greater Glider *Petauroides volans*	-	V	**Not present (surveyed), not assessed further.** No species records occur within 10 km of the Indicative Development Footprints. The closest record is at Binda, approximately 50 km north east of the Project. 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 (Umwelt). Remote cameras were installed within the Indicative Development Footprints 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 2016).

Species	BC Act	EPBC Act	Likelihood
Koala *Phascolarctos cinereus*	V	V	**Not present (surveyed), however assessed further in sections below.** 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 Indicative Development Footprints 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 Indicative Development Footprints 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 considered the Draft Koala Habitat Protection Guideline (DPIE 2020). In the absence of current records of the species within the Indicative Development Footprints, 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 Indicative Development Footprints is likely to be deemed 'Highly Suitable Koala Habitat' (DPIE 2020). Further commentary and consideration of these guidelines and the SEPP is included within the NSW Modification Application report submitted to Department of Planning, Industry and Environment (DPIE). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016).
Grey-headed Flying-fox *Pteropus poliocephalus*	V	V	**Not present (surveyed), not assessed further.** 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 2016).

Species	BC Act	EPBC Act	Likelihood
Yass Daisy *Ammobium craspedioides*	V	V	**Not present (surveyed), not assessed further.** No species records occur within 10 km of the Indicative Development Footprints. Meandering and targeted parallel transects were undertaken across the Indicative Development Footprints 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 2016). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016). However, the original Referral did identify this species as having the potential to be impacted by the Project. Given the absence of records by NGH Environmental surveys (2014 and 2016) as well as from additional Umwelt surveys, it is concluded that this species will not be impacted by the Project.
Floating Swamp Wallaby-grass *Amphibromus fluitans*	V	V	**Not present (surveyed), not assessed further.** No species records occur within 10 km of the Indicative Development Footprints. The closest record is at Crookwell, approximately 50 km north east of the Project. Meandering Transects were undertaken across the Indicative Development Footprints 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 2016).
Hoary Sunray *Leucochrysum albicans* var. *tricolor*	-	E	**Not present (surveyed) within the Indicative Development Footprints, not assessed further.** This species was recorded in a previously considered option of the southern external transport route for the project. Meandering Transects were undertaken across the Indicative Development Footprints in December 2017, January 2018, February 2018, November 2019, December 2019, January 2020 and February 2020 (Umwelt). Meandering searches were undertaken in November 2013 (NGH). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016).
Tarengo Leek Orchid *Prasophyllum petilum*	E	E	**Not present (surveyed), not assessed further.** 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 2016). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016).

Species	BC Act	EPBC Act	Likelihood
Button Wrinklewort *Rutidosis leptorrhyncoides*	E	E	**Not present (surveyed), not assessed further.** No species records occur within 10 km of the Indicative Development Footprints. The closest record is at Goulburn, approximately 70 km 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 2016).
Small Purple-pea *Swainsona recta*	E	E	**Not present (surveyed), not assessed further.** No species records occur within 10 km of the Indicative Development Footprints. Meandering Transects were undertaken across the Indicative Development Footprints 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 2016).
Austral Toadflax *Thesium australe*	V	V	**Not present (surveyed), not assessed further.** No species records occur within 10 km of the Indicative Development Footprints. The closest record is south of Canberra, approximately 80 km south of the Project. Meandering transects were undertaken across the Indicative Development Footprints 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 2016).
Pink-tailed Legless Lizard *Aprasia parapulchella*	V	V	**Not present (surveyed), not assessed further.** 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 2016). Tile grid arrays were also completed by NGH Environmental (2014 and 2016). Impacts were not calculated for this species as part of the original approval for the Project (NGH Environmental 2016). Potential habitat for this species within the Project Area was not considered further as part of this assessment due to the absence of records through NGH Environmental and Umwelt surveys as well as the lack of regional records.

Species	BC Act	EPBC Act	Likelihood
Striped Legless Lizard *Delma impar*	V	V	**Present (previously recorded), assessed further in sections below.** This species was previously recorded by NGH Environmental. A single record was made at one location to the north of the Indicative Development Footprints. 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 2016).
White-bellied Sea Eagle *Haliaeetus leucogaster*	V	MIG	**Not present (surveyed), not assessed further.** The species has not been recorded through previous surveys by NGH Environmental (2014 and 2016) or recent surveys by Umwelt.
Rainbow Bee-eater *Merops ornatus*	-	MAR; MIG	**Present (previously recorded), assessed further in sections below.** The rainbow bee-eater was recorded on 12 occasions most of which occurred within the Project Rotor Swept Area (RSA). The species will therefore be susceptible to impacts from blade strike. Furthermore, the Project will impact on 9.15 hectares (PCT 335) of habitat that could potentially be used for breeding purposes.
Satin Flycatcher *Myiagra cyanoleuca*	-	MAR	**Not present (surveyed), not assessed further.** The species has not been recorded through previous surveys by NGH Environmental (2014 and 2016) or recent surveys by Umwelt.
Cattle Egret *Ardea ibis*	-	MAR	**Not present (surveyed), not assessed further.** The species has not been recorded through previous surveys by NGH Environmental (2014 and 2016) or recent surveys by Umwelt.

CEEC – Critically Endangered Ecological Community

EEC – Endangered Ecological community

CE – Critically Endangered

E – Endangered

V – Vulnerable

MIG – Migratory

MAR - Marine

Through consideration of the above-mentioned biodiversity assessments, a total of six fauna species and one ecological community will be impacted either directly or indirectly as a result of the proposed action. An additional three fauna species have not been recorded for the project but have been assessed further due to the presence of suitable habitat, or to remain consistent with the previous Referral. We note however that in the absence of records from NGH Environmental and Umwelt surveys, as well as regional records, Umwelt have not considered the pink-tailed legless-lizard (*Aprasia parapulchella*) further. These species and ecological community are identified below in **Section 2.1.2**. The remainder of species and ecological communities identified by the EPBC Act Protected Matters Report are not considered further.

2.1.1 Types of Impacts

Direct impacts resulting from construction and operation of the wind farm with the potential to impact MNES are:

- Vegetation clearance

- Habitat loss and fragmentation

- Loss of hollow-bearing trees

- Blade strike and barotrauma.

Other indirect impacts considered with relation to potential for impacts on MNES are:

- Dust

- Noise and vibration

- Hydrology.

Vegetation clearance

Vegetation clearance associated with the construction phase of the project has the potential to directly reduce the extent of native vegetation present, including the listed *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* – Critically Endangered Ecological Community (CEEC).

During construction, the majority of clearing would result from supporting infrastructure such as tracks, cable trenches, overhead transmission lines, turbine footings, crane hardstands and crane operational areas. The operation phase of the wind farm has no impact on vegetation as once the infrastructure is in place, with operational turbines occupying a vertical plane, no further clearing is required.

Development of the project will result in the disturbance of about 396.01 ha of native vegetation as the worst case scenario. Of this, 35.73 hectares has been identified as conforming with the CEEC. The majority of vegetation clearance conforming with the CEEC occurs within the Indicative Development Footprint – Wind Farm, associated with the internal access tracks, installation of underground cabling, turbine hard stands etc. However, the Indicative Development Footprint – External Roads will also involve impacts to the CEEC. These impacts will be restricted to the vegetation along the road edge as well as access points to the internal wind farm site. It is likely that the impacts along the road may be restricted to trimming and pruning of tree branches rather than removal of vegetation itself. This will be detailed in the Roadside Vegetation Management Plan (RVMP) as per Condition 9 of the existing EPBC Act Approval. This extent would be finalised during final stages of detailed design once the preferred turbine model and final turbine envelope and contractors have been selected. For the purposes of this assessment however, the largest extent of impacts has been calculated.

Permanent impacts on this CEEC will comprise 26.69 ha for creation of internal access tracks, installation of underground cabling, a substation near High Rock Road and a concrete batch plant near Days Road. There are also minor impacts associated with external road upgrades. Partial direct impacts are expected to comprise the remaining 9.04 ha for transmission lines within 40 metre wide or 20 metre wide easements, and some permanent impacts are expected for installation of poles. Partial impacts have been calculated through the BAM (OEH 2017) 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 metre wide or 20 metre wide easement (excluding the pole and string locations) as per Section 9.1.2.3 of the BAM [OEH 2017]).

Habitat loss and fragmentation

Clearing during construction has the potential to permanently or temporarily remove habitat for EPBC Act listed threatened flora and fauna. The majority of habitat clearing would result from supporting infrastructure such as tracks, cable trenches, overhead transmission lines, turbine footings, crane hardstands and crane operational areas. The operation phase of the wind farm has no impact on vegetation as once the infrastructure is in place, with operational turbines occupying a vertical plane, no further clearing is required.

Estimates of habitat loss for the MNES are presented in **Section 2.1.2** and the specific impacts of this habitat loss are discussed in detail in **Section 2.1.2** below for each MNES. The project has been designed to avoid and/or minimise impacts to fauna habitat and vegetation communities of conservation significance as a priority and this process is discussed further in **Section 4.0**.

Clearing of native vegetation and habitat, particularly for linear infrastructure such as access tracks and overhead transmission lines has the potential to permanently or temporarily increase habitat fragmentation. While the Project will enhance levels of fragmentation within the region, is will not 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 the Proponent.

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 2016).

Loss of hollow bearing trees

The Biodiversity Assessment Addendum (NGH Environmental 2016), presented a combined total of 50.2 hectares of Box Gum Woodland and associated derived grasslands were to be impacted by the Project. This included 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) 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.

Following Umwelt's additional ecological surveys, an updated hollow bearing tree assessment has been prepared for the Project to provide added rigor around the extrapolation of hollow bearing tree impacts within Box Gum Woodland and associated Derived Native Grasslands being calculated for the project.

Umwelt completed a number of hollow bearing tree assessments within potential superb parrot habitat, being Vegetation Zones 3 and 4. These are detailed in **Table 2** below. It is important to note that although no hollow bearing trees were recorded in the sampling of Vegetation Zone 4 (Box Gum Woodland – DNG), 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 2016) Umwelt has assumed 1 hollow bearing tree per hectare of Vegetation Zone 4.

Table 2   Umwelt Superb Parrot Hollow Bearing Tree Assessment

Vegetation Zone	Area of Assessment	Number of HBTs	Number of HBTs/ha	Average Number of HBTs/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	
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	

Note: HBT = hollow bearing tree

As per **Table 3**, the Project will impact directly on a total of 233 'hollow bearing trees within the Indicative Development Footprints, 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 4.0**, 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.

Table 3   Superb Parrot Hollow Bearing Tree Updated Assessment

PCT and Condition	Vegetation Community[1]	Previous Impact Ratio (HBT/ha)	Current Impact Ratio (HBT/ha)	Average Impact Ratio (HBT/ha)	Area of Impact				Extrapolated Hollow Bearing Tree Impacts [2]			
					DC	IDF - WF	–IDF - PMM	IDF - ER	DC	IDF - WF	–IDF - PMM	IDF - ER
350 *Moderate to Good Condition*	Box Gum Woodland	5.8	15.7	**10.7**	36.33	18.75	-	1.33	389	201	-	12
350 *Derived Native Grassland*	Box Gum Woodland Derived Native Grassland	1	1	**1**	32.71	16.85	-	0.67	33	17	-	1
Total									422	218	-	12

[1]Biodiversity Assessment Addendum (NGH Environmental 2016)

[2] Extrapolated hollow bearing tree impacts 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

HBT: hollow bearing tree

Table 4 below presents the hollow bearing trees in each vegetation zone that are directly impacted by the Project. These were calculated in accordance with 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 above, **Table 4** presents the number of hollow bearing trees providing habitat for superb parrot as additional hollow bearing tree surveys were completed specifically for the superb parrot. While **Table 4** presents the number of hollow bearing trees recorded for Vegetation Zone 3 within the BAM plots, the average number of HBTs per hectare and total number of HBTs to be removed is based on the assessment specific for the superb parrot.

Table 4   Hollow Bearing Trees Recorded Per Vegetation Zone

Vegetation Zone / PCT / Condition	BAM 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 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 (incl. roads, tracks and waterbodies)	7	0	0	0

[1] Number of HBT to be removed are rounded up or down to the nearest whole number.

[2] Number of HBT to be removed are calculated based on the total area of the vegetation zone in the Indicative Development Footprints.

[3] average number of HBTs per hectare and total number of HBTs to be removed is based on the outcome of **Table 3 .**

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

Collision risk and/or blade-strike

A range of direct and indirect impacts of wind farms on birds and bats have been recognised in recent years, with mortality via direct collision with moving turbine rotors being an obvious impact (Madders and Whitfield 2006; Smales 2006). Collision risk can be defined as the likelihood of individual species migrating, feeding or roosting in the proximity of a wind farm which may lead to collisions with wind turbines and other infrastructure (Drewitt and Langston 2006). The number and behaviour of birds, topography and the specifications and layout of the wind farm are all factors influencing collision risk (Smales 2006). Collision with rotor blades generally occurs when birds are approaching the rotor with a tail-wind, which reduces their ability to take evasive action. Mortality or injury can also result from birds being driven down to the ground by the force of the wake behind the rotor (Sharp 2010).

Industry research reveals that the species that appear to be most susceptible to population scale impacts due to blade-strike are common species (i.e. not listed as threatened in State or Commonwealth legislation). However, evidence shows that operational impacts affect particular species disproportionately, compared to habitat loss or stationary elevated structures (Willis et al. 2009). While research on Australian wind farms is lacking, evidence to date suggests the species most affected by collision mortality fall into the following groups (MacMahon 2010, Roaring 40s Renewable Energy 2010, Smales 2006):

- Large sedentary raptors

- Fast high-flying microchiropteran bats, and

- Fast high-flying non-passerines.

The Department of Agriculture, Water and the Environment (DAWE) originally raised concerns about collision risk of birds with powerlines and/or disturbance to bird flight paths from powerlines.

Of the MNES species considered in this report, the Swift Parrot and Regent Honeyeater are not considered to be at risk from proposed powerlines as they were not reported using the site during field surveys and are not commonly known for the locality. The Superb Parrot is known for the project area however it is not expected powerlines would pose additional collision risk to this species given powerline infrastructure is stationary and easily avoided for this species. Collision risk associated with wind farms is associated with the moving turbine blades, as they can be unseen during operation by birds in flight.

Umwelt has considered information provided to the Proponent by the National Superb Parrot Recovery Team in regard to superb parrot flight data. The information provided is based on six superb parrots that nested in Canberra in 2015 and were satellite tracked. Umwelt note that this information and data is currently unpublished and approval from the authors would be required to present this data in any detail. While the data is useful in that it provides additional insight into the flight height of the superb parrot, its application to the assessment of this Project is limited in that the 'Surface Height' is measured Above Sea Level (ASL) plus the height of any structure over which the bird was located. Without the ground height data for the flight paths being provided we cannot determine whether or not the flight heights presented would occur in the RSA for this particular Project. However as noted in our assessments, the data supports the expected utilisation of the species flying at height susceptible to blade strike in wind farms generally. Further consideration of this information is provided in the Assessment of Significance for this species.

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 as Appendix E of the revised BDAR which is provided in Appendix G.

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*).

The prescribed impact assessments broadly involved predicting the likelihood of impact on the above-mentioned species, followed by a prediction of the rate of impact per turbine per year. These components were prepared in consultation with BCD, and based on detailed analysis of collected data for the Project and existing literature. Subsequently, Umwelt prepared comprehensive risk assessment methods, allowing for an estimation of overall risk. An assessment of likelihood and consequence of impact was then undertaken for each of the 14 species.

The relative risk of blade strike for the species assessed was estimated using two criteria to ascribe likelihood of risk and four criteria to ascribe consequence of risk (**Table 5, Table 6**). 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.

It is noted that the current Prescribed Impact Assessment is based on the proposed modification turbine layout which supports 80 wind turbines. However as noted above in **Section 1.0** it is expected the final modified project will result in a number of turbines being removed, possibly resulting in a layout of 77 wind turbines. The Prescribed Impact Assessment has not been updated to capture this change as it remains unclear the extent of turbines being removed. A reduction in the number of wind turbines will potentially reduce the 'likely risk' or 'consequence of the risk'.

Table 5   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 6   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 Project Area. Descriptions for each ranking are outlined in (**Table 7**).

- **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 7   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

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 8**). 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 8   Risk Matrix

		Consequence of collisions		
		Low	Moderate	High
Likelihood of collisions	Low	Negligible	Minor	Moderate
	Moderate	Minor	Moderate	High
	High	Moderate	High	Severe

While the Prescribed Impact Assessment is provided in full as part of Appendix E of the revised BDAR (**Appendix G**), in **Section 2.1.2** below we provide a summary of the assessments undertaken for superb parrot and white-throated needletail following request for additional information by DAWE.

Noise and vibration

Indirect impacts on MNES resulting from noise and vibration are likely to be minimal following application of avoidance and mitigation measures, including buffering and application of standard construction environmental controls in accordance with NSW obligations.

A worst case prediction was modelled as part of the project noise assessment to demonstrate compliance with the NSW Interim Construction Guidelines (DECC 2009). These guidelines also identify mitigation measures to be used if construction noise is an issue during the construction phase. Typically the setback distance required to achieve the construction vibration criteria in the guidelines is in the order of 20 m. At a

distance of 100 m, vibration from construction activities is unlikely to be detectable. Depending on the actual geotechnical conditions encountered during the construction of access tracks and wind turbine foundations, it is possible that some blasting may be required. It is anticipated that any blasting will be required to meet strict criteria including a maximum airblast overpressure of 120 dB (Lin Peak) and a maximum ground vibration of 10 mm/s.

Operational noise from the proposed wind turbines and ancillary equipment (e.g. substation transformers) has been assessed and demonstrated to comply with the required noise guidelines. Construction noise will vary considerably through the construction period depending on the work location and work type.

Dust

Dust generated during construction and/or vehicle movement on unsealed roads has the potential to deposit on adjacent areas, potentially having temporary impacts on suitability of areas for threatened fauna, or long term impacts on survival of sensitive flora. Furthermore, the creation of access tracks and excavation of wind turbine foundations will create similar disturbances from dust during construction activities. Indirect impacts on MNES resulting from dust impacts would be mitigated through the application of standard construction environmental controls in accordance with NSW obligations. This will include spraying with water in accordance with the project Environmental Management Strategy and the Development Consent conditions.

Hydrology

Due to the location and nature of proposed works, hydrological changes are unlikely to be a significant driver of impacts to MNES. Temporary hydrological impacts during construction would be mitigated through the application of standard construction environmental controls in accordance with the Development Consent conditions and NSW guidelines.

2.1.2   Impacts on MNES

Table 9 below presents the MNES that have been assessed further in this document and identifies the associated impacts.

In relation to the assessment that has been completed for the Referral of the modified project, it is important to note the key changes to the project and where direct comparisons cannot be made. The full detail of project changes that have occurred through its approval history is provided above in **Section 1.0**.

Consent Condition 20b of the existing state approval for the project (SSD 6693) states that the Applicant must "*update the baseline mapping of the vegetation and key habitat within the final disturbance area*". The approved project involved vegetation and key habitat mapping which was completed at a regional scale. As a result of implementing this consent condition Umwelt were required to undertake substantial GIS mapping refinements, where vast areas mapped as 'woodland' were revised to comprise woodlands and derived native grasslands, similarly where vast areas mapped as 'derived native grasslands' were revised to also include remnant woodlands.

As a result of completing this extensive 'update of baseline mapping and key habitat' required, in combination with a substantially different project design and a revised assessment methodology in BAM, it is not possible to present a direct comparison of the extent of impacts to MNES considered in the original EPBC Act Referral with that to the modified re-referral for the proposed modification. Instead, the assessment aims to present, as far as is practicable, both the information and methodology previously presented and the information and methodology presented in the current modified project. Where a consistent assessment approach has been taken this has been presented; conversely, where an assessment approach differs to the original assessment this has also been presented.

The process of undertaking this assessment and analysis is complex. While it is not possible to make direct comparisons between the original and modified project, due to the reasons discussed previously, it is possible to compare the extent of impacts within the footprints.

It is noted that the Project Area / Site Boundary assessed as part of the Preliminary Documentation (Epuron 2017) relates to the extent of all landholdings involved with the project. An assessment of this extent has not been completed and therefore cannot be directly compared with the revised assessment.

Table 9   Comparison of Estimated MNES Habitat Loss for The Project

Species – EPBC Status	Original EPBC Act Referral - Preliminary Documentation (Epuron 2017)		Modification Project		Discrepancy Between Original Federal Approval (EPBC 2014/7163) and Modified Project Re-referral
	Estimated Extent in Project Area	Estimated Extent in Development Corridors	Estimated Extent in Development Corridors	Estimated Extent in Indicative Development Footprints	
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered Ecological Community (CEEC)	377 hectares	9.5 hectares	67.64 hectares in total, comprising 36.61 hectares of remnant woodland (Vegetation Zone 3) and 31.34 hectares of derived native grassland (Vegetation Zone 4). This occurs entirely in Development Corridor – Wind Farm, none recorded within Development Corridor – Permanent Met Masts.	35.73 hectares of total impact, including 9.04 hectares of partial direct impacts within the Indicative Development Footprints. The total impact comprises 19.38 hectares of vegetation in remnant woodland condition (Vegetation 3) and 16.35 hectares of derived native grassland condition (Vegetation Zone 4). 34.99 hectares of the total impact occurs within Indicative Development Footprint – Wind Farm. 0.74 hectares of the total impact occurs within the Indicative Development Footprint – External Transport Route. The CEEC was not identified within the Indicative Development Footprint – Permanent Met Masts.	This presents an impact increase of 26.23 hectares for the CEEC.

Species – EPBC Status	Original EPBC Act Referral - Preliminary Documentation (Epuron 2017)		Modification Project		Discrepancy Between Original Federal Approval (EPBC 2014/7163) and Modified Project Re-referral
	Estimated Extent in Project Area	Estimated Extent in Development Corridors	Estimated Extent in Development Corridors	Estimated Extent in Indicative Development Footprints	
Golden sun moth *Synemon plana* – Critically Endangered	3,465 hectares Likely Habitat 315 hectares Known Habitat ~200 individuals	66.94 ha	224.21 hectares in total. Comprising 9.92 hectares of Vegetation Zone 4 (PCT 350 – DNG) and 214.29 hectares of Vegetation Zone 6 (PCT 351 – DNG). 211.94 hectares occurs within the Development Corridor – Wind Farm and 12.27 hectares occurs within Development Corridor – Permanent Met Masts.	85.28 hectares in total within the Indicative Development Footprints. Comprising 5.42 hectares of Vegetation Zone 4 (PCT 350 – DNG) and 79.86 hectares of Vegetation Zone 6 (PCT 351 – DNG). Comprising 81.99 hectares within the Indicative Development Footprint – Wind Farms and 3.29 hectares within the Indicative Development Footprint – Permanent Met Masts. Golden sun moth habitat was not identified within the Indicative Development Footprint – External Roads.	This presents an increased impact of 18.34 hectares for the golden sun moth.
Striped legless lizard (*Delma impar*) – Vulnerable	2,411 hectares of Likely / Potential Habitat 512 hectares of Known Habitat At least one individual	49.5 ha, comprising • 10.5 ha within known habitat • 39 ha of potential / likely habitat	126.11 hectares in total, 125.45 within the Development Corridor – Wind Farm and 0.66 within the Development Corridor – Permanent Met Masts. It is noted that the latter occurs at the boundary edge of habitat for the species.	43.29 hectares in total within the Indicative Development Footprints, 42.72 hectares within the Indicative Development Footprint – Wind Farm and 0.57 hectares within the Indicative Development	This presents an impact reduction of 6.21 hectares for the striped legless lizard.

Species – EPBC Status	Original EPBC Act Referral - Preliminary Documentation (Epuron 2017)		Modification Project		Discrepancy Between Original Federal Approval (EPBC 2014/7163) and Modified Project Re-referral
	Estimated Extent in Project Area	Estimated Extent in Development Corridors	Estimated Extent in Development Corridors	Estimated Extent in Indicative Development Footprints	
				Footprint – Permanent Met Masts. No habitat was identified within the Indicative Development Footprint – External Roads.	
Superb parrot (*Polytelis swainsonii*) – Vulnerable	1,130 hectares of Box Gum Woodland Habitat Three known nest trees Additional hollow-bearing trees Unknown individuals	24.9 ha of habitat, three nest trees and 170 hollow-bearing trees / potential nest tree	36.33 hectares in total, entirely within the Development Corridor – Wind Farm. Superb parrot habitat was not identified within the Development Corridor – Permanent Met Masts.	20.08 hectares and 233 hollow bearing trees within the Indicative Development Footprints. This includes 18.76 hectares within the Indicative Development Footprint – Wind Farm and 1.33 hectares within the Indicative Development Footprint – External Roads. Superb parrot habitat was not identified within the Indicative Development Footprint – Permanent Met Masts.	This presents an impact reduction of 4.82 hectares for the superb parrot and an increase of 63 hollow bearing trees suitable for superb parrot. All identified nest trees have been avoided.
Koala (*Phascolarctos cinereus*) – Vulnerable	3,664.60 hectares – Inland Scribbly Gum	84.9 ha – Inland Scribbly Gum (64 hectares of moderate-good condition and 20.5 hectares of poor condition)	269.83 hectares in total within the Development Corridors. Comprising 257.43 hectares within the Development Corridor – Wind Farm and 12.40 hectares within the Development Corridor – Permanent Met Masts.	106.29 ha of potential foraging and breeding habitat within the Indicative Development Footprints. Comprising 103 hectares within the Indicative Development Footprint –	This presents an increase of 21.39 hectares impact for the koala. This increase includes the consideration of two additional PCTs of

Species – EPBC Status	Original EPBC Act Referral - Preliminary Documentation (Epuron 2017)		Modification Project		Discrepancy Between Original Federal Approval (EPBC 2014/7163) and Modified Project Re-referral
	Estimated Extent in Project Area	Estimated Extent in Development Corridors	Estimated Extent in Development Corridors	Estimated Extent in Indicative Development Footprints	
				Wind Farm, 0.47 hectares within the Indicative Development Footprint – Permanent Met Masts and 2.82 hectares within the Indicative Development Footprint – External Roads.	habitat for the species, being PCT 298 and PCT 350. Previously only PCT 351 was considered.
Regent honeyeater (*Anthochaera phrygia*) – Critically Endangered	377 hectares Box Gum Woodland CEEC 1,130 hectares of Box Gum Woodland (all) Not known from site	9.5 ha	36.33 hectares of potential habitat in total, entirely within the Development Corridor – Wind Farm. Potential regent honeyeater habitat was not identified within the Development Corridor – Permanent Met Masts.	20.08 hectares of potential habitat within the Indicative Development Footprints. This includes 18.76 hectares within the Indicative Development Footprint – Wind Farm and 1.33 hectares within the Indicative Development Footprint – External Roads. Potential regent honeyeater habitat was not identified within the Indicative Development Footprint – Permanent Met Masts.	This presents an impact reduction of 4.82 hectares for the regent honeyeater.
Swift parrot (*Lathamus discolor*) – Critically Endangered	0 ha – turbine collision risk only	0 ha – turbine collision risk only	36.33 hectares of potential habitat in total, entirely within the Development Corridor – Wind Farm. Potential swift parrot habitat was not identified within the Development Corridor – Permanent Met Masts.	20.08 hectares of potential habitat within the Indicative Development Footprints. This includes 18.76 hectares within the Indicative Development Footprint – Wind Farm and 1.33	This presents an impact reduction of 4.82 hectares for the swift parrot.

Species – EPBC Status	Original EPBC Act Referral - Preliminary Documentation (Epuron 2017)		Modification Project		Discrepancy Between Original Federal Approval (EPBC 2014/7163) and Modified Project Re-referral
	Estimated Extent in Project Area	Estimated Extent in Development Corridors	Estimated Extent in Development Corridors	Estimated Extent in Indicative Development Footprints	
				hectares within the Indicative Development Footprint – External Roads. Potential swift parrot habitat was not identified within the Indicative Development Footprint – Permanent Met Masts.	
White-throated needletail (*Hirundapus caudactus*) – Vulnerable	0 ha	0 ha	Habitat loss not quantifiable– turbine strike risk only	Habitat loss not quantifiable – turbine strike risk only	Habitat loss not quantifiable – turbine strike risk only
Painted Honeyeater (*Grantiella picta*) – Vulnerable	Not assessed, but mentioned in combination with regent honeyeater.	Not assessed, but mentioned in combination with regent honeyeater.	36.33 hectares of habitat in total, entirely within the Development Corridor – Wind Farm. Painted honeyeater habitat was not identified within the Development Corridor – Permanent Met Masts.	20.08 hectares of habitat within the Indicative Development Footprints. This includes 18.76 hectares within the Indicative Development Footprint – Wind Farm and 1.33 hectares within the Indicative Development Footprint – External Roads. Painted honeyeater habitat was not identified within the Indicative Development Footprint – Permanent Met Masts.	This presents a new impact assessment of 20.08 hectares as the painted honeyeater was not assessed previously.

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

As noted earlier, a direct comparison cannot be made between the impact assessments of the Preliminary Documentation (Epuron 2017) and that of the revised BDAR (Umwelt 2020) for the federal *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC on the project due to the substantial updates that were required to be made for the vegetation mapping as part of the State Approval Develop Consent. As a result, the mapping of vegetation communities assessed as part of the modified project and re-referral is substantially different to the original State and Federal approvals. Therefore, the comparison of impacts can only be made between total areas within the previous project footprint and that of the current modification.

Previous Impact Assessment

Approximately 377 hectares of Box Gum Woodland CEEC was identified within the Project Area assessed as part of the Preliminary Documentation (Epuron 2017). Of this, 9.5 hectares was assessed within the project footprint assessed as part of the Preliminary Documentation (Epuron 2017).

The Biodiversity Assessment Addendum (NGH 2016) described 24.9 hectares of Box Gum Woodland and 25.3 hectares of Box Gum Woodland Derived Grassland, totalling 50.2 hectares. The total 50.2 hectares of Box Gum Woodland and Derived Grasslands was analysed against the state White Box Yellow Box Blakely's Red Gum Grassy Woodland EEC (now CEEC) and federal *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC*. This analysis concluded that the entire 50.2 hectares aligned with the state White Box Yellow Box Blakely's Red Gum Grassy Woodland EEC (now CEEC), but just 9.5 hectares (~19 per cent) aligned with the federal *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC*. This being the 9.5 hectares within the project footprint assessed as part of the Preliminary Documentation (Epuron 2017).

It is noted that the Site Boundary / Project Area assessed as part of the Preliminary Documentation (Epuron 2017) will be the extent of all landholdings involved with the project. Umwelt has not completed an assessment of this extent and therefore cannot be directly compared with the revised assessment.

Revised Impact Assessment

Following our substantial updates to the baseline vegetation mapping, Umwelt completed a revised analysis against the respective TECs. This analysis is provided in full within Section 3.2.3 of the revised BDAR (**Appendix G**). However the analysis against the federal *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC* is provided below in **Section 3.5.1**.

The revised analysis completed by Umwelt included consideration of PCT 350 in its entirety, including remnant woodland (Vegetation Zone 3) and derived native grassland (Vegetation Zone 4). The analysis determined that 37.50 hectares of the BC Act listed White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. The majority of which also aligned with the EPBC Act listed counterpart. With 35.73 hectares found to align with the EPBC Act listed White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (see **Appendix I**).

Therefore, Umwelt's analysis concluded a higher proportion of consistency between the two TECs.

The revised BDAR (**Appendix G**) provides justification for the concurrent increased impact on the federal *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC and decreased impact to the state White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (BC Act).

This is not a result of better patches of vegetation being impacted, but rather a more detailed and rigorous analysis of floristic plot data against the federal *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC condition thresholds. Broadly speaking, the area assessed as part of the Modification for the Project is consistent with that assessed as part of the existing approval. However, the revised analysis against the federal *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC condition thresholds completed by Umwelt has resulted in a greater proportion of vegetation aligning with the federal *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC.

A total of 67.64 hectares of the federal *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC was identified within the Development Corridors of the Modified Project. Of which 35.73 hectares will be permanently impacted within the Indicative Development Footprints. This comprises 19.38 hectares of remnant woodland (Vegetation Zone 3) and 16.35 hectares of derived native grassland (Vegetation Zone 4).

2.1.2.2   Golden Sun Moth

Previous Impact Assessment

The Preliminary Documentation (Epuron 2017) presents that two targeted surveys for golden sun moth were undertaken, being flight surveys undertaken between 18 November and 8 December 2013, then habitat assessments between 12 to 15 March 2014.

Flight surveys were undertaken with consideration of the guidelines outlined in EPBC Act Policy statement 3.12 Significant impact guidelines for the critically endangered golden sun moth (DEHWA 2009). Ten search areas were targeted at detecting the presence or absence of the golden sun moth, sites were within Box Gum Woodland, Box Gum Derived Grasslands and to a lesser extent within native pasture.

Habitat surveys were completed to further determine the quality of grassland habitat available within the Project Area assessed as part of the Preliminary Documentation (Epuron 2017) and map potential habitat. Surveys were guided by project specific Director General Requirements (DGRs) issued by OEH and methods were developed in consultation with a BCD (OEH at the time) Senior Threatened Species Officer.

The habitat assessments for golden sun moth were undertaken between 12 to 15 March 2014. The methodology of the assessments involved a mixture of transect and quadrat surveys.

Habitat for golden sun moth were defined as five categories as the golden sun moth is known to occur in a variety of grasslands in varying condition. Wallaby grasses (*Rytidosperma* spp.) were identified as the key species used by golden sun moth and used as the indicator of potential habitat even if present in low abundance. The abundance of wallaby grasses were therefore used as an indicator of quality for the species. The five categories were:

- **Not Present**: 0% wallaby grass

- **Low Abundance**: 1 – 25% wallaby grass

- **Moderate Abundance**: 26 – 50% wallaby grass

- **Good Abundance**: 51 – 75% wallaby grass

- **Excellent Abundance**: 76 – 100% wallaby grass.

The outcome of the habitat assessment identified a total of 5,488 hectares of habitat for golden sun moth in varying quality (**Table 10**) within the Project Area assessed as part of the Preliminary Documentation (Epuron 2017).

Table 10   Preliminary Documentation Golden Sun Moth Habitat Assessment (Epuron 2017)

Golden Sun Moth Habitat Quality	Area within site boundary (ha)
Low Abundance (1 – 25%)	2,023.74
Moderate (26 – 50%)	1,613.54
Good (51 – 75%)	1,570.26
Excellent (76 – 100%)	280.84
Total	**5,488.37**

Habitat suitable for golden sun moth was considered to be habitat where wallaby grass abundance exceeded 25%. Therefore, habitat categories of Moderate, Good and Excellent were assessed as habitat for golden sun moth. Based on this, 3,465 hectares of estimated likely habitat and 315 hectares of known habitat for gold sun moth was recorded within the Project Area assessed as part of the Preliminary Documentation (Epuron 2017), of which, 66.94 hectares of golden sun moth habitat would have been permanently impacted by the project footprint assessed as part of the Preliminary Documentation (Epuron 2017).

It is noted that the Project Area assessed as part of the Preliminary Documentation (Epuron 2017) was the extent of all landholdings involved with the project. Umwelt has not completed an assessment of this extent and therefore cannot be directly compared with the revised assessment.

Revised Impact Assessment

Following extensive consultation with DPIE and BCD, it was agreed that a revised assessment process would be employed to define the impact assessment for golden sun moth. It was acknowledged through the consultation process that the species' habitat is difficult to assess, and this is further complicated for a Project of this scale, and over a long project timeframe and approval history.

Umwelt developed two methods to map golden sun moth species polygons, depending on whether sightings had been recorded in particular locations, or whether surveys had recorded an absence of the species. Each method comprised particular attributes that led to areas of grassland habitat being excluded or included for consideration as the species polygon across all grassland habitats, including derived native grasslands (Vegetation Zone 4 [PCT 350 – DNG] and Vegetation Zone 6 [PCT 351 – DNG], as well as non-native vegetation (Vegetation Zone 10). Attributes considered included relevant vegetation zones, wallaby grass cover categories, golden sun moth records (and 200 metre buffers thereof), shading effects, soil moisture, vegetative barriers, slope and aspect.

The first method applies to the process undertaken to determine golden sun moth habitat within the Development Corridors that do not support existing golden sun moth records. The second method applies to the process undertaken to determine habitat for the species where the species has been recorded. The second method is important as it recognises the species has been recorded potentially outside of ideal habitat requirements, i.e. the species has been recorded in grassland habitat that perhaps does not support suitable cover of wallaby grass. The two methods are described below in **Table 11** and **Table 12**, while further detail on each attribute is provided following these tables.

Table 11   Method 1 – Species polygon assessment in the absence of golden sun moth records

Habitat Parameter	Exclusion	Inclusion
Vegetation Zones	• Remnant forest and woodlands of PCTs 289, 350 and 351 have been excluded (Vegetation Zones 1, 3, 5 and 9) • Shrublands of PCT 351 have been excluded (Vegetation Zones 7 and 8) • Drainage line vegetation of PCT 335 have been excluded (Vegetation Zone 2) *These vegetation zones have been excluded as they are widely not recognised to provide habitat for the species, due to their canopy cover, shrub cover, shading effects and/or soil moisture...etc.*	• Derived native grasslands of PCTs 350 and 351 have been included (Vegetation Zones 4 and 6) • Non-native grasslands (Vegetation Zone 10).
Wallaby Grass Cover Categories – Consistent with NGH (Epuron 2017)[1] **Categories are defined by NGH (Epuron 2017), classification of categories has been updated where relevant based on more recent Umwelt survey results (Umwelt 2020)**	• Not Present (0%) • Low Cover (1 – 25%) *It is acknowledged that there are records within Not Present and Low Cover categories. Habitat within 200m of records has been assessed, an approach consistent with NGH (2017), see table below.*	• Moderate Cover (26 – 50%) • Good Cover (51 – 75%) • Excellent Cover (76 – 100%)
Absence of records despite survey – Scenario 1 (BCD and DPIE Approved 25/9/2020)	• Scenario 1: areas where surveys have been completed in correct GSM season, but not detected. • Extent of survey limit is determined by 100 m either side for transects or otherwise the boundary of areas surveyed.	• Areas not surveyed.
Extent of impact analysis	• Outside of Development Corridors.	• Within the Development Corridors and Indicative Development Footprints
Shading	• 10m buffer of all excluded tree-dominated remnant vegetation into DNG (Vegetation Zones 1, 3, 5, 9) due to shading and soil moisture affects. • Restricted to vegetation zones with a canopy height of at least 10 m.	• Shrubland Vegetation Zones (7 and 8) have not been buffered as their shading factor is considered limited due to their maximum height typically being less than 3 m.

Habitat Parameter	Exclusion	Inclusion
Soil Moisture	• Vegetation Zone 2 as it is mapped along drainage lines. • Deeper soils, waterlogged soils, dominance of tall sedges, rushes, couch and scattered occurrences of tussock grass (Umwelt 2020). • Soil and vegetative structure described above is unsuitable for GSM.	• Not applicable.
Vegetative barriers of at least 200 m and areas historically unlikely to have supported habitat. **Only applied in isolated grassland habitat near proposed Turbine 64.**	• Derived native grasslands that are enclosed by remnant vegetation at least 200 m in width. Vegetative barriers include patches of remnant forests, woodlands and shrublands. • The influence of vegetative barriers that exist beyond the extent of the Development Corridors is also considered.	• If a grassland patch is currently enclosed by remnant forests, woodlands or shrublands, but the location will have historically been connected to surrounding grasslands previously. • Derived native grasslands that historically would have supported suitable habitat for GSM (e.g. grasslands / open grassy woodlands).
Slope (GIS Digital elevation model)	• >13 degrees • The species is documented as using slopes less than 3 degrees (DEWHA 2009), but site data suggests 1.7% (3 of 179 records) of records occur on slopes greater than 13 degrees.	• ≤13 degrees • Site data suggests 98.3% (176 of 179 records) of records occur on slopes 13 degrees or less.
Aspect (GIS Digital elevation model)	• Aspects between east-southeast (112.5°) and south-southwest (202.5°) aspects. • Site data suggest just 7.2% (13 of 179 records) of records occur on south-east and southerly aspects.	• All others • The species is documented to favour northly aspects (DEWHA 2009).

[1] Completed at a wide scale e.g. paddock level. Completed across the project but only completed within Derived native grasslands of PCTs 350 and 351 (Vegetation Zones 4 and 6) and non-native grasslands (Vegetation Zone 10).

Table 12   Method 2 – Species polygon assessment where golden sun moths were recorded

Habitat Parameter	Exclusion	Inclusion
Vegetation Zones	• Remnant forest and woodlands of PCTs 289, 350 and 351 have been excluded (Vegetation Zones 1, 3, 5 and 9) • Shrublands of PCT 351 have been excluded (Vegetation Zones 7 and 8) • Drainage line vegetation of PCT 335 have been excluded (Vegetation Zone 2) *These vegetation zones have been excluded as they are widely not recognised to provide habitat for the species, due to their canopy cover, shrub cover, shading effects and/or soil moisture...etc.*	• Derived native grasslands of PCTs 350 and 351 have been included (Vegetation Zones 4 and 6) • Non-native grasslands (Vegetation Zone 10).
Wallaby Grass Cover Categories – Consistent with NGH (Epuron 2017) [1] *Categories are defined by NGH (Epuron 2017), classification of categories has been updated where relevant based on more recent Umwelt survey results (Umwelt 2020).*	• Not applicable	• Not Present (0%) • Low Cover (1 – 25%) • Moderate Cover (26 – 50%) • Good Cover (51 – 75%) • Excellent Cover (76 – 100%) *It is acknowledged that there are records within all categories. Habitat within 200m of records has been assessed, an approach consistent with NGH (2017).*
GSM Records - 200m buffers	• Remnant forest, woodlands and shrublands (Vegetation Zones 1, 2, 3, 5, 7, 8 and 9) within the 200m record buffers.	• Derived Native Grasslands (Vegetation Zones 4 and 6) within the 200m buffers from records. • Non-native grasslands (Vegetation Zone 10) within 200m buffers from records have been included for the assessment of Prescribed Impact Assessment.

Habitat Parameter	Exclusion	Inclusion
Extent of habitat category classification	• Not applicable	• Completed at a wide scale e.g. paddock level. • Completed across the project but only completed within Derived native grasslands of PCTs 350 and 351 (Vegetation Zones 4 and 6) and non-native grasslands (Vegetation Zone 10).
Extent of impact analysis	• Outside of Development Corridors.	• Within the Development Corridors and Indicative Development Footprints
Shading	• 10m buffer of all excluded tree-dominated remnant vegetation into DNG (Vegetation Zones 1, 3, 5, 9) due to shading and soil moisture affects. • Restricted to vegetation zones with a canopy height of at least 10m.	• Shrubland Vegetation Zones (7 and 8) have not been buffered as their shading factor is considered limited due to their maximum height typically being less than 3m.
Soil Moisture	• Vegetation Zone 2 as it is mapped along drainage lines. • Deeper soils, waterlogged soils, dominance of tall sedges, rushes, couch and scattered occurrences of tussock grass (Umwelt 2020). • Soil and vegetative structure described above is unsuitable for GSM.	• Not applicable.

[1] Completed at a wide scale e.g. paddock level. Completed across the project but only completed within Derived native grasslands of PCTs 350 and 351 (Vegetation Zones 4 and 6) and non-native grasslands (Vegetation Zone 10).

Wallaby Grass Cover Category

The use of Wallaby Grass Cover Categories (being not present; low cover; moderate cover; good cover; and excellent cover) is consistent with the categories defined by NGH in the EPBC Preliminary Documentation (Epuron 2017), as described above. The classification of these categories however has been updated based on additional and more recent Umwelt survey results (Umwelt 2020b). It is noted however that Umwelt's floristic and golden sun moth habitat data generally supported the NGH habitat classification. Where inconsistent, cover categories were updated.

The revised habitat assessment for golden sun moth included a review of all Umwelt plots undertaken within Vegetation Zones 4, 6 and 10, Umwelt golden sun moth habitat transects and NGH GSM Habitat Transects. The percentage cover of wallaby grass (*Rytidosperma* spp.) was determined from each of these survey components. Analysis was then undertaken to determine the percentage cover of wallaby grass that was recorded in all of the beforementioned survey components, using the closest survey component in consistent habitat. This analysis determined that on average, golden sun moth records for the Project occurred where there was at least 30.13% of wallaby grass.

However in recognition of variability of habitat across the Project and to remain consistent with the previous EPBC Preliminary Documentation (Epuron 2017), a conservative approach was taken to use 25% cover of wallaby grass as the measure to consider overarching habitat for golden sun moth.

Extent of Survey

During consultation with DPIE and BCD, a scenario was approved whereby areas of the Project that had been surveyed within the golden sun moth survey season but at which the species had not been detected, grassland habitat in these locations could be excluded from consideration. The application of this scenario required development of the extent to which it was to be applied.

Through this revised assessment of the species, a 100 metre buffer of tracks surveyed by Umwelt within golden sun moth season was applied, while no buffer was applied to the survey areas defined by NGH in the previous EPBC Preliminary Documentation (Epuron 2017). The latter were not buffered as their extent of survey extent is already determined.

Shading

Shading on grassland habitat is known to be negatively associated with suitable golden sun moth habitat (DEWHA 2009b) and the species is known to be particularly vulnerable to shading affects (DEWHA 2009a). The negative association is in regard to soil temperatures, soil moisture and plant characteristics.

All tree-dominated remnant vegetation identified for the Project was buffered by 10 metres, this included Vegetation Zones 1, 3, 5 and 9. All these vegetation zones support intact canopies greater than 10 metres of height (Umwelt 2020). Where these 10 metre buffers intersected with grassland habitats (being Vegetation Zones 4, 6 and 10), this intersected grassland was excluded from consideration of the revised golden sun moth habitat assessment due to the negative association with shading.

Shrubland vegetation (Vegetation Zones 7 and 8) were not buffered as they support vegetation that is typically less than three metres in height.

Soil Moisture

Soil moisture can determine suitability of grassland habitat for golden sun moth. Soil that maintains high moisture levels is not considered to support suitable golden sun moth habitat (DEWHA 2009a and 2009b).

Vegetation Zone 2 was identified within the Project along drainage lines and is therefore associated with consistently high soil moisture. Furthermore, this vegetation zone is characterised by deeper soils,

waterlogged soils, dominance of tall sedges, rushes, couch and scattered occurrences of tussock grass (Umwelt 2020). The mixture of these characteristics is not considered suitable habitat for the golden sun moth and was therefore excluded from the revised golden sun moth habitat assessment.

Vegetative Barriers of at least 200 metres wide

The species is recognised to have limited capability to cope with significant barriers between suitable habitat, with mobile males unlikely to fly more than 100 metres away from suitable habitat (DEWHA 2009a and 2009b). As a result, suitable habitat that is separated by a barrier of greater than 200 metres is considered isolated (DEWHA 2009a and 2009b).

Consequently, patches of derived native grasslands within the Project that were enclosed by remnant vegetation at least 200 m in width were excluded from consideration from the revised golden sun moth habitat assessment. Vegetative barriers included continuous patches of remnant forests, woodlands and shrublands.

Importantly, this attribute was not employed where the derived native grasslands would have historically been connected to surrounding grasslands previously. This is in recognition of the species being able to persist in an isolated patch of derived native grassland if it had previously been connected to additional habitat.

Slope

The golden sun moth is recognised to prefer grassland habitats on slopes of less than 3 degrees (DEWHA 2009b). However, a GIS Digital Elevation Model that was prepared as part of the revised golden sun moth habitat assessment found that 1.7% (3) of all golden sun moth records (179) from the Project occur on slopes greater than 13 degrees. Alternatively, 98.3% (176) of all golden sun moth records (179) from the Project occur on slopes 13 degrees or less.

Consequently, patches of derived native grasslands within the Project that had a slope of greater than 13 degrees were excluded from consideration from the revised golden sun moth habitat assessment.

Aspect

The golden sun moth is recognised to prefer grassland habitats with a northerly aspect (DEWHA 2009b).

However, a GIS Digital Elevation Model that was prepared as part of the revised golden sun moth habitat assessment found that just 7.2% (13) of all golden sun moth records of (179) records from the Project occur on south-east and southerly aspects.

Consequently, patches of derived native grasslands within the Project that occurred on aspects between east-southeast (112.5°) and south-southwest (202.5°) were excluded from consideration from the revised golden sun moth habitat assessment.

The outcome of the application of each method is provided below in **Table 13.** The table displays the results of each method for the three vegetation zones being assessed and clearly defines the area which has been excluded or included as part of the golden sun moth species polygon. Outcomes of the revised golden sun moth habitat assessment are presented in **Appendix K.**

The results are divided into the two Development Corridors (Development Corridor – Wind Farm and Development Corridor – Permanent Met Masts) and three Indicative Development Footprints (Indicative Development Footprints – Wind Farm, Indicative Development Footprints – Permanent Met Masts and Indicative Development Footprints – External Roads). All definitions of the development corridors and development footprints is as per the current BDAR (Umwelt 2020b).

Development Corridors

The revised analysis mapped a total of 224.21 hectares of golden sun moth species polygon within the Development Corridors, comprising 9.92 hectares of Vegetation Zone 4 (PCT 350 – DNG) and 214.29 hectares of Vegetation Zone 6 (PCT 351 – DNG). A further 276.17 hectares of grassland habitat was excluded from the golden sun moth species polygon, comprising 22.79 hectares of Vegetation Zone 4 (PCT 350 – DNG) and 253.38 hectares of Vegetation Zone 6 (PCT 351 – DNG).

An additional 59.26 hectares of Vegetation Zone 10 (Non-native Vegetation) occurs in the Development Corridors. The extent of this vegetation zone within the project will be assessed as part of the Prescribed Impact Assessment of the BDAR. A further 174.50 hectares of Vegetation Zone 10 (Non-native Vegetation) was excluded from the golden sun moth species polygon.

Indicative Development Footprints

The revised analysis mapped a total of 85.28 hectares of golden sun moth species polygon that could be impacted by the Project within the Indicative Development Footprints, comprising 5.42 hectares of Vegetation Zone 4 (PCT 350 – DNG) and 79.86 hectares of Vegetation Zone 6 (PCT 351 – DNG). A further 106.21 hectares of grassland habitat was excluded from the golden sun moth species polygon, comprising 12.10 hectares of Vegetation Zone 4 (PCT 350 – DNG) and 94.11 hectares of Vegetation Zone 6 (PCT 351 – DNG).

An additional 25.53 hectares of Vegetation Zone 10 (Non-native Vegetation) occurs in the Development Corridors. The extent of this vegetation zone within the project will be assessed as part of the Prescribed Impact Assessment of the BDAR. A further 79.64 hectares of Vegetation Zone 10 (Non-native Vegetation) was excluded from the golden sun moth species polygon.

The previous golden sun moth species polygon for the project totalled 43.20 hectares (Umwelt 2020b). The revised assessment totalling 85.28 hectares presents an increase of 42.08 hectares.

Table 13   Summary of species polygon analysis for golden sun moth

	Assessment Outcome	Development Corridors							Indicative Development Footprints								
		Development Corridor - Wind Farm (ha)		Development Corridor - Permanent Met Masts (ha)		Total (ha)			Indicative Development Footprint - Wind Farm (ha)		Indicative Development Footprint - Permanent Met Masts (ha)		Indicative Development Footprint - External Roads (ha)		Total (ha)		
		SWS	SEH	SWS	SEH	SWS	SEH	Total	SWS	SEH	SWS	SEH	SWS	SEH	SWS	SEH	Total
Method 1 - No Records																	
Vegetation Zone 4 (PCT 350-DNG)	Habitat Exclusion	18.15	4.14	0.00	0.00	18.15	4.14	22.29	9.14	2.22	0.00	0.00	0.67	0.00	9.81	2.22	12.03
	GSM Habitat Inclusion	**2.85**	**1.98**	**0.00**	**0.00**	**2.85**	**1.98**	**4.83**	**1.44**	**0.87**	**0.00**	**0.00**	**0.00**	**0.00**	**1.44**	**0.87**	**2.31**
Vegetation Zone 6 (PCT 351-DNG)	Habitat Exclusion	177.31	65.52	5.09	0.55	182.40	66.07	248.47	70.44	20.17	1.33	0.10	0.14	0.00	71.91	20.27	92.18
	GSM Habitat Inclusion	**97.18**	**26.45**	**9.67**	**2.51**	**106.85**	**28.96**	**135.81**	**39.76**	**9.06**	**1.65**	**0.84**	**0.00**	**0.00**	**41.41**	**9.90**	**51.31**
Vegetation Zone 10 (Non-native)	Habitat Exclusion	113.43	57.77	0.00	2.53	113.43	60.30	173.73	44.22	20.61	0.40	0.47	13.60	0.00	58.22	21.08	79.30
	GSM Habitat Inclusion	**17.42**	**10.63**	**0.00**	**0.00**	**17.42**	**10.63**	**28.05**	**7.16**	**4.06**	**0.00**	**0.00**	**0.00**	**0.00**	**7.16**	**4.06**	**11.22**
Method 2 - Records																	
Vegetation Zone 4 (PCT 350-DNG)	Habitat Exclusion	0.00	0.50	0.00	0.00	0.00	0.50	0.50	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.07	0.07
	GSM Habitat Inclusion	**1.36**	**3.73**	**0.00**	**0.00**	**1.36**	**3.73**	**5.09**	**0.65**	**2.46**	**0.00**	**0.00**	**0.00**	**0.00**	**0.65**	**2.46**	**3.11**
Vegetation Zone 6 (PCT 351-DNG)	Habitat Exclusion	2.54	2.36	0.01	0.00	2.55	2.36	4.91	0.86	1.03	0.02	0.02	0.00	0.00	0.88	1.05	1.93
	GSM Habitat Inclusion	**38.00**	**40.39**	**0.00**	**0.09**	**38.00**	**40.48**	**78.48**	**14.33**	**13.42**	**0.16**	**0.64**	**0.00**	**0.00**	**14.49**	**14.06**	**28.55**
Vegetation Zone 10 (Non-native)	Habitat Exclusion	0.55	0.17	0.05	0.00	0.60	0.17	0.77	0.18	0.11	0.05	0.00	0.00	0.00	0.23	0.11	0.34
	GSM Habitat Inclusion	**10.45**	**19.29**	**0.31**	**1.16**	**10.76**	**20.45**	**31.21**	**4.66**	**9.22**	**0.28**	**0.15**	**0.00**	**0.00**	**4.94**	**9.37**	**14.31**

2.1.2.3   Striped Legless Lizard

Previous Impact Assessment

The Preliminary Documentation (Epuron 2017) presents that three targeted surveys were undertaken for the striped legless lizard, being artificial shelter surveys installed in July 2013 and checked in October 2013, funnel trap surveys between 4 to 8 November 2013 and habitat assessments between 12 to 15 March 2014.

Striped legless lizard surveys were guided by the Survey Guidelines for Australia Threatened Reptiles: Guidelines for detecting reptiles listed as threatened under the EPBC Act 1999 (SEWPAC 2011), NSW Guidelines for Threatened Species (DEC 2004), the project specific Director-General Requirements (DGRs) issued by NSW Office of Environment and Heritage (OEH). Methods and survey effort, including the protocol for checking tiles, were developed in consultation with a BCD (OEH at the time) Senior Threatened Species Officer.

A total of ten artificial tile grids were installed; five were installed on 11 July 2013 and five were installed on 10 to 11 October 2013. The artificial tile grids were checked during spring and summer 2013. Site selection was based on EPBC guidelines (DSEWPC 2011). Funnel trap surveys were undertaken to support the artificial shelter survey detailed above. Funnel trap surveys were undertaken between 4 and 8 November 2013. Twelve funnel traps were installed at two sites.

Habitat assessments were undertaken at the same time as the golden sun moth habitat assessments. The habitat assessments for striped legless lizard were undertaken between 12 and 15 March 2014. The methodology of the assessments involved a mixture of transect and quadrat surveys and were developed in consultation with a BCD (OEH at the time) Senior Threatened Species Officer.

Likely habitat suitability for striped legless lizard was delineated as four categories, comprising Excellent, Good, Moderate and Low. The four categories are described below.

- **Excellent**: Tussock forming native grasses dominant (exotic species may be present but in lower abundance). Tussock forming species relatively dense and continuous (≥ 50 % cover). Rock and ground timber present. Low - moderate grazing pressure.

- **Good**: Tussock forming native or exotic grasses dominant. Tussock forming species relatively dense and continuous (≥ 50% cover), rock and ground timber present or absent. Or if tussock forming species not continuous, rock and ground timber present. Low - moderate grazing pressure.

- **Moderate**: Tussock forming grasses present (native or exotic species). Tussock forming species moderately dense (≤ 50% cover). Rock and ground timber generally absent or in low abundance. Low - moderate grazing pressure.

- **Low**: No to little tussock forming species or rock or ground timber shelter available. Moderate-high grazing pressure.

The outcome of the habitat assessment identified a total of 6,407 hectares of native grasslands in these categories (**Table 14**) within the Project Area / Site Boundary assessed as part of the Preliminary Documentation (Epuron 2017). It is noted that the Site Boundary / Project Area assessed as part of the Preliminary Documentation (Epuron 2017) relates to the extent of relevant landholdings of all landholdings involved with the project at the time of the Preliminary Documentation. Umwelt has not completed an assessment of this extent and therefore cannot be directly compared with the revised assessment.

Table 14   Preliminary Documentation Striped Legless Lizard Habitat Assessment (Epuron 2017)

Striped Legless Lizard Habitat Quality	Area within site boundary (ha)
Excellent	1,140
Good	1,271
Moderate	2,547
Low	1,449
Total	**6,407**

The low and moderate habitat quality categories were excluded as potential habitat due to their lack of dense and continuous cover of tussock forming species present.

NGH took the approach of known habitat being that of suitable habitat (i.e. excellent and good quality habitat) contiguous with that of the known record (Epuron 2017). The justification for this position was that suitable habitat at the site is present as disjunct patches across very broad areas separated by expanses of less suitable habitat. Through this BCD supported approach, known habitat was defined as continuous excellent and good condition habitat separated by no more than 30 metres (Epuron 2017). As a result, 512 hectares of known habitat for striped legless lizard was identified as being impacted by the Project Area assessed as part of the Preliminary Documentation (Epuron 2017). This is referred to as the area of 'known habitat' for striped legless lizard which occurs in the north of the Project, south of Grassy Creek Road.

This area of known habitat is mapped within the Project Area assessed as part of the Preliminary Documentation (Epuron 2017), which is much larger than that considered by Umwelt. It extends well beyond the Development Corridors and Indicative Development Footprints. Umwelt supports this approach, as did BCD on 13 October 2015 (Epuron 2017).

NGH also identified 2,411 hectares of potential / likely habitat for striped legless lizard within the Project Area assessed as part of the Preliminary Documentation (Epuron 2017). This was suitable habitat (i.e. excellent and good quality habitat) in which striped legless lizard was not detected by targeted surveys (tile arrays, active searches and funnel trapping).

Of the 512 hectares of 'known habitat' within the Project Area assessed as part of the Preliminary Documentation (Epuron 2017), 10.5 hectares is documented as being permanently impacted by the project footprint assessed as part of the Preliminary Documentation (Epuron 2017). Furthermore, of the 2,411 hectares of 'likely / potential habitat' within the Project Area assessed as part of the Preliminary Documentation (Epuron 2017), 39 hectares is documented as being permanently impacted by the project footprint assessed as part of the Preliminary Documentation (Epuron 2017).

Revised Impact Assessment

There is a large amount of documentation regarding survey effort, habitat assessment and impact consideration for the striped legless lizard through the Biodiversity Assessment (NGH 2014), Biodiversity Assessment Addendum (NGH 2016) and the Preliminary Documentation (Epuron 2017). Furthermore, there is a degree of inconsistency between these documents, some which may be the result of alterations of Project design and some which are likely a result of inconsistent reporting. It is not possible to directly compare the original referral with that of the re-referral due to the substantial refinement to the baseline vegetation and key habitat mapping in the Development Corridor. Similarly, a comparison cannot be made with the habitat identified as part of the Project Area assessed as part of the Preliminary Documentation (Epuron 2017) as this same extent was not considered as part of the modified project assessment.

Umwelt used the original mapping of known striped legless lizard habitat, i.e. 512 hectares in the Project Area assessed as part of the Preliminary Documentation (Epuron 2017), to determine impacts on known habitat. Of the 512 hectares of known habitat for striped legless lizard identified within the Project Area assessed as part of the Preliminary Documentation (Epuron 2017), 126.11 hectares occur within the Development Corridors assessed as part of the modification project. This comprises 125.45 hectares within the Development Corridor – Wind Farm and 0.66 hectares within the Development Corridor Permanent Masts. Of the extent within the Development Corridors, 43.29 hectares occur within the Indicative Development Footprints assessed as part of the modification project, comprising 42.72 hectares within the Indicative Development Footprint – Wind Farm and 0.57 hectares within the Indicative Development Footprint – Permanent Met Masts. It is noted that the impacts identified for the species in relation to the permanent met masts occurs at the boundary edge of the habitat for the species. While it presents an impact to the species it will not further fragment or isolate the remaining habitat.

However, the identification of 2,411 hectares of likely / potential habitat considered as part of the Preliminary Documentation (Epuron 2017) is not supported by the results of the ecological surveys or consistent with the referral guidelines for striped legless lizard (DSEWPC 2011). Targeted surveys for the striped legless lizard occurred throughout the Project Area assessed as part of the Preliminary Documentation (Epuron 2017). These targeted surveys considered the Guidelines for Australia Threatened Reptiles: Guidelines for detecting reptiles listed as threatened under the EPBC Act 1999 (SEWPAC 2011), NSW Guidelines for Threatened Species (DEC 2004), and the project specific Director-General Requirements (DGRs) issued by NSW Office of Environment and Heritage (OEH). Furthermore, these surveys were completed in accordance with the referral guidelines for striped legless lizard (DSEWPC 2011), comprising artificial tile grids, active searching, funnel traps with use of drift line (replicating pit-fall trapping) and supported by habitat assessments.

The one record of the species occurred in a single continuous patch of grassland habitat, which subsequently formed the identification of the 512 hectares of known habitat for the species within the Project Area assessed as part of the Preliminary Documentation (Epuron 2017). While the location of the record occurs within the predominant agricultural land use of the area (cattle grazing, and occasionally sheep grazing), it is within an area that has been less intensively grazed than other similar areas throughout the Development Corridors. Therefore the extrapolation of this known habitat to other areas that are regarded as likely / potential habitat as part of the Preliminary Documentation (Epuron 2017), but are more intensively grazed, is not appropriate.

There were no striped legless lizards recorded in the remaining grassland habitats of the Project Area assessed as part of the Preliminary Documentation (Epuron 2017), Therefore while 2,411 hectares of likely / potential habitat for the species was identified within the Preliminary Documentation (Epuron 2017), based on habitat condition and survey results, it is not appropriate for these areas to be assessed as generating impacts for the species in the modification project. Properties within the Development Corridors to the north and south of the known record are considered to support more intensive agricultural land uses, whether that constitutes sheep grazing as the primary or sole stock, higher stocking rates or also includes soil disturbing activities such as ploughing or tilling. While the 2,411 hectares of likely / potential habitat for the species was identified within the Preliminary Documentation (Epuron 2017) as potentially suitable for the striped legless lizard, the absence of records of the species and observations of more intensive agricultural land uses strongly indicates the species is not utilising this broader area.

Based on the original NGH mapping of known habitat within the Preliminary Documentation (Epuron 2017), there would be impacts of 43.29 hectares of striped legless lizard habitat within the Indicative Development Footprints, 6.21 hectares less than the current impact threshold for the species as part of the existing federal approval (EPBC 2014/7163) of 49.5 hectares. Outcomes of the revised striped legless lizard assessment are presented in **Appendix K.**

Due to the different treatment of potential habitat in this assessment, as justified by survey results, no areas of potential habitat would be impacted. This updated impact assessment for the striped legless lizard will need to inform an update to the credit calculations as part of the BDAR.

Umwelt has considered the assessment approach described above with direct regard for the Referral Guidelines for the striped legless lizard (DSEWPC, 2011) for the Department's consideration:

- The single record of the striped legless lizard indicates an 'important population' of the species.

- The definition and assessment of 512 hectares of 'known habitat' within a single continuous patch of grassland habitat within the north of the Project meets the threshold for medium to long-term habitat and population viability, being greater than 0.5 hectares.

- Umwelt considers the exclusion of the 'likely / potential habitat' for the species identified within the Preliminary Documentation (Epuron 2017) to be consistent with the Referral Guidelines for the striped legless lizard (DSEWPC, 2011). Justification being that this exclusion is based on the results of 9 artificial tile grid arrays and funnel traps in combination with habitat assessment, which did not record striped legless lizard. While the Preliminary Documentation reported 2,411 hectares of likely / potential habitat for the species (Epuron 2017), with artificial tile grid arrays and funnel trap lines completed throughout this habitat in accordance with the Referral Guidelines for the striped legless lizard (DSEWPC, 2011) it is believed no important population occurs within the remainder of the Project.

2.1.2.4   Superb Parrot

Previous Impact Assessment

The Preliminary Documentation (Epuron 2017) states that the remnant and regrowth Box Gum Woodland vegetation community provides habitat for superb parrot. It was further noted that preference was shown toward stands of Box Gum Woodland CEEC, with lower quality Box Gum Woodland not considered to be optimal habitat for the species.

Approximately 1,130 hectares of Box Gum Woodland is documented as occurring within the previously considered Project Area and could be considered as potential habitat for the species. However as noted in the paragraph above, superb parrot was assessed as showing preference to the Box Gum Woodland CEEC of which 377 hectares is recorded as occurring in the previously considered Project Area.

Three hollow-bearing trees were recorded as being known nest trees for superb parrot. A further two potential nest trees were also recorded.

In total, the Preliminary Documentation (Epuron 2017) reports 24.9 hectares of Box Gum Woodland habitat for the superb parrot will be impacted by the Project. This is the full extent of remnant Box Gum Woodland within the Project footprint. Of the 24.9 hectares, 9.5 hectares is noted as comprising Box Gum Woodland CEEC. This is not in addition to, but rather part thereof.

The three superb parrot known nest trees were identified as being avoided by the project. However a total of 170 hollow-bearing trees that could potentially support breeding habitat for the species were identified as being impacted by the footprint assessed as part of the Preliminary Documentation (Epuron 2017).

Revised Impact Assessment

The updated impact assessment completed by Umwelt as part of the re-referral remains consistent with this approach of determining impacts for the superb parrot, being that all PCT 350 remnant woodland (Vegetation Zone 3) provides suitable habitat for the superb parrot. This totals 20.08 hectares within the Indicative Development Footprints, which is part of the 36.33 hectares identified within the Development Corridor – Wind Farm (**Appendix J**).

Umwelt refers to this habitat as 'breeding habitat' for the superb parrot in accordance with BAM (OEH 2017). However the habitat definition is consistent with that assigned previously by NGH as 'foraging habitat'. Differences in areas between the two terminology is a result of detailed updates to the vegetation mapping for the Project (a requirement of the existing state approval) as well as the various project design changes that have occurred since the original Referral.

As noted above in **Section 2.1.1**, the Project will impact directly on a total of 233 hollow bearing trees within the Indicative Development Footprints, 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 4.0**, 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.

Blade Strike Assessment

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).

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 (**Appendix L**), with survey effort focused 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:
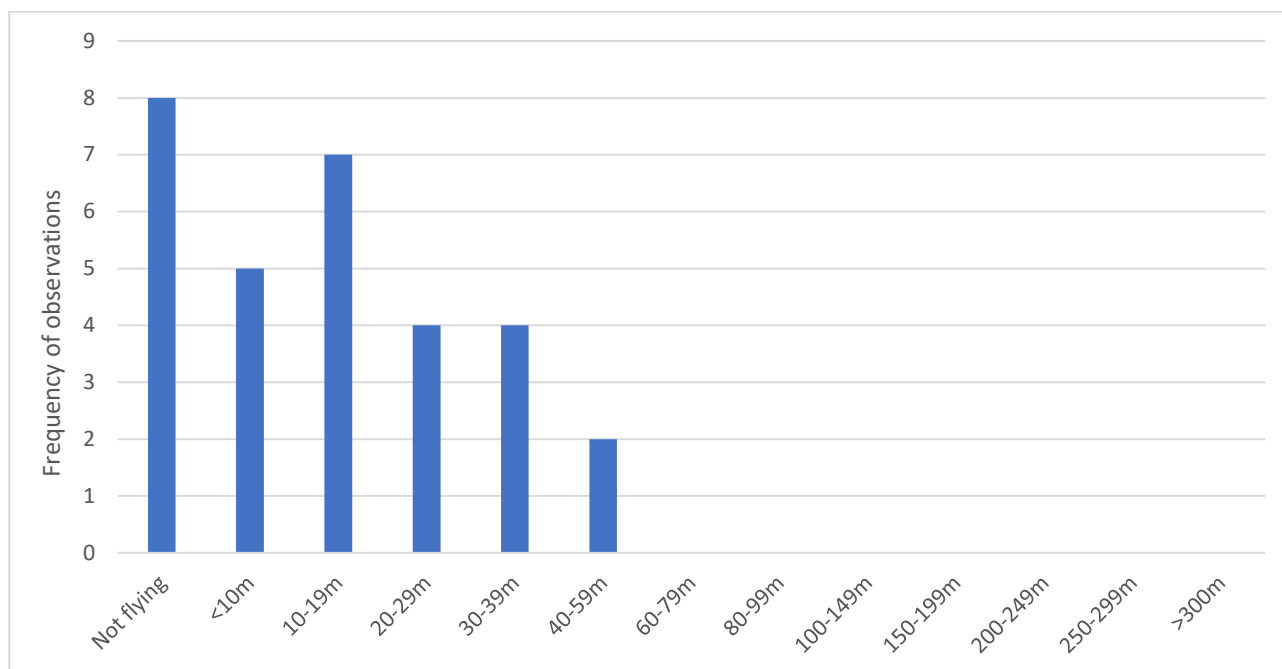
- 30 January 2019: three superb parrots were observed flying in a northerly direction at 15 m AGL in the north-eastern section of the Project Area 500 m east of proposed turbine #22 and 700 m west of proposed turbine #136.

- 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 and not flying on 8 occasions (**Graph 1**). 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 1**.

Graph 1 Frequency of superb parrot observations in each height class

The overall risk rating for superb parrot is high, based on a high likelihood and moderate consequence of collisions (**Table 15**). 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 parrots 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 15　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	

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 three wind farms that are approved or under construction in the region (being Bango Wind Farm, Biala Wind Farm and Coppabella Wind Farm) 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 potential to result in an increase in the 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. It is noted that the current assessment is based on the proposed modification turbine layout which supports 80 wind turbines. However as noted above in **Section 1.0** it is expected the final modified project will result in a number of turbines being removed, possibly to a layout of 77 wind turbines. The Prescribed Impact Assessment has not been updated to capture this change as it remains unclear the extent of turbines being removed. However, a reduction in the number of wind turbines will reduce the percentage increase of total turbines in the region.

The degree to which this development will contribute to the overall cumulative impact is unknown however, 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 Bango Wind Farm will pose a greater risk per turbine (and potentially overall) to superb parrot than the Rye Park Wind Farm 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 and Coppabella 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). It is understood the research team have decided to prepare separate management plans for each project given the differing construction timeframes. This research may allow an informed cumulative impact assessment to be conducted for this region in the future.

2.1.2.5 Koala

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). Call playback and nocturnal spotlighting searches were also undertaken in suitable habitat areas. Remote cameras were installed within the Development Corridor and Indicative Development Footprint – External Roads to target the koala in February and March 2018 (Umwelt). 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).

Despite the extensive field survey efforts described above, no individuals or signs thereof were recorded.

Previous Impact Assessment

The Preliminary Documentation (Epuron 2017) for the Project noted that the koala was not listed as a MNES at the time of the original request assessment, it adds that the species is not considered at risk from the proposed action. It considers it highly unlikely the koala would occur in the Box Gum Woodland community identified in the Project due to its openness and fragmented state. Instead, habitat for the koala is linked to the Scribbly Gum Forest identified in the Project.

The Preliminary Documentation (Epuron 2017) found that 84.9 hectares will be cleared by the project footprint assessed as part of the Preliminary Documentation. This includes 64 hectares in moderate or good condition and 20.5 hectares in poor condition. With 3,664.6 hectares occurring in the wider 'Project Area' assessed as part of the Preliminary Documentation (Epuron 2017).

Revised Impact Assessment

Umwelt considered the Draft Koala Habitat Protection Guideline (DPIE 2020). In the absence of current records of the species within the Development Corridors, 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 likely to be deemed 'Highly Suitable Koala Habitat' (DPIE 2020).

Together, these PCTs contain several koala tree species as per schedule 2 of the SEPP, including Blakely's red gum (*Eucalyptus blakelyi*), apple box (*Eucalyptus bridgesiana*), river red gum (*Eucalyptus camaldulensis*), bundy (*Eucalyptus goniocalyx*), red stringybark (*Eucalyptus macrorhyncha*), yellow box (*Eucalyptus melliodora*), brittle gum (*Eucalyptus mannifera*) and mugga ironbark (*Eucalyptus sideroxylon*).

The revised assessment completed by Umwelt found that the Project will result in the loss of approximately 106.29 hectares of potential foraging and breeding habitat for the koala within the Indicative Development Footprints. This comprised vegetation within PCT 289 (Moderate to Good Condition – Vegetation Zone 1), PCT 350 (Moderate to Good Condition – Vegetation Zone 3) and PCT 351 (Moderate to Good Condition – Vegetation Zone 5 and Argyle Apple Forest – Vegetation Zone 9), with 269.83 hectares identified in the Development Corridors.

As previously discussed, it is not possible to directly compare the koala assessment of the original referral with that of the re-referral due to the substantial updates to the baseline vegetation and key habitat mapping. A comparison can also not be made with the habitat identified as part of the wider 'Project Area' previously assessed as this extent was not considered as part of the revised assessment.

A comparison can only be made strictly between the extent of habitat assessed within the footprints. The original referral considering 84.9 hectares, solely comprising Scribbly Gum Forest or PCT 351 as per the revised assessment. The revised assessment considers an increased impact on habitat for the koala totalling 106.29 hectares, being 21.39 hectares greater than the original assessment. However this considers two additional vegetation communities, being PCT 298 and PCT 350.

2.1.2.6   Regent Honeyeater

The regent honeyeater is a rare visitor to the Boorowa / Rye Park / Yass region having been recorded in the most recently near Yass in 1998 and near Frogmore in 2001 and 2003. It was not recorded during bird surveys conducted in the Project Area by NGH Environmental during November 2013 or by Umwelt during surveys conducted in February, March, October and November 2018 and January, February, March, April and July 2019. There are no contemporary or historic records from the Project Area.

Previous Impact Assessment

The Preliminary Documentation (NGH 2017) noted that the extent of habitat within the region for the regent honeyeater is unknown, noting that at a minimum the habitat would be linked to the distribution of Box Gum Woodland and native grasslands. As a result, it considers the potential foraging habitat for the regent honeyeater to be the better quality Box Gum Woodland CEEC within the southern section of the proposed Project. Totalling 377 hectares in the previously considered Project Area assessed as part of the Preliminary Documentation (Epuron 2017), of which 9.5 hectares would be impacted by the footprint assessed as part of the Preliminary Documentation (Epuron 2017). However it states that the Project does not support primary foraging habitat.

Revised Impact Assessment

For the purpose of this re-referral, it is assumed that the regent honeyeater has the potential to utilise woodland habitat within the Indicative Development Footprints and wider area, for foraging and potentially breeding, as the species is highly mobile and irregularly detected over a wide range. The likelihood of the species utilising habitat in the Indicative Development Footprints is consistent with that of extensive areas of degraded woodland and dry forest throughout the species range.

As previously discussed, it is not possible to directly compare the regent honeyeater assessment of the original referral with that of the re-referral due to the substantial updates to the baseline vegetation and key habitat mapping. A comparison can also not be made with the habitat identified as part of the wider 'Project Area' assessed as part of the Preliminary Documentation (Epuron 2017) as this extent was not considered as part of the revised assessment.

However, remaining consistent with this assessment approach, Umwelt also considers the PCT 350 remnant woodlands (Vegetation Zone 3) to provide potential habitat for the regent honeyeater. Thus, the modified project will impact on 20.08 hectares of potential habitat for the regent honeyeater, with 36.33 hectares of potential habitat for the species occurring within the Development Corridors.

2.1.2.7   Swift Parrot

The swift parrot is an uncommon / rare visitor to woodlands in the Boorowa / Rye Park / Yass region, though the greater south-west slopes region provides key foraging habitat for this species (Saunders and Saunders and Henson 2008). All records in the Boorowa / Rye Park / Yass region since 2000 are from the Frogmore area, approximately 15 kilometres north of the Project where swift parrot were observed in 2001, 2008, 2013 and 2014. Swift parrots were not recorded during targeted surveys conducted by NGH Environmental from 8-12 July 2013 or by Umwelt during extensive bird surveys conducted during September and October 2018 and April, July and September 2019.

Previous Impact Assessment

The Preliminary Documentation (NGH 2017) noted that the remnant and regrowth Box Gum Woodland provide foraging habitat for swift parrot in the project area assessed as part of the Preliminary Documentation (Epuron 2017). It adds, the best area of this habitat occurs in the form of Box Gum Woodland CEEC within the southern section of the proposed Project, totalling 377 hectares in the Project Area assessed as part of the Preliminary Documentation (Epuron 2017), of which 9.5 hectares would be impacted by the project assessed as part of the Preliminary Documentation (Epuron 2017).

Revised Impact Assessment

As previously discussed, it is not possible to directly compare the swift parrot assessment of the original referral with that of the re-referral due to the substantial updates to the baseline vegetation and key habitat mapping. A comparison can also not be made with the habitat identified as part of the wider 'Project Area' previously assessed as part of the Preliminary Documentation (Epuron 2017) as this extent was not considered as part of the revised assessment.

However, remaining consistent with this assessment approach, Umwelt also considers the PCT 350 remnant woodlands (Vegetation Zone 3) to provide potential habitat for the swift parrot. Thus, the modified project will impact on 20.08 hectares of potential habitat for the swift parrot, with 36.33 hectares of potential habitat for the species occurring within the Development Corridors.

2.1.2.8   White-throated needletail

Revised Impact Assessment

This species was not previously assessed as part of the Preliminary Documentation (Epuron 2017).

There were no observations of white-throated needletail roosting or behaving as if preparing to roost in the Project Area. Furthermore, no white-throated needletail were seen within three hours of sunrise, which would have potentially indicated the species was roosting in the Project Area. The latest observation (and the sole observation within one hour of sunset) was of 41 individuals flying south out of the Project Area singularly or in small loose flocks over a 20 minute period. It is considered highly unlikely that the Project Area supports roosting habitat. As such, impacts have not been considered for habitat of this species as part of the re-referral.

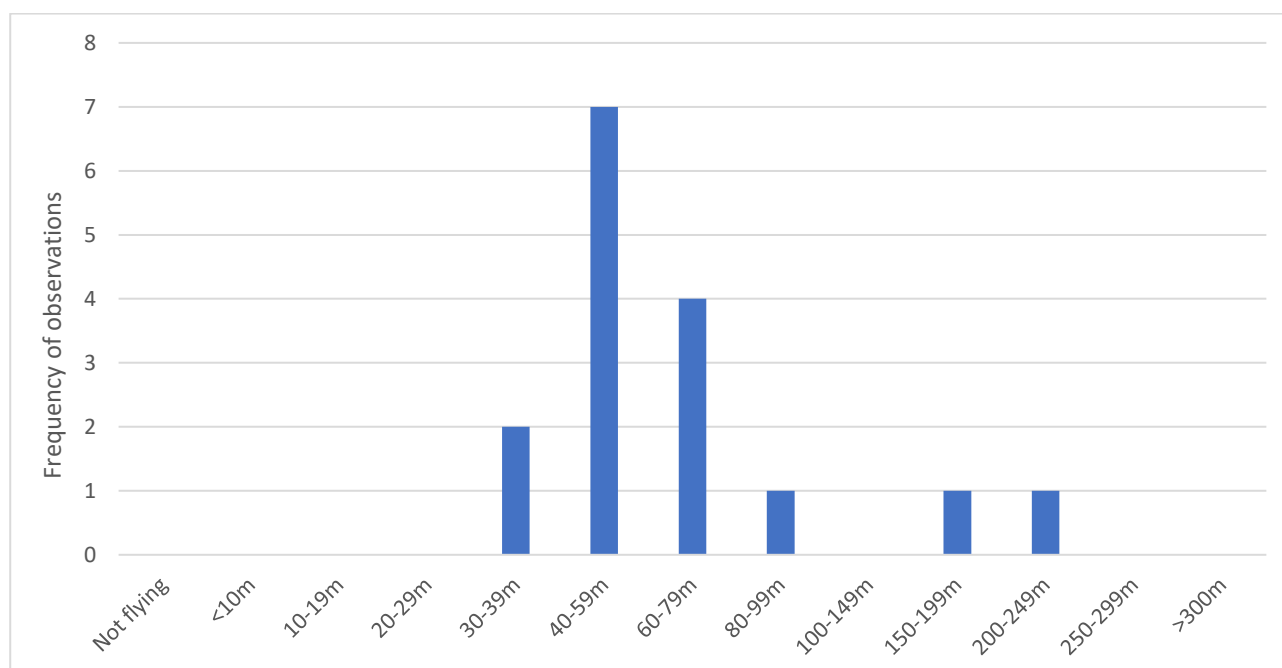Impacts have only been considered in regard to turbine blade strike. This is provided below.

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.

White-throated needletails were recorded on 16 occasions in the Project Area in February/March 2019 (**Appendix L**). 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 2**). 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 2   Frequency of observations of white-throated needletail in each height class.

The overall risk rating for white-throated needletail is high, based on a high likelihood and moderate consequence of collisions (**Table 16**). 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 16   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	

2.1.2.9   Painted Honeyeater

The painted honeyeater is an uncommon species in the Boorowa / Rye Park / Yass region where it is predominantly recorded in box-gum woodland and in riverine areas during spring and summer. Painted honeyeater were recorded at six locations in the Project Area by NGH Environmental during November 2013 including near, but not within the Indicative Development Footprints. There are no other records of painted honeyeater in the Indicative Development Footprints. The species is an occasional, and potentially breeding visitor to the Project Area, with their occurrence likely to be correlated with the availability of flowering mistletoes.

Previous Impact Assessment

The Preliminary Documentation (NGH 2017) does not assess the painted honeyeater specifically. Rather it uses the species as a surrogate habitat indicator in the assessment of regent honeyeater. Thus, habitat for the painted honeyeater was linked to the distribution of Box Gum Woodland and native grasslands. As a result, it considers the potential habitat for the painted honeyeater to be the better quality Box Gum Woodland CEEC within the southern section of the proposed Project assessed as part of the Preliminary Documentation (Epuron 2017), totalling 377 hectares in the previously considered Project Area assessed as

part of the Preliminary Documentation (Epuron 2017), of which 9.5 hectares would be impacted by the project assessed as part of the Preliminary Documentation (Epuron 2017).

Revised Impact Assessment

As previously discussed, it is not possible to directly compare the painted honeyeater assessment of the original referral with that of the re-referral due to the substantial updates to the baseline vegetation and key habitat mapping. A comparison can also not be made with the habitat identified as part of the wider 'Project Area' previously assessed as part of the Preliminary Documentation (Epuron 2017) as this extent was not considered as part of the revised assessment.

However, remaining consistent with this assessment approach, Umwelt also considers the PCT 350 remnant woodlands (Vegetation Zone 3) to provide potential habitat for the painted honeyeater. Thus, the modified project will impact on 20.08 hectares of potential habitat for the regent honeyeater, with 36.33 hectares of potential habitat for the species occurring within the Development Corridors.

2.1.3   Assessment of Significance

For those EPBC Act listed species and ecological community recorded or considered likely to occur in the Indicative Development Footprints based on the identification of suitable habitat, an Assessment of Significance has been undertaken (refer to **Appendix M**), according to the Significant Impact Criteria in the Significant Impact Guidelines (DoE 2013).

Outcomes of the nine Assessments of Significance are provided below.

- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC – the Project is considered **likely to have a significant impact** on this CEEC,

- Superb parrot – the Project is considered to have a low **potential of significant impact** on this species through a combination of habitat loss and blade strike,

- Swift parrot – the Project is considered **unlikely to have a significant impact** on this species,

- White-throated needletail – the Project has the **potential to have a significant impact** on the species as there is a real chance of direct impacts on an ecologically significant proportion of its population,

- Regent honeyeater – the Project is considered **unlikely to have a significant impact** on this species,

- Painted honeyeater – the Project is considered **unlikely to have a significant impact** on this species,

- Striped legless lizard – the Project has the **potential to cause a significant impact** on the species,

- Golden sun moth – the Project is considered **likely to have a significant impact** on the species, and

- Koala – the Project is considered is **unlikely to have a significant impact** on the species.

2.2   Listed Migratory Species

Through consideration of the biodiversity assessments mentioned above in **Section 2.1**, one listed migratory and one listed marine species were recorded within the Indicative Development Footprints, being the white-throated needletail (*Hirundapus caudacutus*) (migratory) and rainbow bee-eater (*Merops ornatus*) (marine).

2.2.1   Impact Table

Table 17 below presents the migratory MNES that have been assessed further in this document and identifies the associated impacts.

Table 17   Migratory or Marine MNES assessed further for the Project

Species	Original EPBC Act Referral - Preliminary Documentation (21 Apr 2017)		Modification Project	
	Estimated Extent in Project Area	**Estimated Permanent Habitat Loss**	**Estimated Extent in Development Corridors**	**Estimated Extent in Indicative Development Footprints**
White-throated needletail *Hirundapus caudacutus*	0 ha	0 ha	Habitat loss not quantifiable – turbine strike risk only	Habitat loss not quantifiable – turbine strike risk only
Rainbow bee-eater *Merops ornatus*	Not assessed	Not assessed	14.58 hectares in total within the Development Corridor – Wind Farm. Rainbow bee-eater habitat was not identified within the Development Corridor – Permanent Met Masts.	5.50 hectares in total, entirely within the Indicative Development Footprint – Wind Farm. Rainbow bee-eater habitat was not identified within the Indicative Development Footprint – Permanent Met Masts or Indicative Development Footprint – External Roads.

2.2.1.1   White-throated Needletail

Assessment of this species in regard to potential impacts of turbine strike is provided above in **Section 2.1.2**.

2.2.1.2   Rainbow Bee-eater

The species was not previously considered as part of the Preliminary Documentation (Epuron 2017).

The rainbow bee-eater is an aerial nomad / migrant, marine listed species under the EPBC Act. The species is distributed across much of mainland Australia. The number of locations that the rainbow bee-eater occurs in is unknown, and has not been estimated. The concept of discrete locations is difficult to apply to the species because of its widespread distribution and its ability to undertake long-distance movements (Species Profile and Threats Database, 2020). The species distribution extends from Australia into eastern Indonesia, the Lesser Sundas and Sulawesi, and east to Papua New Guinea, the Bismarck Archipelago and, rarely, the Solomon Islands (Species Profile and Threats Database, 2020). It is a vagrant visitor to locations further north including Palau, south-western Micronesia, Saipan, the northern Mariana Islands, and Miyako Island and the southern Ryuku Islands in Japan (DoE, 2020).

The rainbow bee-eater was recorded on 12 occasions, with the majority (8/12 [67%]) of observations in flight in the Project Area were of flocks flying between 30-150 m AGL. Wind farms have not been identified as a formal threat for the species. In fact, the only actual identified threat to the species is the introduced cane toad which reduces breeding success and productivity by feeding on eggs and nestlings (DoE, 2020).

As the rainbow bee-eater was often recorded within the Project RSA, it will be susceptible to impacts from blade strike. Furthermore, the Project will impact on 5.50 hectares (PCT 335 – Vegetation Zone 2) of habitat that could potentially be used for breeding purposes, while a total of 14.58 hectares was identified within the Development Corridors.

2.2.2 Assessment of Significance

For the EPBC Act listed migratory species' recorded or considered likely to occur in the Project Area based on the identification of suitable habitat, an Assessment of Significance has been undertaken (refer to **Appendix M**), according to the Significant Impact Criteria in the Significant Impact Guidelines (DoE 2013).

An assessment of significance for the migratory listing of the white-throated needletail and rainbow bee-eater was completed. The assessment for white-throated needletail concluded that the Project **may potentially have a significant impact** on the species. The assessment for rainbow bee-eater concluded that the Project is **unlikely to have a significant impact** on the species.

3.0 Description of the Project Area

3.1 Flora and Fauna Relevant to The Project Area

The Project Area is located on a long ridgeline running generally north-south, near the townships of Rye Park, north of Yass and east of Boorowa, NSW. 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 practices 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 of pastoral land.

The Indicative Development Footprints supports four Plant Community Types (PCTs), being:

- Vegetation Zone 1: 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.

- Vegetation Zone 2: 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.

- Vegetation Zones 3 (woodland) and 4 (derived native grassland): 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.

- Vegetation Zones 5 (forest), 6 (derived native grassland), 7 (acacia shrubland), 8 (argyle apple forest) and 9 (sifton bush shrubland): 352.13 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.

The summary of change in direct impacts (vegetation communities listed above and fauna species habitat described below) associated with the modified project compared with the approved project is presented below in **Table 18.**

Table 18   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.
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 ha

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 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 ha
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 ha
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 ha

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 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 ha
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 ha
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 ha
VZ 10 - Non-native Vegetation	20.0	90.23	1.35	13.60	105.18	Increase of 85.18 ha

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
Species						
striped legless lizard *Delma impar*	49.5	43.29	-	-	43.29	Avoidance of 6.21 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	81.99	3.29	-	85.28	Increased impact of 18.34 ha

The Project Area supports relatively few habitat types for fauna species. The dominant habitat throughout the Project Area is the most disturbed habitat, being grasslands (either native or exotic). The grasslands lack structural diversity as a result of grazing pressures and therefore provide very limited habitat for fauna species. The most significant fauna species that were found to use the grasslands habitats across the majority of the Project Area were the golden sun moth. The grasslands also support scattered paddock trees, depending on the parent PCT the grasslands were derived from, would determine the significant of these paddock trees. Where they were derived from PCT 350, they had the potential to support habitat for superb parrot. Where they were derived from PCT 351, they did not support habitat for any significant fauna species.

The Project Area also supports large patches of remnant forest (mid to upper slopes and ridgelines) and to a lesser extent, remnant grassy woodlands (valley floors and lower slopes). Remnant forests comprised PCT 298 and 351, and were generally supported better quality patches of remnant vegetation within the Project Area. A result of both vegetation communities not being exposed to the intensive agricultural practices of PCT 350. The remnant forests were structurally diverse and supported substantial fauna habitat through the presence of hollow bearing trees (including hollows of different sizes), fallen logs, some ground rocks, as well as medium to heavy cover of organic litter. The remnant forests were not identified as providing habitat for any EPBC Act listed species.

The remnant woodlands, while they have been substantially modified through agricultural practices, they do provide habitat from the EPBC Act listed superb parrot through the presence of hollow bearing trees. Hollow bearing trees within the remnant woodlands of PCT 350 within the Indicative Development Footprints have been identified as habitat for this species.

Aquatic habitat is very limited within the Project Area, reduced to farm dams, drainage lines as well as ephemeral and permanent creeklines. All varieties of these aquatic habitats have been heavily modified from agricultural land uses. No aquatic habitat has been identified as provided habitat for EPBC Act listed species.

A number of additional species listed only under the BC Act were recorded and are susceptible to impacts from the Project, these are identified in **Table 19** below. It is noted that this table does not include those species or communities listed under both BC Act and EPBC Act as they have been identified previously.

Table 19   BC Act threatened species

Species	BC Act
Southern myotis *Macropus*	V
Squirrel glider *Petaurus norfolcensis*	V
Dusky woodswallow *Artamus cyanopterus*	V
Varied sittella *Daphoenositta chrysoptera*	V
White-fronted chat *Epthianura albifrons*	V
Black falcon *Falco subniger*	V
Little eagle *Hieraaetus morphnoides*	V
Hooded robin *Melanodryas cucullata cucullata*	V
Flame robin *Petroica phoenicea*	V
Scarlet robin *Petroica boodang*	V
Speckled warbler *Chthonicola sagittata*	V

Species	BC Act
Brown treecreeper *Climacteris picumnus victoriae*	V
Diamond firetail *Stagonopleura guttata*	V
Large bent-winged bat *Miniopterus orianae oceanensis*	V
Eastern false pipistrelle *Falsistrellus tasmaniensis*	V
Yellow-bellied sheathtail bat *Saccolaimus flaviventris*	V

3.2 Hydrology Relevant to The Project Area (Including Water Flows)

The majority of the wind farm is located within the Lachlan catchment. No major rivers or wetlands occur within the project area. The principle water courses being the Lachlan River 16 km to the east, Boorowa River 20 km to the west, the Yass River 10 km to the south and the Murrumbidgee River 50 km to the south-west. There are no significant wetlands within, adjacent to or immediately downstream of the Project Area.

The following creeks are identified as being intersected by the Indicative Development Footprints , including Strahler stream order classification:

- 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).

3.3 Soil And Vegetation Characteristics Relevant To The Project Area

There are no areas of geological significance or soil hazard features identified within the Indicative Development Footprints.

As identified in the Environmental Assessment – Main Report (Epuron 2014) the soils of the Project Area are described as:

- Palaeozoic slates,

- Granites,

- Tertiary basalts, and

- Limited areas of organic loams.

Vegetation communities and condition in the Indicative Development Footprints is described in **Section 3.1**.

3.4 Outstanding Natural Features and/or Any Other Important or Unique Values Relevant To The Project Area

There are no areas of outstanding biodiversity values identified within the Indicative Development Footprints . Furthermore, the Project Area does not support any outstanding natural features and/or any other important or unique values. Examples of features or values that do not occur in the Project Area:

- Caves,

- Cliffs,

- Escarpments,

- Karsts,

- Pagodas, or

- Significant view points.

3.5 Status Of Native Vegetation Relevant To The Project Area

The PCT percent cleared category for each of the four PCTs identified within the Indicative Development Footprints are listed below as confirmed through the BioNet Vegetation Classification:

- 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 = 60 per cent,

- 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 = 83 per cent,

- 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 = 87 per cent, and

- 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 = 60 per cent.

One vegetation community (PCT350) identified within the Indicative Development Footprints has a legislative status under the EPBC Act, being *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC*.

Specifically, of the 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, a total of 35.73 hectares conforms with *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC*. This includes both woodland and derived native grassland forms of vegetation.

A total of 37.50 hectares is also listed as White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland Critically Endangered Ecological Community (CEEC) under the *Biodiversity Conservation Act 2016* (BC Act). Importantly, this is not in addition to the extent of vegetation conforming with the federally listed CEEC.

It is important to note the key discrepancies between the development consent for the previously approved project and the modified project. The development consent for the previously approved project identified 50.2 hectares of Box Gum Woodland that aligned with White Box Yellow Box Blakely's Red Gum Woodland EEC under the BC Act. Of this, just 9.5 hectares was identified as conforming with the federally listed CEEC. The increase in area of impact on the federally listed CEEC is NOT a result of the project substantially modifying its footprint to intersect with better quality stands of Box Gum Woodland, but rather a new analysis of vegetation within the Indicative Development Footprints against the CEEC. This analysis against the CEEC is provided in **Section 3.5.1** below, while the analysis against the EEC is provided in the BDAR (**Appendix G**).

Stands of the CEEC identified within the Indicative Development Footprints were recorded within the public road reserves of the external transport route; valley floors, low slopes and drainage lines in the north of the Project, near High Rock Road, south of Flakney Creek Road, south of Blakney Creek South Road and north of Coolalie Road. See **Appendix I** for the precise locations of the CEEC.

3.5.1 Analysis of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC

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).

Diagnostic Criteria

In relation to the particular area of the *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC*, the Threatened Species Scientific Committee (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.

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 20**.

Table 20   Floristic analysis of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC

BAM 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 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 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 **Appendix I**. 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 Corridor. Therefore, 31.91 hectares of the CEEC has been avoided by the Project and will persist within the wider Development Corridor, and considerable amounts of the CEEC occur beyond the Development Corridor in the local region. As described in **Section 4.0**, RPRE has made a number of changes to their detailed design to minimise impacts to this CEEC where possible.

3.6   Gradient Relevant To The Project Area

The Project Area generally occurs between 550 and 650 metres above sea level but does extend up to 780 metres above sea level at particular locations. Low and undulating hills extend upslope towards saddles and knolls before reaching moderate to steep ridgelines.

The gradient characters of the Project Area are considered to be consistent with the local region and are therefore not considered to be significant.

3.7   Current Condition of The Environment Relevant To The Project Area

The Project Area occurs in a highly fragmented and modified landscape. It supports 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 practices 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 of pastoral land. With many, if not all, of the creeklines and drainage lines within the Project Area being un-fenced from stock grazing these environments have been substantially compromised. They are now characterised by steep banks as a result of heavy erosion, substantial pugging within the water beds, and a degraded species diversity and composition.

Agricultural activities have also resulted in the establishment of a range of introduced plant species. The moister, more fertile valley floor areas, and areas subjected to intensive agricultural practices are those most substantially impacted by the introduced plant species. In many areas grazing is likely to have reduced or eliminated sensitive native species of grasses, forbs, orchids and shrubs, that are largely intolerant of grazing pressures. Many areas of the site have been grazed and show evidence of this in the low native species diversity. As a result, the project area carries a high proportion of exotic weed and pasture species. Common weeds associated with grazing are widespread and have invaded areas of more intact woodland

and forest vegetation. Large areas of the site are now dominated by the colonising species sifton bush, declared noxious in many NSW council areas. The major exotic species are grasses, clovers, Capeweed, and Patersons curse.

As a result, the majority of Plant Community Types (PCTs) identified within the Project Area have been negatively impacted.

The dominant vegetation type, PCT 351 persists across five vegetation zones, being remnant forest, an Argyle apple (*Eucalyptus cinerea*) dominated forest, derived native grasslands, two shrubland forms (one dominated by Parramatta wattle [*Acacia parramattensis*] and the other by sifton bush [*Cassinia arcuata*]). Only the remnant form of this vegetation community remains unaffected, or minimally impacted by the historical agricultural practices, with an intact canopy, understorey and ground layer. The remaining condition zones have substantially reduced structural and species diversity.

The next most dominant vegetation type, PCT 350 persists as two vegetation zones, being remnant woodland and derived native grasslands. Because this vegetation community is associated with more fertile soils of the valley floor and lower slopes, it has been more substantially impacted by the historical agricultural practices. Even in the patches of remnant woodland where the canopy remains, the structural and species diversity of the understorey and ground layer are heavily degraded. While in the derived native grasslands, canopy trees only persist as scattered in low numbers, there is no understorey and the groundlayer is mostly characterised by hardy native grasses.

Vegetation community PCT 298 was only recorded within a single stretch of road reserve, therefore it occurs solely as a remnant forest. As it occurs in public land, fenced off from the agricultural practices, it largely remains unaffected from the surrounding land use. However, as they are typically narrow patches, they are exposed to greater edge effects. Thus, the ground layer supports reasonable numbers of introduced flora species.

Vegetation community PCT 335 occurs along the creeklines and drainage lines of the Indicative Development Footprints . As mentioned above, these areas are largely unfenced, and therefore the vegetation community has been significantly impacted by the historical agricultural practices. Introduced flora species co-dominate the vegetation community, alongside just a few hardy native grasses, rushes and sedges.

4.0 Measures to Avoid Or Reduce Impacts

4.1 Measures to Avoid and Minimise Impacts

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 the Proponent 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 .

We note that RPRE received written communication from BCD in regard to the project (BCD 2020). 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 21** 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.

Specific avoidance and minimization measures for MNES are also summarised below:

- It is noted that 67.64 hectares of the Box Gum Woodland CEEC was identified within the Development Corridor; 31.91 hectares of the CEEC has been avoided by the Project and will persist within the wider Development Corridor. Furthermore, considerable amounts of the CEEC occur beyond the Development Corridor in the local region.

- With 224.21 hectares of golden sun moth habitat identified within the Development Corridor, and a total impact of 85.28 hectares within the Indicative Development Footprints, 138.93 hectares will persist beyond the extent of the Indicative Development Footprints.

- The Project is impacting 43.29 hectares of habitat for the striped legless lizard. Compared with the approved clearance threshold for the species of 49.5 hectares, this presents an avoidance of 6.21 hectares. Additional habitat for the striped legless lizard will persist beyond the extent of the Indicative Development Footprints. With 126.11 hectares of striped legless lizard habitat identified within the Development Corridor, 82.82 hectares will persist beyond the extent of the Indicative Development Footprints.

- The Project is impacting 20.08 hectares of breeding habitat for the superb parrot. Compared with the approved clearance threshold for the species of 24.9 hectares, that presents an avoidance of 4.82 hectares. With 36.33 hectares of superb parrot habitat identified within the Development Corridor, 15.53 hectares will persist beyond the extent of the Indicative Development Footprints. With 422 HBTs suitable for superb parrot calculated within the Development Corridor, 189 of these will be avoided by

the Project. Furthermore, 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.

- In addition to the avoidance measures for the superb parrot presented above as part of the modified project, a number of other extensive measures and design changes were employed to reduce impacts to suitable or known habitat of the superb parrot during the original Biodiversity Assessment (NGH Environmental 2014) and the Biodiversity Assessment Addendum (NGH Environment 2016). Of importance, many of these measures included avoidance of core habitat and known nesting trees for the species.

Table 21   Summary of Avoidance Measures to Reduce The Clearing Footprint

MNES Constraint	Measure	Outcome
n/a	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. - 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.
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC Golden sun moth	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 TECs under the BC Act and 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.
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC Striped legless lizard Superb parrot Golden sun moth	Reduction in number of substations, from three to one (reduction of two)	- The 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 TECs under the BC Act and 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.

MNES Constraint	Measure	Outcome
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC Superb Parrot	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 metres compared with 103,400 metres). • Decrease in total length of underground cabling length (60,324 metres compared with 82,350 metres). • 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 kilometres of a ridgeline north of Blakney Creek South Road. • This redesign **avoids** a new fragmentation corridor within remnant forest along approximately **4 kilometres**, 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 the Proponent 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 TECs** under the BC Act and EPBC Act is being avoided by an internal access track south of Turbine 69.
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC Hoary sunray Golden sun moth	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 TECs under the BC Act and 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. • 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 TECs under the BC Act and EPBC Act.

MNES Constraint	Measure	Outcome
		• 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 kilometres of Dalton Road, Rye Park Road and Blakney Creek South Road. This avoidance measure **avoids** approximately **14 hectares** of Box Gum Woodland TECs under the BC Act and 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
Striped Legless Lizard	Previous consideration of Wind Turbine 25 (and associated infrastructure)have been removed to minimise clearance of habitat for the striped legless lizard in the vicinity of the known record and to minimise impacts to the broader area of known Striped Legless Lizard habitat.	• As noted by NGH Environmental (2017) habitat degradation and destruction (especially through grazing and ploughing) are listed in the recovery plan as key threats for the striped legless lizard (Smith & Robertson 1999). The minimisation of clearance and management of habitat near the known record for this species facilitates achievement of Objective 4 'establish managed areas such that viable populations are maintained'. The project area is unlikely to support a large population as only one individual was found and this was not a confident sighting, but demarcation of this habitat (to be detailed in the Biodiversity Management Plan [BMP] and Construction Environmental Management Plan [CMP]) and offsetting the impact in known habitat will provide long-term conservation. It will also ensure grazing and ploughing from existing agriculture will be avoided in this area.
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC Superb Parrot Golden Sun Moth	Removal of turbines and associated access tracks from high constraint areas of CEEC and identified superb parrot corridor, avoiding and minimising impacts to both entities. Infrastructure has been minimised in high constraint golden sun moth known habitat to the west of previous Turbine IDs 98 and 99.	• The avoidance measures of the CEEC aligns with one of the primary recovery actions for the community through conservation of the community within private lands. The securement of land-based offsets in the local area which the Proponent is working towards will also link to Strategy 2 of increasing protection of the CEEC. • Avoidance of confirmed nest trees for superb parrot and core habitat within the Project Area is in line with Objective 3 of the Recovery Plan (Baker-Gabb 2011). Targeted surveys and monitoring of the species as part of the future Bird and Bat Adaptive Management Plans (BBAMP) will contribute to increasing the knowledge of this species, in line with Objective 2. • The removal of turbines in high constraint areas of the golden sun moth minimised impacts to this species.

4.2 Mitigation Measures

RPRE will seek to further minimise impacts to biodiversity values once final detailed design is completed including selection of turbines and contractor(s). 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 BMP, BBAMP and RVMP that will be prepared as per the existing Consent Conditions 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 2016) 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. 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 construction 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.

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

Table 22 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 BMP, RVMP, CEMP as well as the BBAMP required as part of the existing approval.

Table 22   Preliminary Mitigation Measures

Measure	Timing	Proposed Techniques	Outcome
Striped legless lizard habitat	Prior to construction. During construction.	• Identified habitat for striped legless lizard will be subject to further additional targeted surveys in surrounding areas of grassland habitat of the project to further avoid and minimise impacts. • Complete pre-clearance and construction monitoring by a suitably qualified ecologist to capture individuals during project works within the identified habitat.	• Avoid impacts to individuals during the construction works.
Superb parrot nest trees and impacts to breeding habitat	Prior to construction for avoidance of nest trees. During construction for avoidance of clearance near nest trees during this time.	• Establish temporal buffers around identified and potential superb parrot nest trees in the southern section of the project area. These would be established at suitable distances to minimise the indirect impacts of clearing and blasting. • Complete additional targeted surveys during suitable timing (spring) to identify superb parrot nesting trees prior to construction.	• Avoid impacts to individuals during the construction works.
Painted honeyeater foraging habitat	Prior to construction. During construction.	• Complete pre-clearance and construction monitoring by a suitably qualified ecologist to capture individuals during project works within the identified habitat.	• Avoid impacts to individuals during the construction works.
Golden sun moth habitat	Prior to construction	• Create management protocols for the species within the BMP, to be implemented as part of the construction phase.	• Avoid any inadvertent impacts to the species and its habitat beyond the extent of works identified in this Referral.

Measure	Timing	Proposed Techniques	Outcome
Box Gum Woodland CEEC	Prior to and during construction	• Complete pre-clearance surveys and construction monitoring to confirm where areas of the CEEC can or cannot be avoided by final micro-siting and design changes.	• Avoid impacts to the CEEC during the construction works. • Prioritise trimming or pruning of branches rather than removal of confirmed areas of CEEC. • Avoid the removal of trees, trimming or pruning of branches that do not support hollow bearing trees. Prioritise the removal of vegetation not supporting hollows.
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.
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.

Measure	Timing	Proposed Techniques	Outcome
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, to be cleared under the supervision of an ecologist or site environmental officer to capture and release fauna	Minimise additional impacts to fauna species
Salvage key fauna habitat	During clearance activities	- Where key fauna habitat occurs in the final Development Footprint but is not required to be impacted through construction work, if possible leave undisturbed - If it needs to be cleared, move into adjacent vegetation	- Minimise additional impacts to fauna species - Minimise the clearance of fauna habitat
Rehabilitation and revegetating temporary disturbance areas	Proceeding clearance activities	Revegetate areas of temporary disturbance with previously collected native grasses	- Speeds up the recovery of the land - Secures the stability of the site - Reduces risk of erosion - Reduces risk of weed species taking control
Weed management	Construction and operation	- Chemical and physical removal of invasive weed species in accordance with the *Noxious and Environmental Weeds Handbook* (DPI 2014) - Appropriate vehicle and machinery washing	- Minimisation of environmental and noxious weeds in the final Development Footprint - Minimisation of weed spread from and into the wider locality

Measure	Timing	Proposed Techniques	Outcome
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.
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.
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.

4.3 For matters protected by the EPBC Act that may be affected by the proposed action, describe the proposed environmental outcomes to be achieved

Those impacts described above (**Table 1** and **Table 17**) for MNES will be offset generally in accordance with the BAM (OEH 2017), subject to the NSW Biodiversity Conservation Regulation 2017 clause 6.6A (1) which specifies that the "[BAM] variation rules do not apply to the impact on a listed threatened species or ecological community, or its habitat, of a proposed action that is a controlled action." The offset requirements for the project are described in full within Section 6.3 of the BDAR (see **Appendix G**).

In relation to impacts of the Indicative Development Footprints, associated with Vegetation Zone 3 and 4, it is important to note that a majority of these impacts include Box Gum Woodland listed under the BC Act and EPBC Act. Therefore particular offset rules will apply. This alignment with TECs does not result in additional credits to those presented below.

For Vegetation Zone 3, 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, 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).

Provision of the final credit requirements for the project will be provided to DAWE at completion of the state assessment components. Credit requirements for the Project through the response to submissions process are provided in the revised BDAR.

The proponent is committed to delivering a biodiversity offset strategy that appropriately compensates for the unavoidable loss of ecological values as a result of the Project. The Indicative Development Footprints will be finalised once turbine and contractor(s) are selected by the proponent. In doing so, the proponent 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 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 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. The proponent 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 the Biodiversity Conservation Fund (BCF).

Seven 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, Tilt Renewables 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 other proposed wind farm projects.

The five potential offset 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. Species credits species likely to generate credits on the five potential offset sites are golden sun moth (*Synemon plana*) and superb parrot (*Polytelis swainsonii*).

Between the offset mechanisms described above and, where possible, application of the draft Bilateral Agreement for offsetting of State and Federal attributes, Tilt Renewables are dedicated to achieving a no net loss in the local landscape. In relation to PCT 350 and associated Box Gum Woodland TECs, securing local land-based offsets will be a substantial outcome for the TEC in the local region, with very little amounts of the community persisting in conserved land (locally and regionally). Similarly, this will result in positive ecological outcomes for the superb parrot through provision of suitable breeding habitat within conserved land. Although impacts from the Project were not identified as being potentially significant, swift parrot, regent honeyeater and painted honeyeater will also benefit from local land-based offsets supporting PCT 350 and associated Box Gum Woodland TECs through provision of suitable habitat. A number of local land-based offsets being considered by Tilt Renewables are either known to, or are considered highly likely to, support golden sun moth.

Furthermore, post-construction monitoring of blade strike will be completed as part of the BBAMP. The outcomes of these monitoring events would determine if additional measures were required to manage blade strike impacts on superb parrot, white-throated needletail or any other bird species for that matter. One aspect of this management plan will be the targeted assessment of impacts to the white-throated needletail. In the absence of NSW offset requirements for the species, the management plan should employ the use of carcass tracking canine(s) to increase the success rate of identifying any white-throated needletail individuals struck by turbines, given their small size.

5.0 Conclusion on The Likelihood Of Significance Impacts

5.1 Listed threatened species or any threatened ecological community

As discussed above in **Section 2.1**, Assessments of Significance were completed for the following EPBC Act threatened fauna species and TECs. The assessments are provided in **Appendix M**, however the outcome of these assessments are provided below:

- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC – the Project is considered **likely to have a significant impact** on this CEEC,

- Superb parrot – the Project is considered to have a low **potential of significant impact** on this species through a combination of habitat loss and blade strike,

- Swift parrot – the Project is **unlikely to have a significant impact** on this species,

- White-throated needletail – the Project has the **potential have a significant impact** on the species, as a threatened and migratory species, as there is a real chance of direct impacts on an ecologically significant proportion of its population;

- Regent honeyeater – the Project is **unlikely to have a significant impact** on this species,

- Painted honeyeater – the Project is **unlikely to have a significant impact** on this species,

- Striped legless lizard – the Project is **likely to have a significant impact** on the species,

- Golden sun moth – the Project is **likely to have a significant impact** on the species,

- Koala – the Project is **unlikely to have a significant impact** on the species, and

- Rainbow bee-eater – the Project is **unlikely to have a significant impact** on the species.

Beyond those presented above, no other EPBC Act threatened species or ecological communities have been considered as having the potential to be impacted by the proposed project.

5.2 Listed migratory species

One migratory species listed under the EPBC Act has been assessed for the project, being white-throated needletail (*Hirundapus caudactus*).

The assessments are provided in **Appendix M**, however this assessment concluded that the Project **may potentially have a significant impact** on the species.

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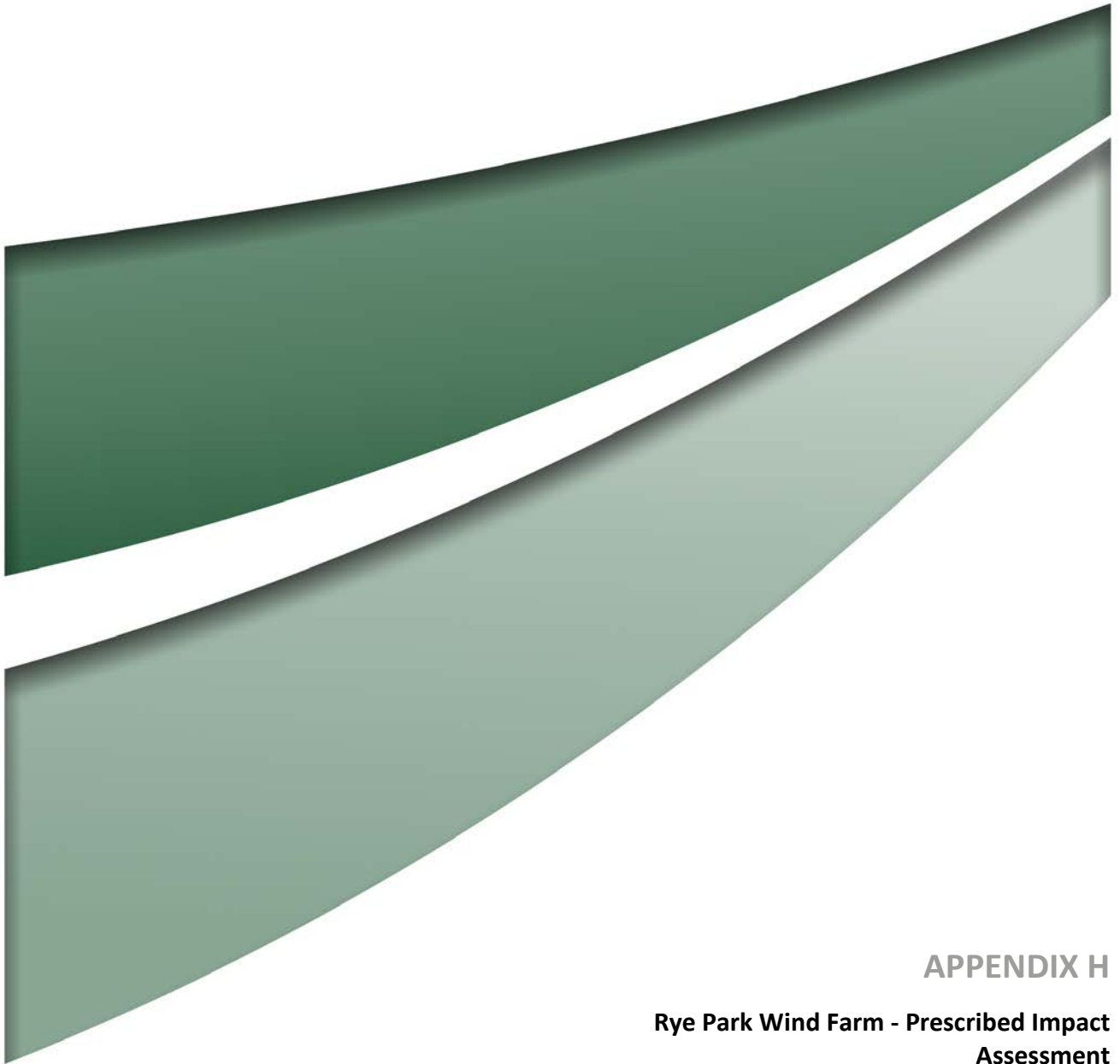
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APPENDIX G
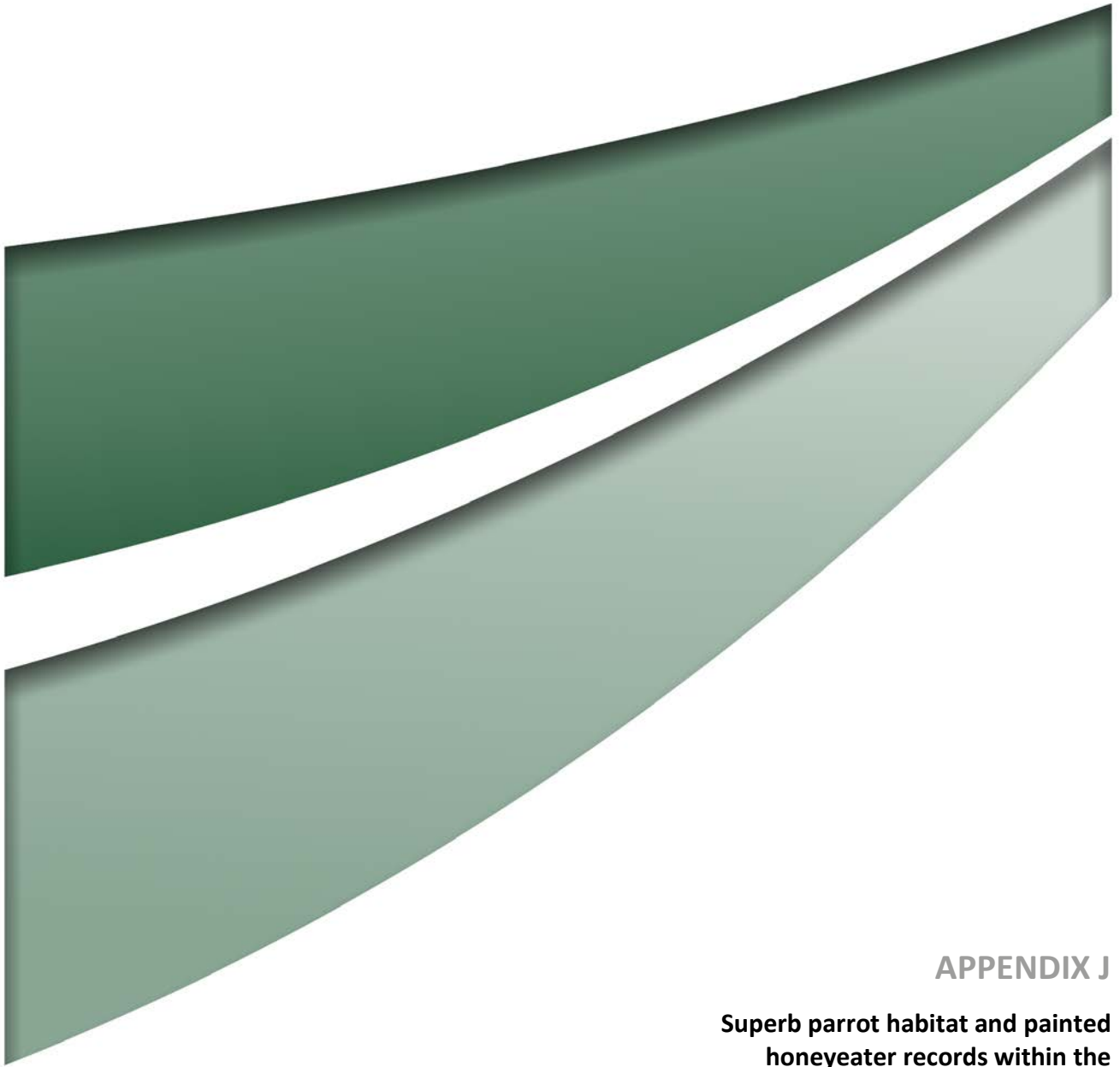
**Biodiversity Development Assessment
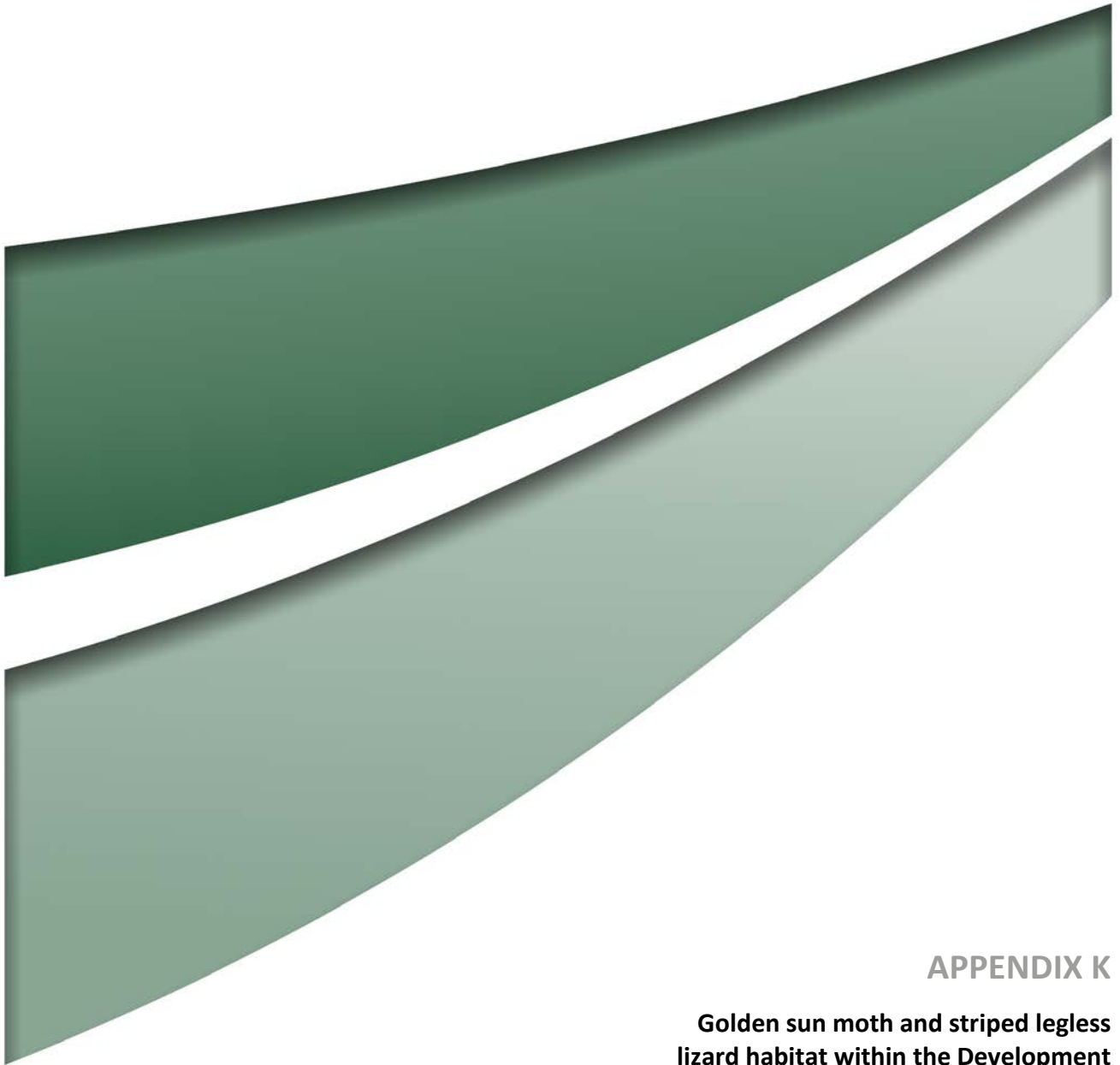Report**

**Rye Park Wind Farm - Prescribed Impact
Assessment**

White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC recorded within the Development Corridor and Indicative Development Footprints
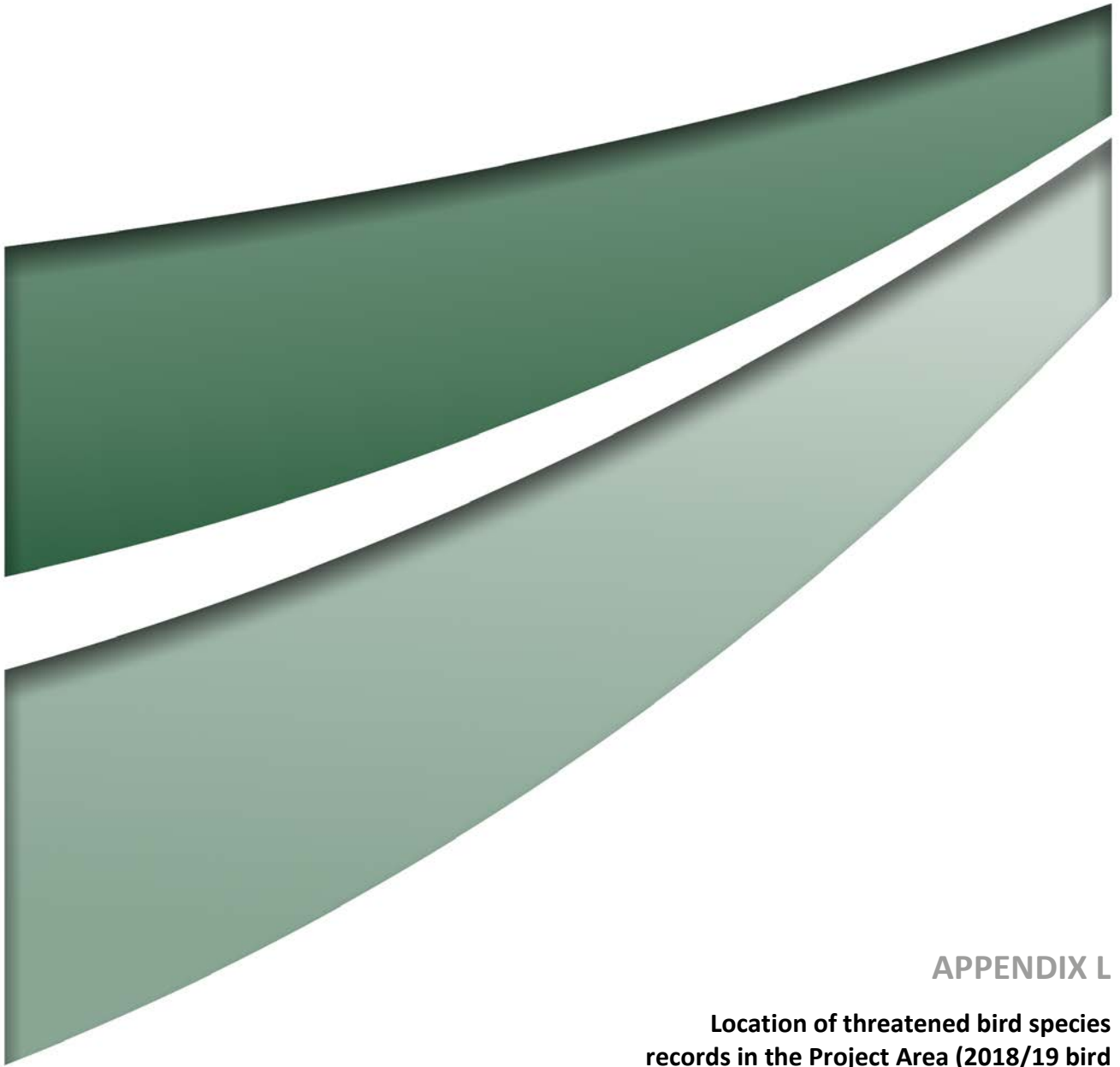
APPENDIX J

Superb parrot habitat and painted honeyeater records within the Development Corridor and Indicative Development Footprints
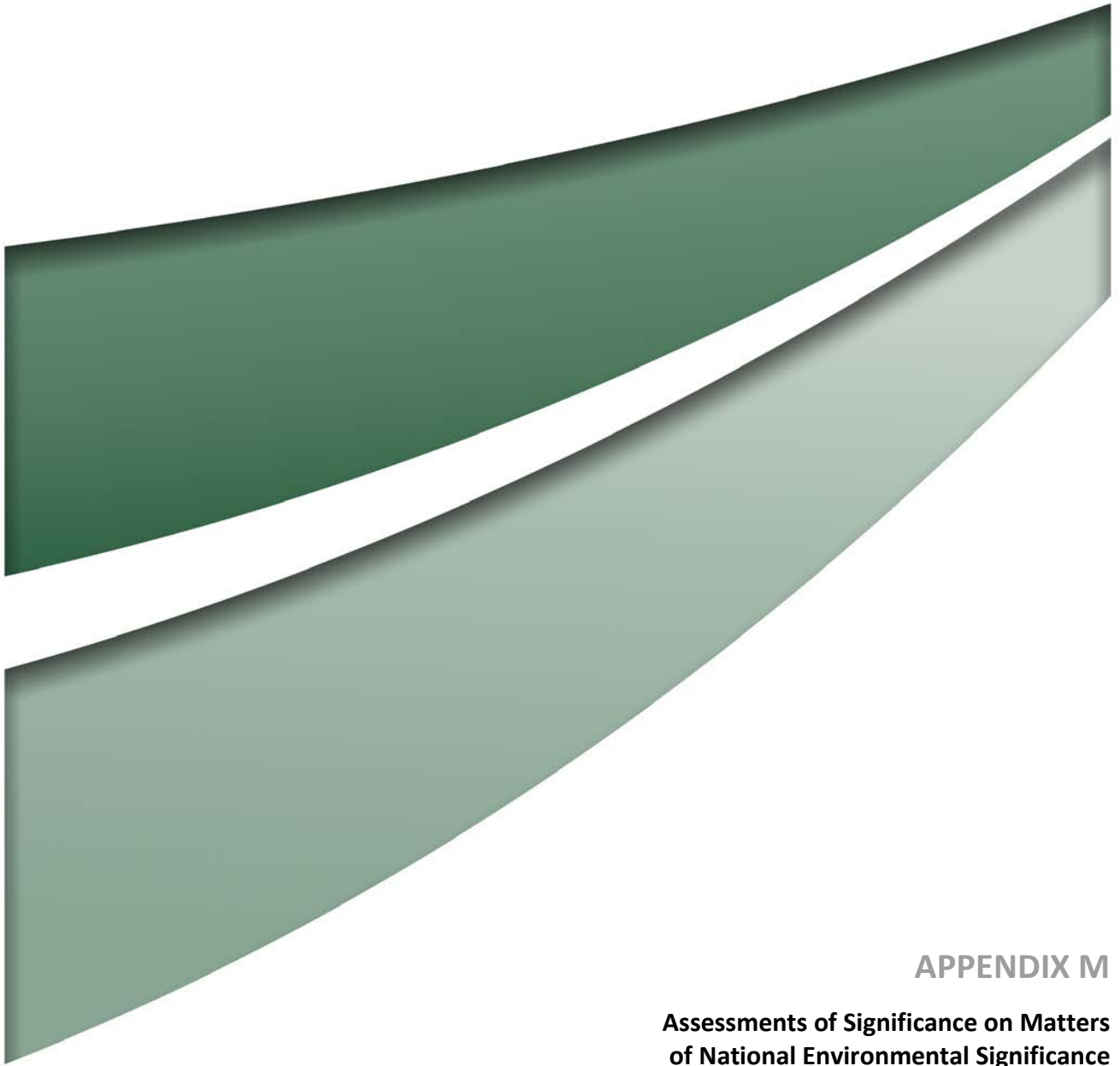
Golden sun moth and striped legless lizard habitat within the Development Corridor and Indicative Development Footprints

Location of threatened bird species records in the Project Area (2018/19 bird utilisation surveys)

**Assessments of Significance on Matters
of National Environmental Significance**