Environmental Resources Management Australia

Building C,
33 Saunders Street
Pyrmont NSW 2009

Locked Bag 24,
Broadway NSW 2007

Telephone +61 2 8584 8888
Facsimile +61 2 8584 8800

www.erm.com

10 April, 2013

Shaq Mohajerani
Crookwell Development Pty Ltd
Suite 403, 68 York St
SYDNEY NSW 2000

Our Reference: *0193328*

Attention: **Shaq Mohajerani**

Dear Shaq,

RE: CROOKWELL 3 WIND FARM: SUPPLEMENTARY ECOLOGY REPORT

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) has undertaken this ecological assessment to support a Response to Submissions Report on behalf of Crookwell Development Pty Ltd (CDPL), regarding the Crookwell 3 Wind Farm site (the Project). This ecological assessment addresses selected items from the Office of Environment and Heritage's (OEH) submission to the Department of Planning and Infrastructure (DoPI), as outlined in *Table 1.1*:

Table 1.1 Sections of OEH Submission Addressed in this Report

OEH Comment	Addressed in this Report	Chapter Number
DGRs Point 1: Flora and Vegetation Survey		
Not all woody remnants within the property have been identified, nor is there any description of vegetation types for these.	• vegetation mapping using BioMetric vegetation types has been undertaken for the Development Footprint of turbine A18 (TA18) and its access track; and • vegetation mapping using BioMetric vegetation types has been undertaken for the woody remnants that were not previously mapped in detail, including woodland remnants to the west of TA13, to the north of TA26 and along the proposed access road to the Wollondilly property.	3.1, 4.1 and 4.5

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A.C.N. 002 773 248
A.B.N. 12 002 773 248

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OEH Comment	Addressed in this Report	Chapter Number
There is insufficient information to determine whether turbines or access track construction will impact on native grassland. OEH requires a single figure for how much of each vegetation type in all conditions will be impacted by the proposal, both permanently and temporarily.	• Investigation and mapping was undertaken of grassland areas in the Development Footprint.	3.1 and 3.4
The vegetation along the preferred access to Crookwell 3 East via Greywood Siding Road has not been mapped.	• Vegetation mapping was undertaken for the area along Greywood Siding Road.	3.1
DGRs Point 1: Fauna Survey		
The potential impacts of installing turbines in a landscape that provides potential habitat for migratory threatened species must be considered.	• habitat condition assessments focussed on remnant habitat in the vicinity of TA12 and TA18. Habitat potential of other areas of woodland and grassland were also assessed; • proposed creek crossings were assessed for their potential to be Booroolong Frog (*Litoria booroolongensis*) habitat; and • the potential for Regent Honeyeater and Swift Parrot to occur in areas of Yellow Box (*Eucalyptus melliodora*) woodland was assessed.	3.3, 4.2 and 4.5
The potential impacts of installing turbines adjacent to Pejar Dam on any species of flocking bird must be considered.	• the potential for impacts on Pejar Dam and migratory waterbirds has been assessed.	3.3.5, 3.3.6, 4.2, 4.3 and 4.5
DGRs Point 2: Development Footprint and Turbine Layout		
OEH recommend that turbines A18 and A19 be removed from high conservation value remnant woodland and A12 should also be removed to avoid potential impacts on threatened species that are likely to use patches of remnant woodland.	• TA19 has been removed from the Project; • vegetation mapping indicates that TA18 does not occur in high conservation value remnant woodland; and • TA12 is not intended to be removed from the Project. Recommendations have been provided to help minimise the impacts associated with this turbine.	3.1, 4.1.1, 4.1.2 and 4.5
DGRs Point 4: Offsets		
The location, vegetation types, habitat features, management actions proposed and the legal mechanism proposed to secure the offset need to be documented.	• Details of an offset strategy were not within the scope of this report, however, areas of each vegetation type that will be impacted are provided.	3.4 and 4.4
OEH requires accurate numbers of hollow bearing trees to be cleared for the Project so that the value of the proposed offset in maintaining hollow bearing tree numbers can be considered.	• mapping of hollows within the Development Footprint of TA12 and TA18 and their associated access tracks was undertaken. Mapping of hollows in paddock trees was not undertaken as these trees can be avoided.	3.4.2 and 4.5

1.1 DEFINITIONS

In this assessment, the following definitions apply:

- Study Area: the area which is the subject of this ecological assessment, which includes:
    - the Development Footprint of TA12 and TA18 and their associated access tracks;
    - areas of Box-Gum Woodland;
    - proposed creek crossings; and
    - grassland areas in the Development Footprint.
- Development Footprint: the parts of the Study Area in which physical disturbance is proposed for development of the Project. This includes the location of infrastructure and any required easements including Wind Turbine Generators (WTGs), access tracks including passing bays and cuttings, access roads, overhead power lines (including stanchions and their associated easements), underground electrical reticulation routes and wind monitoring masts. Areas that will be temporarily disturbed during construction are included in this area, i.e. the temporary concrete batching plant;
- Derived Native Grassland: grassland areas where the woody vegetation is less than 10% of its previous cover, greater than 50% of the ground cover comprises indigenous grasses and forbs and greater than 50% of the number of species are native (Benson 1996) (it should be noted that separate criteria apply to grasslands derived from Box Gum Woodland as it is an endangered ecological community (see *Chapter 4.1.3*);
- Pasture: areas of grassland that comprise greater than 75% exotic species and all or most of the indigenous vegetation has been removed (Benson 1996).

2. LIMITATIONS

This ecological assessment is targeted towards the client's requested scope and as such, the following limitations apply:

- the assessment does not address all the issues raised in OEH's submission, including;
    - sections of DGRs Point 1: Fauna Surveys (information regarding previous targeted fauna surveys will be provided by Anderson Environmental Consultants Pty Ltd); and
    - all aspects related to Aboriginal Cultural Heritage Impacts (to be provided by Anderson Environmental Consultants Pty Ltd).

- fauna surveys comprised habitat assessments and opportunistic sightings;
- the survey effort and season was restricted to a period of four days by two field ecologists (for a total of 8 days of field effort) in March 2013, thereby limiting opportunities to observe flora and fauna to those that are present or visible during this season; and
- ERM have been advised that TA19 has now been removed from the Project to meet to the first step of the mitigation hierarchy, i.e. avoidance. Therefore no further ecological assessment has been applied to this portion of the Project as there will no longer be direct impacts to this area.

3. METHODS

Surveys were undertaken by two ERM ecologists during 4th – 7th March 2013.

3.1 VEGETATION MAPPING

The Study Area was traversed by vehicle and on foot, enabling all vegetation to be surveyed. Random meanders were undertaken throughout the Study Area. This technique involves walking through the Study Area and identifying flora species encountered.

Six 20 m x 20 m quadrats were undertaken at selected sites that were representative of different vegetation types. Within each 20 m x 20 m quadrat, all species were recorded to species or subspecies level. The relative abundance of each species was recorded using the following scale of foliage projective cover (FPC):

- 1 = <5% FPC and uncommon;
- 2 = <5% FPC and common;
- 3 = 6 - 20% FPC;
- 4 = 21 - 50% FPC;
- 5 = 51 - 75% FPC; and
- 6 = 76 - 100% FPC.

Boundaries of vegetation communities were marked out using a handheld GPS and hand drawings on aerial photographs. The data was input into ArcMap to produce maps and undertake data interpretation.

Potential EECs or critically endangered ecological communities (CEECs) under the TSC Act or EPBC Act were assessed against the criteria provided by OEH and the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) to determine their status.

3.2 HABITAT ASSESSMENT

Habitat assessments were undertaken in the areas specified in *Table 1.1*. Areas of habitat were initially identified through interpretation of satellite imagery and previous reports. The habitat assessment considered the type and condition of potential habitats for fauna species. Habitat features investigated on the subject site included:

- topographic features (such as slope, aspect & landscape position);
- dominant vegetation community composition, structure and condition at all strata levels (i.e. from ground to canopy cover);
- ground cover type and percentage cover;
- form, quality and location of water sources;
- location, type and size of tree hollows;
- the presence, number and condition of unique habitat features (such as caves, crevices, loose tree bark, rocks and mistletoe); and
- the level of disturbance.

During the habitat assessment all opportunistic observations of fauna or faunal activity were recorded, including visual and auditory recognition of fauna species and identification of evidence of faunal activity (e.g. nests, diggings, scratch marks, droppings).

3.3 HOLLOW MAPPING

The area within 100 m of TA12 and TA18 were surveyed on foot. All hollow bearing trees were marked using a handheld GPS.

3.4 OPPORTUNISTIC SIGHTINGS

Opportunistic sightings made during the survey period were recorded using a handheld GPS. This includes species that were seen and / or heard.

4. RESULTS

4.1 WEATHER CONDITIONS

Table 4.1 Prevailing Weather Conditions During Survey

Survey Date	Temperature (°C)		Wind Speed Max Gusts (Km/h)	Total Daily Precipitation (mm)
	Lowest Daily Maximum	Highest Daily Maximum	Max	Total Rainfall
04-03-2012	11.4	22.9	54	0.6
05-03-2313	13.1	24.3	69	0
06-03-2013	14.0	26.0	24	0.2
07-03-2013	9.9	28.0	30	0

*Information sourced from the Australian Government Bureau of Meteorology Goulburn weather station.

4.2 VEGETATION MAPPING

Vegetation mapping focussed on the following areas:

- woodland remnants that fall within the development footprint of TA12 and TA18 and their access tracks and associated infrastructure, i.e. temporary crane hardstand platforms;
- Greywood Siding Road reserve;
- the grassland areas that fall within the Development Footprint; and
- the woodland remnants that were not previously mapped in detail, including the woodland remnants to the west of TA13, to the north of TA26 and along the proposed access road to the Wollondilly property.

Four BioMetric vegetation types were identified in these areas. As the Project occurs within the Hawkesbury Nepean Catchment Management Authority (CMA) area, the codes for the vegetation types are prefixed with HN. This contradicts the vegetation types identified in the OEH submission letter, which are prefixed with LA (for vegetation types that occur in the Lachlan Catchment Management Authority area).

- Silvertop Ash - Narrow-leaved Peppermint open forest on ridges of the eastern tableland, South Eastern Highlands and South East Corner (Silvertop Ash Open Forest (HN584));
- Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands (Red Stringybark Open Forest (HN570));

- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands (Box-Gum Woodland (HN614)); and

- Pasture.

These are described in further detail below and their location in the Study Area is shown in *Figure 1*.

4.2.1 Silvertop Ash Open Forest (HN584)

This vegetation type was recorded in the Development Footprint of TA18 and adjacent to sections of Greywood Siding Road (refer *Figure 1*). The canopy is dominated by Silvertop Ash (*Eucalyptus sieberi*). The mid-storey is dominated by Mountain Hickory (*Acacia falciformis*), which has formed a dense mid-storey layer in the vicinity of TA18, however, the mid-storey of HN584 is generally sparse with scattered native shrubs such as Hoary Guinea-flower (*Hibbertia obtusifolia*), Peach Heath (*Lissanthe strigosa*) and Hop Bitter-pea (*Daviesia latifolia*). The groundcover is sparse, comprising scattered Snowgrass (*Poa siberiana*).

In the Development Footprint of TA18, this vegetation type is in good condition, comprising an intact native canopy, mid-storey and ground layer. Exotic species do not occur in the canopy and comprise less than 5% of the foliage cover in the mid-storey and ground layer. In other parts of the Study Area it has been cleared and occurs as derived native grassland or regrowth.

Areas of regrowth comprise a number of mid-storey species including Silver Wattle (*Acacia dealbata*), Sydney Green Wattle (*Acacia decurrens*), Mountain Hickory (*Acacia penninervis*) and Sifton Bush (*Cassinia arcuata*). Native forbs and orchids were also observed in the regrowth areas including Tall Bluebell (*Wahlenbergia stricta* subsp. *stricta*), Red Midge Orchid (*Genoplesium rufum*) and *Eriochilus cucullatus.*

Grassland areas derived from HN584 have been identified based on the remaining paddock tree species in the area, the composition of nearby woodland remnants and location in the landscape, i.e. elevation, aspect and proximity to features such as creeks. They are distinguished from areas of Pasture in accordance with the definition provided in *Chapter 1.1.* Grassland areas derived from HN584 comprise a mix of native grasses such as Speargrass (*Austrostipa scabra*), Snowgrass and Weeping Grass (*Microlaena stipoides*) with scattered low native shrubs such as Hoary Guinea-flower.

Based on the results of this assessment and the results of the previous assessment, it is estimated that 2.45 ha of Silvertop Ash Open Forest occurs in the Development Footprint. This includes 1.33 ha of woodland, 0.56 ha of regrowth and 0.56 ha of derived native grassland.

4.2.2 Red Stringybark Open Forest (HN570)

This vegetation type was recorded in the woodland remnant to the west of TA13 and small stands occur adjacent to Greywood Siding Road Reserve (refer *Figure 1*). This vegetation type comprises a canopy dominated by Red Stringybark (*Eucalyptus macrorhynca*), Brittle Gum (*E. mannifera*) and Broad-leaved Peppermint (*E. dives*). The mid-storey is sparse and comprises low native shrubs such as Hoary Guinea-flower and Peach Heath. Scattered Speargrass occurs in the groundlayer. These stands of HN570 are in good condition, comprising an intact native canopy, mid-storey and groundlayer. Exotic species do not occur in the canopy and comprise less than 5% of the foliage cover in the mid-storey and groundlayer.

This vegetation type also occurs as derived native grassland, which comprise a mix of native grasses such as Speargrass (*Austrostipa scabra*), Snowgrass and Weeping Grass (*Microlaena stipoides*) with scattered low native shrubs such as Hoary Guinea-flower. Grassland areas derived from HN570 have been identified based on the remaining paddock tree species in the area, the composition of nearby woodland remnants and location in the landscape, i.e. elevation, aspect and proximity to features such as creeks. They are distinguished from areas of Pasture in accordance with the definition provided in *Chapter 1.1.*

Based on the results of this assessment and the results of the previous assessment, it is estimated that 6.33 ha of Red Stringybark Open Forest occurs in the Development Footprint. This includes 1.37 ha of woodland and 4.96 ha of derived native grassland.

4.2.3 Box-Gum Woodland

Box-Gum Woodland occurs in the woodland remnant to the west of TA13, along the access road to the Wollondilly property and to the north of TA26. The canopy is dominated by Yellow Box (*Eucalyptus melliodora*), with no mid-storey. Patches of native grass occur in the groundlayer comprising Speargrass, Wallaby Grasses (*Rytidosperma spp.*) and Snowgrass.

Parts of the Box-Gum Woodland to the west of TA13 occur within a fenced area and are in good condition, comprising an intact native canopy and groundlayer. Exotic species do not occur in the canopy and comprise less than 5% of the foliage cover in the mid-storey and groundlayer. The Box-Gum Woodland to the west of TA13 that occurs outside the fenced area is in poor condition, comprising a stand of Yellow Box over a pasture dominated groundlayer with >75% exotic species.

The Box-Gum Woodland that occurs along the access road to the Wollondilly property is also in good condition, comprising an intact native canopy and groundlayer. Exotic species comprise less than 5% of the foliage cover in the canopy, mid-storey and groundlayer. The Box-Gum Woodland to the north of TA26 is in poor condition, comprising a stand of Yellow Box over a pasture dominated groundlayer with >75% exotic species.

Areas of native grassland in the vicinity of TA26 are derived from Box-Gum Woodland. This has been determined based on the nearby presence of Yellow Box and the location of the grassland on undulating terrain between 500 m and 900 m (OEH 2012). The presence of native species (with a foliage cover of >50%) also contributes to its inclusion as derived native grassland.

The criteria for inclusion of this area as derived native grassland is based on the *Identification Guidelines for Endangered Ecological Communities: White Box Yellow Box Blakelys Red Gum Woodland (Box-Gum Woodland)* (NPWS undated). Parts of this community comprise the endangered ecological community (EEC), White Box Yellow Box Blakely's Red Gum Woodland, as listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) (refer to *Figure 2*). Sections of this community also comprise the critically endangered ecological community (CEEC), White Box - Yellow Box - Blakely's Red Gum grassy woodlands and derived native grasslands, as listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (refer to *Figure 2*).

Based on the results of this assessment and the results of the previous assessment, it is estimated that 0.67 ha of Box-Gum Woodland occurs in the Development Footprint. This includes 0.64 ha of woodland and 0.03 ha of derived native grassland. It also includes 0.67 ha of the EEC listed under the TSC Act. These calculations are based on the assumption that clearing or lopping of vegetation along the Wollondilly access road will not be required.

4.2.4 Pasture

Areas of pasture comprise greater than 75% exotic species and all or most of the indigenous vegetation has been removed (Benson 1996). Approximately 70% of the Development Footprint have undergone pasture improvement and are dominated by exotic pasture species. These areas generally occur on lower slopes where the soil is more fertile. The majority of the internal access tracks occur in areas of pasture (refer *Figure 1*).

4.3 THREATENED FLORA

Threatened flora species were not observed during the ERM field survey, however, the survey was not undertaken during the optimal survey season for the majority of threatened flora species (usually in spring or summer). The areas of intact woodland have the potential to support a variety of threatened plants. Areas of regrowth and derived native grassland can also comprise threatened species habitat, however, this is less likely as the majority of these areas have undergone disturbance.

4.4 THREATENED FAUNA HABITAT

During the fauna habitat assessments undertaken by ERM, all species that were opportunistically observed were recorded. A total of 74 fauna species were recorded throughout the areas targeted. This total consisted of one mammal, five reptiles, seven frog species and 61 bird species.

The following five threatened species listed as Vulnerable under the TSC Act were recorded and include the Little Eagle (*Hieraaetus morphnoides*), Scarlet Robin (*Petroica boodang*), Varied Sittella (*Daphoenositta chrysoptera*), White-fronted Chat (*Epthianura albifrons*) and Gang-gang Cockatoo (*Callocephalon fimbriatum*). One migratory species listed under the EPBC Act (White-throated Needletail (*Hirundapus caudacutus*) was recorded although none of the threatened species recorded are listed under the EPBC Act.

Table 4.2 Threatened and Migratory Fauna

Species Name	Common Name	Status TSC Act	Status EPBC Act	Number	Observation Type
Hieraaetus morphnoides	Little Eagle	V	-	1	O (Flyover)
Petroica boodang	Scarlet Robin	V	-	2	O (Woodland)
Daphoenositta chrysoptera	Varied Sittella	V	-	3	O (Woodland)
Epthianura albifrons	White-fronted Chat	V	-	2	O (Open pasture)
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	6	O (In flight then Perched)
Hirundapus caudacutus	White-throated Needletail	-	Mi	4	O (Flyover)

Status: TSC Act, V = Vulnerable, Status EPBC Act Mi = Migratory

Observation Type, O = Observed

4.4.1 Woodland Habitat

Woodland habitats were identified and assessed in the vicinity of turbines TA12 and TA18. These areas consist of open to moderately open woodlands with a grassy understorey. The condition of these areas would be regarded as good given the natural structure and integrity of this community. Three threatened species were recorded within these areas, (Scarlet Robin, Varied Sittella and Gang-gang Cockatoo). This community would provide potential habitat for at least another four threatened species listed as Vulnerable under the TSC Act, (Speckled Warbler (*Pyrrholaemus sagittatus*), Brown Treecreeper (*Climacteris picumnus*) Diamond Firetail (*Stagonopleura guttata)* and Hooded Robin (*Melanodryas cucullata cucullata)*.

Other fauna species recognised in the DGR's as subject to investigation include the Superb Parrot (*Polytelis swainsonii)*, Glossy Black-cockatoo (*Calyptorhynchus lathami)*, Powerful Owl (*Ninox strenua)*, Barking Owl (*Ninox connivens)*, Squirrel Glider (*Petaurus norfolcensis)*, Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris)* Southern Myotis *(Myotis macropus)* Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis)* and the Greater Long-eared Bat (*Nyctophilus corbeni)*. The Study Area is unlikely to form an important habitat for any of the above species due to the fragmented nature of the woodland patches, the lack of specific food trees in the case of the Glossy Black-cockatoo, lack of connectivity to greater expanses of suitable habitat, or the Study Area does not form part of a species' known range.

4.4.2 Open Grasslands and Paddocks

The open grasslands and paddocks include areas of derived native grassland and pasture. These areas provide habitat for the White Fronted Chat that was recorded during field surveys. The majority of the open pasture areas have undergone improvement and as such would unlikely be suitable habitat for the Striped Legless lizard (*Delma impar*) or the Pink-tailed Worm-lizard (*Aprasia parapulchella*).

4.4.3 Booroolong Frog Habitat

The Booroolong Frog prefers permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adult Booroolong Frogs often occur on or near cobble banks and other rock structures within stream margins. This species shelters under rocks or amongst vegetation near the ground on the stream edge. The Booroolong Frog can often be seen basking in the sun on exposed rocks near flowing water during summer months (OEH 2012c). The Booroolong Frog is associated with a wide variety of vegetation groups including wet and dry sclerophyll forests (shrubby and grassy sub-formation), grassy woodlands, heathland, forested wetland, freshwater wetland, rainforest, cleared grazing land and pasture (DSEWPC 2013a).

A total of four creek crossings were investigated during the surveys and habitat was assessed for the Booroolong Frog (*Figure 3*). These areas were assessed in terms of the flow, substrate, presence of riffles, level and type of vegetation both within the channel line and the associated riparian area.

Three of the four crossings investigated (crossing numbers 1, 3 and 4) (*Figure 3*) were considered to hold little value in terms of potential habitat for the Booroolong Frog in that they were lacking essential habitat components for this species. One of the crossings investigated, First Creek crossing number 2, which is approximately 2 km to the west of Pejar Dam, was found to have the greatest potential habitat for this species as it contains deeper pools, substantial rock platforms and well vegetated banks (*see Image 4.1*).

Image 4.1 First Creek crossing area potential Booroolong Frog habitat.

4.4.4 Regent Honeyeater and Swift Parrot - Migratory Species

The Regent Honeyeater (*Anthochaera phrygia*) mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years (OEH 2012a). The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands typically have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes (OEH 2012a). On the southern tablelands of NSW, around Canberra, they are a regular visitor in small numbers between August and May (DSEWPC 2013b).

The Swift Parrot (*Lathamus discolor*) breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland (OEH 2012). In NSW the species mostly occurs on the coast and south west slopes. The Swift Parrot migrates from its Tasmanian breeding grounds to overwinter in the box-ironbark forests and woodlands of Victoria, New South Wales and southern Queensland. The principal wintering grounds are the inland slopes of the Great Dividing Range and along the eastern coastal plains (DSEWPC 2013c).

Records for both the Regent Honeyeater and the Swift Parrot are distributed to either the east or west of the Study Area. The survey period was not optimal for the detection of the Regent Honeyeater or the Swift Parrot. Surveys for these species in this area should be carried out in the winter months, preferably in profusely flowering areas of Box / Ironbark woodlands.

The Study Area consists of small patches of woodland areas that are typical of a highly fragmented rural landscape. The Study Area in general does not exhibit larger tracts of contiguous high quality mature woodland. The Tarlo River National Park, 21 km to the east of the Study Area, contains the largest areas of contiguous native woodland and forest habitat.

The woodland remnants in the Study Area may provide sub optimal foraging areas for the Regent Honeyeater and the Swift Parrot. The small patches of woodland habitats available on the Study Area are unlikely to provide habitat essential to survival of either the Regent Honeyeater or the Swift Parrot, and at best the habitats within the Study Area would provide an occasional stopover point for these migratory species.

4.4.5 Migratory Waterbirds

The Pejar Dam is fed by the Wollondilly River and was constructed to supply water for the city of Goulburn. It has a surface area of approximately 155 ha. The dam is vegetated and has some areas of shallow water along the edges. The area surrounding the Dam has little to no vegetative cover, with the exception of some areas of revegetation on the southern banks of the dam.

No migratory waterbird species listed in either the TSC Act or the EPBC Act have been recorded at the Pejar Dam and it is not recognised as an important migratory bird habitat.

A number of waterbird species have been recorded within the Upper Lachlan LGA (OEH 2013) and are also likely to utilise the habitats provided by the dam, including Grey Teal, Chestnut Teal, Magpie Goose, Australasian Shoveler, Pacific Black Duck, Hardhead and Australian Wood Duck. Based on the habitats available, it is likely that the Pejar Dam would also provide suitable habitat for migratory waterbirds as a stopover to more suitable breeding areas however the Study Area is not in a known migratory bird path and any instances would be of stray birds seeking respite from windy conditions.

4.4.6 Pejar Dam

The Wollondilly River feeds the Pejar Dam from an east to west flow. Potential impacts that this development could have on the Pejar Dam relate directly to the construction phase and would include runoff from land disturbance, and sediment being transported in to the dam. It is unlikely that the ecological values of the Pejar Dam would be impacted by the proposal due to the distance the construction activities are likely to be from the dam (approximately 5 km within the catchment) and that all works taking place on crossings near to the dam would be outside of the catchment on the western side of the dam wall flowing away from the water body and are actually lower than dam surface level.

4.5 OFFSETS

4.5.1 Extent of Vegetation Removal

Vegetation mapping indicates that 5.55 ha of native grassland will be removed as part of the Project. The native grassland to be removed comprises the following:

- 0.56 ha of Silvertop Ash Open Forest Derived Native Grassland;
- 4.96 ha of Red Stringybark Open Forest Derived Native Grassland; and
- 0.03 ha of Box Gum Woodland Derived Native Grassland.

The areas of other vegetation types that will be removed as part of the Project have been calculated based on ERM's vegetation mapping and the calculations provided in the previous Ecological Assessment Report (Anderson Environmental Consultants Pty Ltd 2012). It should be noted that the areas identified as Western Tablelands Dry Forest in the previous Ecological Assessment Report are included here in the equivalent BioMetric Vegetation Types. They comprise the following:

- 1.89 ha of Silvertop Ash Open Forest;
- 1.37 ha of Red Stringybark Open Forest; and
- 0.64 ha of Box Gum Woodland (based on the assumption that clearing or lopping of vegetation along the Wollondilly access road will not be required).

4.5.2 Hollow Bearing Trees in the Vicinity of Turbine A12 and A18

Trees within the footprints of TA12 and TA18 and their associated access tracks were assessed for the presence of potential nesting hollows. Hollows were recorded by two ecologists, using a meander technique. Potential hollows were assessed using binoculars to gauge the viability and size of each hollow. The location of each hollow was recorded using a GPS.

A total of 65 hollow bearing trees were mapped during the survey. Of these, a total of nine hollow bearing trees were mapped within a 100m radius of TA12 and a further 27 within a 100 m radius of TA18 (see *Figure 3*). These hollows have the potential to provide suitable shelter and/or breeding habitat for a number of species listed under the TSC Act including the Gang-gang Cockatoo, Brown Treecreeper, Greater Broad-nosed Bat (*Scoteanax rueppellii*), and the Eastern False Pipistrelle (*Falsistrellus tasmaniensis*).

The Eastern False Pipistrelle was detected by Anabat ultrasonic detection during the surveys for the Crookwell 2 Windfarm (URS 2004) to the north. The Eastern False Pipistrelle calls can be confused with the Greater Broad-nosed Bat and their respective ranges can overlap. Thus, it is possible that the Study Area could also provide foraging habitat for the Greater Broad-nosed Bat.

5. DISCUSSION AND RECOMMENDATIONS

5.1 VEGETATION

5.1.1 Turbine A18

It is estimated that 20% of Silvertop Ash Open Forest has been cleared compared to its pre-European extent (OEH 2012). This does not constitute a red flag area, which is defined in the BioBanking Operational Manual as:

> *"a vegetation type that has been cleared by more than 70%, as listed in the Vegetation Types Database and the vegetation is not in low condition."*

(Department of Environment and Climate Change (DECC) 2008).

Nonetheless, this woodland comprises habitat values for native species and therefore, it is recommended that the Development Footprint is adjusted to minimise clearing by making use of the existing cleared and regrowth areas in the vicinity of the current location of TA18.

5.1.2 Turbine A12

It is estimated that 55% of Red Stringybark Open Forest has been cleared compared to its pre-European extent (OEH 2012). This does not constitute a red flag area, as defined above.

This woodland area comprises habitat values for native species, including hollow bearing trees. Where possible, adjustments should be made to the Development Footprint to minimise clearing by making use of the existing farm tracks and cleared areas and minimising the length of the access track for this turbine.

5.1.3 Turbine A24

TA24 is located in an area of derived native grassland that has been fenced and has the potential to regenerate back to Silvertop Ash Open Forest. The adjacent paddock to the west of this comprises pasture and has a reduced potential to provide habitat for native species. It is recommended that TA24 be moved to the paddock to the west of its current location.

5.1.4 Box-Gum Woodland

The Box-Gum Woodland derived native grassland that occurs at TA26 will be removed to accommodate the turbine and its associated infrastructure. The impacts associated with this have been assessed in a seven part test (refer *Annex C*), which concluded that there would not be a significant impact to the ecological community due to its degraded nature in this area and the avoidance of more intact occurrences.

All other areas of Box-Gum Woodland can be avoided (see *Chapter 5.6*). The proposed northern access to the Wollondilly property is located in an area of Box-Gum Woodland that meets the criteria for the CEEC under the EPBC Act. The access road is proposed along an existing road (previously part of the Crookwell Road, prior to realignment of the road. It is understood that the tall cranes would be assembled on site after they have been delivered as smaller components by smaller trucks, hence there is no apparent need for lopping of branches. Therefore, as there will be no impacts to this area of Box-Gum Woodland, further assessment under the EPBC Act or TSC Act is not required. However, if clearing or lopping is proposed in this area, further impact assessment would be required, unless an alternative access road is to be considered.

5.2 FAUNA HABITATS

The habitat assessments carried out over the Study Area identified areas of woodland habitat that support or are likely to support a number of threatened species. A total of five threatened species were identified during the field surveys, three of which are woodland bird species, one is a raptor and the other a generalist bird species that can persist in a range of habitats. The woodland habitats would provide potential habitat for at least another four threatened species listed as Vulnerable under the TSC Act.

A total of 65 hollow bearing trees were mapped during the survey. Of these a total of nine hollow bearing trees were mapped within a 100m radius of TA12 and a further 27 within a 100 m radius of TA18 (see *Figure 3*). These hollows have the potential to provide suitable shelter and/or breeding habitat for a number of species listed under the TSC Act that include the Gang-gang Cockatoo, Brown Treecreeper, Greater Broad-nosed Bat and the Eastern False Pipistrelle. As a result of the proposal it is likely that eight hollow bearing trees in the vicinity of TA 18 would be removed as part of the establishment of the crane pad. To mitigate any potential harm to individual species that utilise those hollows, a tree felling protocol should be developed for all hollow bearing trees to be removed.

The creek crossing assessment identified one crossing over First Creek that would provide suitable habitat for the Booroolong Frog. It is recommended that this area be avoided where possible or suitable mitigation measures such as conducting works in these areas outside of breeding season, and avoiding disturbance to the rock shelf and vegetated banks be put in place to minimise the impact on habitat resource.

The woodland areas are relatively small patches but are in good condition with an intact structure and diverse species composition. No contiguous woodlands with high species richness were recorded in the Study Area and the woodland habitats would not provide optimal habitat for either the Regent Honeyeater or the Swift Parrot and neither of these species would be dependent on the resources available within the Study Area for any part of their lifecycle.

While neither of these species would be dependent on the resources available within the Study Area for any part of their lifecycle, the installation of turbines within this landscape has the potential to impact the movement patterns of migratory species and should be further addressed as part of an updated assessment of significance.

No migratory waterbird species listed in either the TSC Act or the EPBC Act have been recorded at the Pejar Dam. The Pejar Dam is not recognised as an important migratory bird habitat. A number of waterbird species have been recorded within the Upper Lachlan LGA. Taking the precautionary approach, it would be feasible that Pejar Dam would provide suitable habitat for migratory species and is a potential stopover point.

5.3 PEJAR DAM

The Pejar Dam is known locally to provide amenity in the form of fishing and bird watching. Potential impacts that this development could have on the Pejar Dam would generally relate directly to the construction phase and would include runoff from land disturbance, and sediment being transported in to the dam.

It is unlikely that the ecological values of the Pejar Dam would be impacted by the proposal due to the distance the construction activities are likely to be from the dam (approximately 5 km within the catchment) and that all works taking place on crossings near to the dam would be outside of the catchment on the western side of the dam wall flowing away from the water body and are actually lower than dam surface level.

5.4 REVISED 7-PART TESTS

The revised field surveys identified Box-Gum Woodland remnant to the west of TA13, along the access road to the Wollondilly property and to the north of TA26. Five threatened species were recorded that are listed as Vulnerable under the TSC Act. Habitat was identified for at least another four threatened species listed as Vulnerable and one species listed as Endangered under the TSC Act. In accordance with Section 5A of the Environmental Planning and Assessment Act, 1979 (EP&A Act), a revised set of *assessment of significance* (7-part tests) were carried out to measure the impacts of the proposal on the ecologically endangered community and the ten threatened species listed above. The 7-part test involves the consideration of seven factors to assess if the threatened fauna species or endangered ecological communities will be impacted by the Project. The 7-part tests undertaken are detailed in full in Annex C.

Conclusions from the Seven-Part Test:

The proposal is unlikely to have a significant impact on any of the species or the ecologically endangered community and therefore, further assessment under the NSW TSC Act is not required (refer Annex C). Measures to reduce potential impacts are discussed in Chapter 5.

5.5 OFFSETS

To satisfy the offset requirements, an offset strategy will be prepared. It is proposed that offsets will be secured onsite within areas of Silvertop Ash Open Forest, Red Stringybark Open Forest and Box Gum Woodland. Areas of native grassland derived from these vegetation types will be offset into open forest / woodland areas comprising the original equivalent vegetation type.

It is proposed that the quantum of offset including the area, vegetation type and condition be defined and included in the consent so that the offset strategy reflects the requirements associated with the final approved Project. Subsequent to this, the location, management and securing mechanism will be included in the offset strategy to the satisfaction of OEH. The offset strategy will be prepared and its approval sought prior to commencement of works.

5.6 RECOMMENDATIONS

Having regard to the additional field survey, further assessment and revised 7-part test, the following measures and amendments to the project are recommended:

- adjust the Development Footprint around TA18 to make use of the existing cleared and regrowth areas within the woodland patch to avoid hollow bearing trees and minimise clearing;

- adjust the access track to TA18 to avoid removal of hollow bearing trees;

- adjust the Development Footprint around TA12 to make use of the existing farm tracks and cleared areas within the woodland patch to avoid hollow bearing trees and minimise clearing;
- move TA24 to the adjacent paddock to the west of its current proposed location;
- consider an alternative access road to the Wollondilly property if clearing or lopping of branches is unavoidable;
- adjust the location of the access track between TA13 and TA16 to avoid areas of Box-Gum Woodland;
- implement mitigation measures to reduce potential impacts associated with the First Creek crossing on identified Booroolong Frog habitat;
- undertake bird utilisation surveys around Pejar Dam to record how the water body is utilised through the seasons by sedentary and or any migratory waterbird species and address any potential impacts to these species;
- develop a tree felling protocol if hollow bearing trees are removed as part of the proposal to mitigate any potential harm to individual species that utilise those hollows, the protocol should detail a methodology that can be applied to all vegetation clearance and should include the following measures,
    - delineation of vegetation to be cleared;
    - pre-clearing inspection of vegetation;
    - diurnal and nocturnal inspection of hollow bearing trees to be removed;
    - implement a two stage approach to clearing works;
    - non-hollow bearing trees will be cleared before habitat trees to allow fauna an opportunity to move from the hollow bearing trees and allow time to concentrate rescue efforts on the trees that are most likely to be inhabited;
    - hollow bearing trees will be felled after a minimum 24 hour delay after clearing of non-habitat trees;
    - an Ecologist will be on site for the felling of all hollow bearing trees;
    - felled hollow bearing trees will be inspected as soon as possible by a qualified ecologist; and
    - habitat components from felled trees such as hollow branches and trunks should be salvaged and placed in adjacent habitat.

- Implementation of construction management plans throughout the construction phase and should include but not limited to, Soil Sediment and Erosion Control Plan, Vegetation Management Plan and vegetation pre clearance protocols to mitigate any impacts on threatened fauna habitats and the Pejar Dam.

We thank you for the opportunity to assist CDPL on this project. Our report found that on ecological grounds, the proposed Crookwell 3 Wind Farm is suitable for the site, subject to some minor modifications and environmental management to be incorporated into the construction environmental management plans. Should you have any enquires regarding our response please contact Evelyn Craigie, Senior Ecologist or Adam Coburn, Principal Planner on 8584 8888.

Yours sincerely,
for Environmental Resources Management Australia Pty Ltd

Evelyn Craigie
Senior Ecologist

Steve Laister
Partner

REFERENCES

Anderson, J. 2012 (Revised). **Ecological Assessment for Crookwell 3 Windfarm**. Anderson Environmental Consultants Pty Ltd.

Benson, J, 1996. **What is a native grassland?** http://grasslandnsw.com.au/news/wp-content/uploads/2011/09/Benson-1996.pdf

DECC (2012) **Vegetation Types Database (Updated May 2012)**, available online: http://www.environment.nsw.gov.au/BioBanking/vegtypedatabase.htm Accessed February 2012.

Department of Sustainability, Environment, Water, Population and Communities (2013a). Litoria booroolongensis in **Species Profile and Threats Database**, Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Department of Sustainability, Environment, Water, Population and Communities (2013b). Anthochaera phrygia in **Species Profile and Threats Database**, Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Department of Sustainability, Environment, Water, Population and Communities (2013c). **Lathamus discolor in Species Profile and Threats Database**, Department of Sustainability, Environment, Water, Population and Communities, Canberra.

NPWS (undated) **Identification Guidelines for Endangered Ecological Communities: White Box Yellow Box Blakelys Red Gum Woodland (Box Gum Woodland),** available online: http://www.environment.nsw.gov.au/resources/nature/box-gumIdGuidelines.pdf

Office of Environment and Heritage. (OEH) 2012a. **Regent Honeyeater – profile**. Threatened Species Database.

Office of Environment and Heritage. (OEH) 2012b. **Swift Parrot – profile**. Threatened Species Database.

Office of Environment and Heritage. (OEH) 2012c. **Booroolong Frog – profile**. Threatened Species Database.

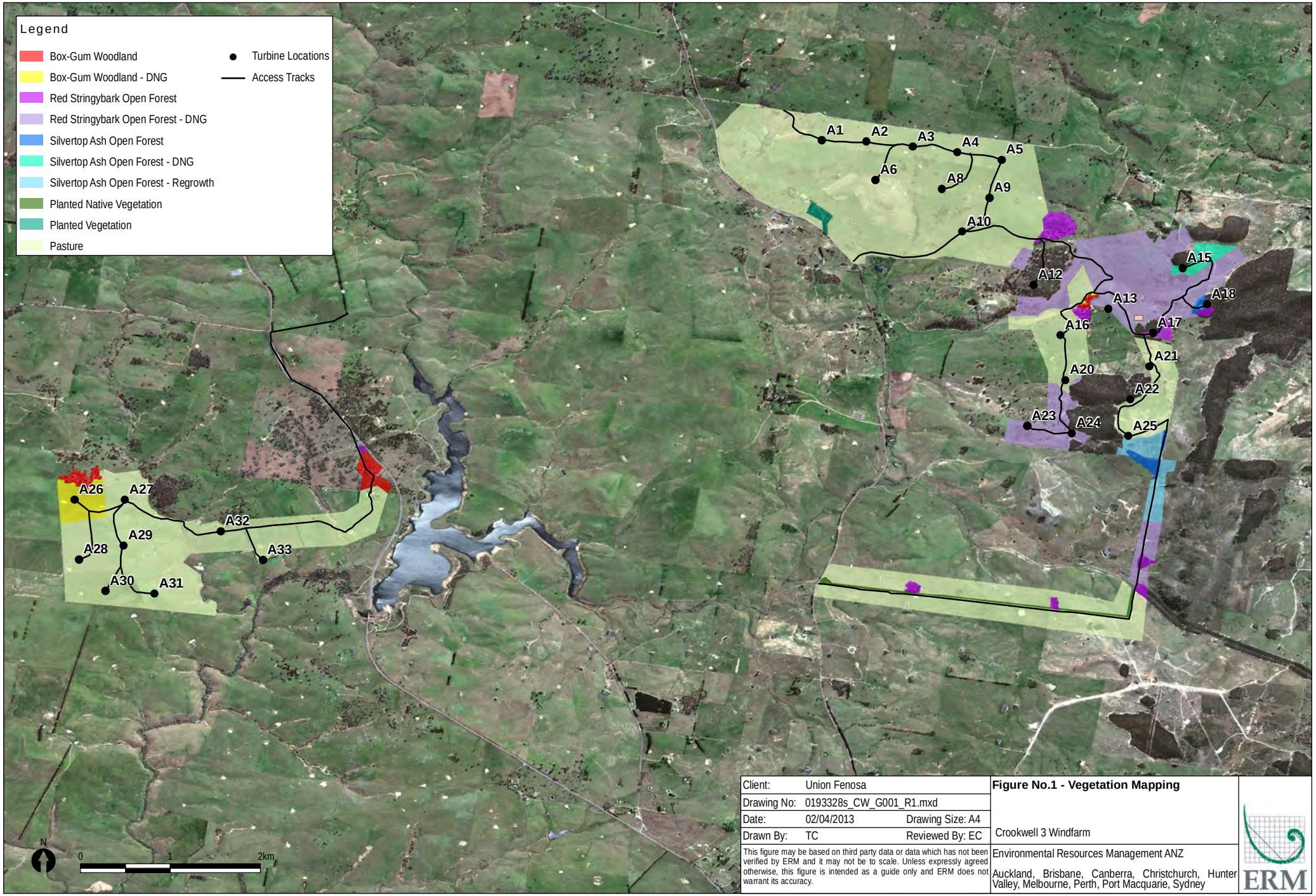
Office of Environment and Heritage. (OEH) 2013. **Bionet Wildlife Atlas search Upper Lachlan LGA**.

Smales Ian 2005. Modelled cumulative impacts on the Swift Parrot of wind farms across the species' range in southeastern Australia. Biosis Research for Department of Environment and Heritage.

URS 2004. **A Survey and Impact Assessment of the Terrestrial Flora and Fauna of the Proposed Crookwell 2 Wind Farm Development**.

Annex A

FIGURES



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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Figure No.1 - Vegetation Mapping

Crookwell 3 Windfarm

Environmental Resources Management ANZ

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ERM

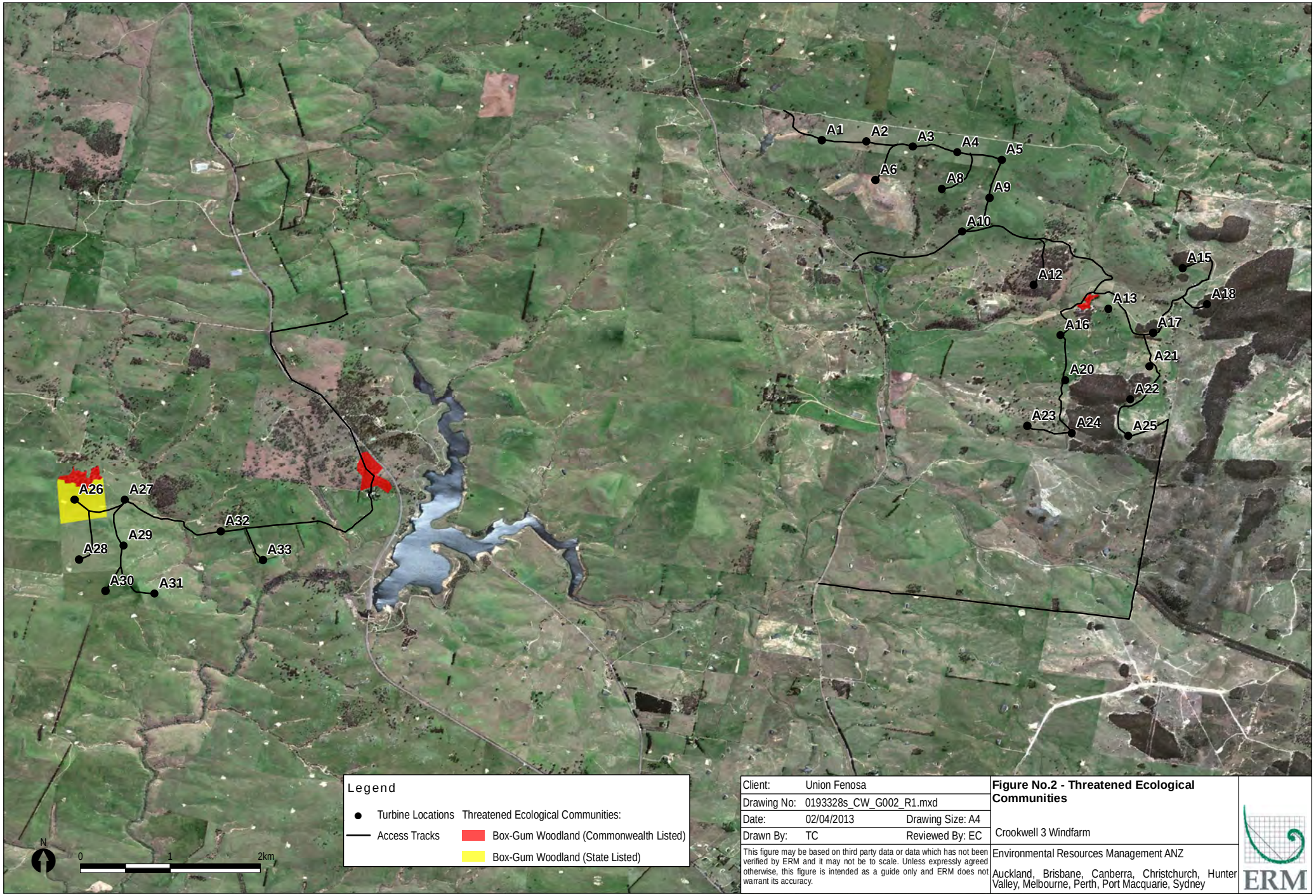

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Figure No.2 - Threatened Ecological Communities

Crookwell 3 Windfarm

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

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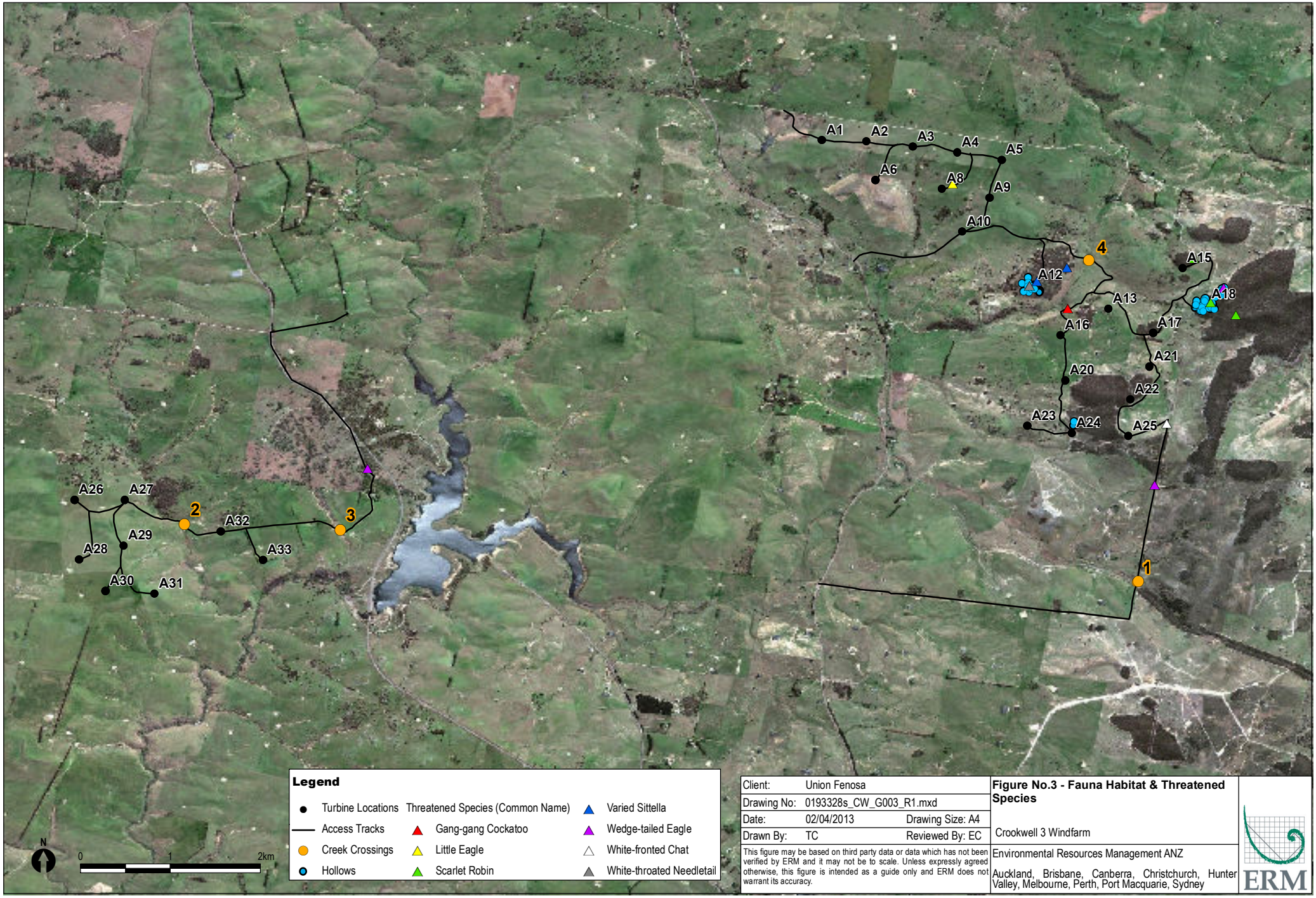

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Figure No.3 - Fauna Habitat & Threatened Species

Crookwell 3 Windfarm

Environmental Resources Management ANZ

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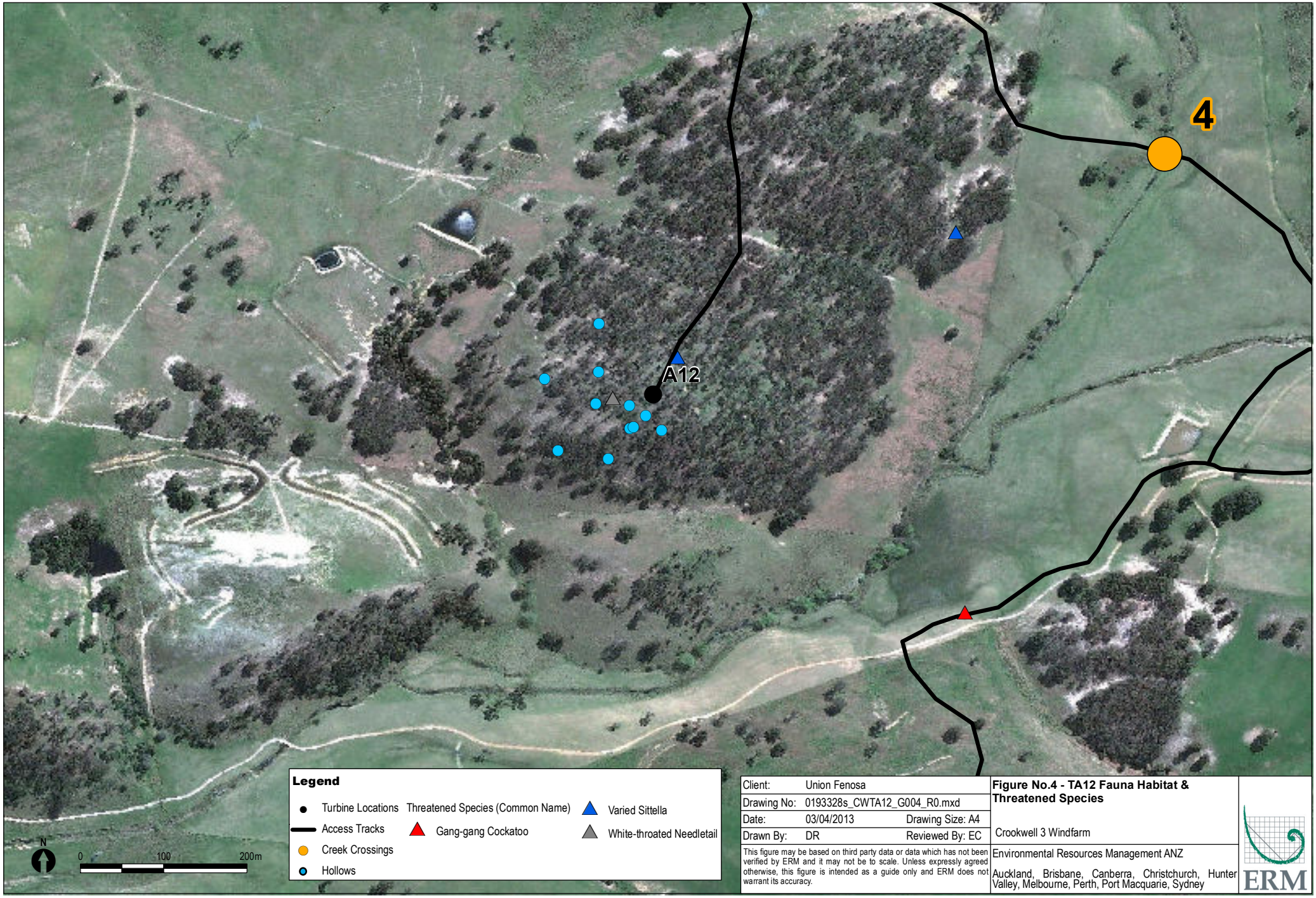
ERM



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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Figure No.4 - TA12 Fauna Habitat & Threatened Species

Crookwell 3 Windfarm

Environmental Resources Management ANZ

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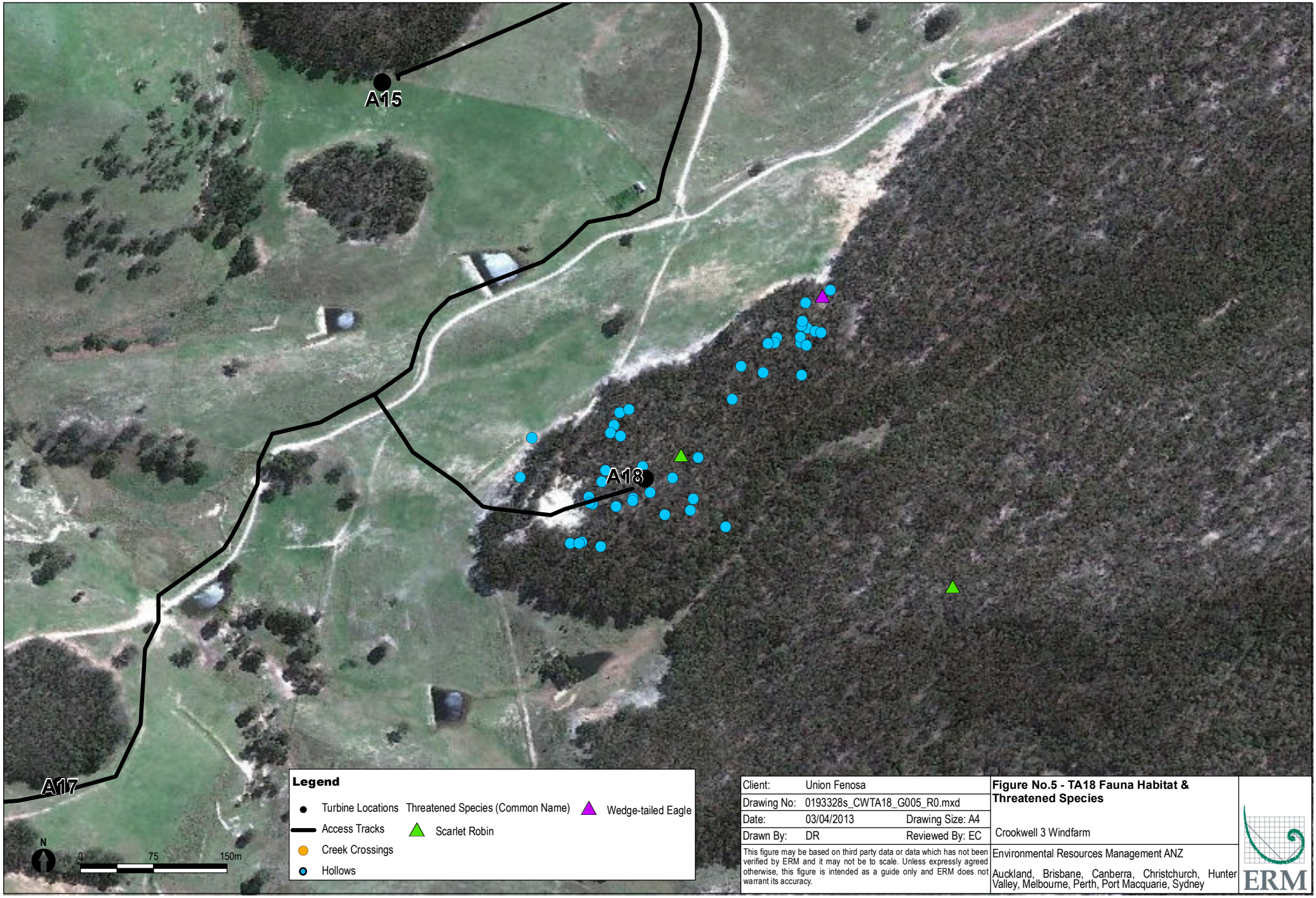
ERM



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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Figure No.5 - TA18 Fauna Habitat & Threatened Species

Crookwell 3 Windfarm

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM

Annex B

SPECIES LIST

Flora Species List

Species Name	Common Name
Acacia dealbata	Silver Wattle
Acacia decurrens	Sydney Green Wattle
Acacia falciformis	Mountain Hickory
Acacia genistiolia	Early Wattle
*Acetosella vulgaris**	Sorrel
*Aira sp.**	
Aristida ramosa	Purple Wiregrass
Austrostipa scabra	Speargrass
Brachyloma daphnoides	Daphne Heath
Cassinia arcuata	Sifton Bush
*Centaurium erythraea**	Common Centaury
*Dactylis glomerata**	Cocksfoot
Daviesia latifolia	Hop Bitter-pea
Dianella longifolia	Blue Flax-lily
*Echinopogon sp.**	Hedgehog Grass
Elymus scaber	Wheatgrass
*Eragrostis sp.**	Lovegrass
Eriochilus cucullatus	Orchid
Eucalyptus blakelyi	Blakely's Red Gum
Eucalyptus bridgesiana	Apple Box
Eucalyptus dives	Broad-leaved Peppermint
Eucalyptus macrorhyncha	Red Gum
Eucalyptus mannifera	Brittle Gum
Eucalyptus melliodora	Yellow Box
Euclayptus rubida	Candlebark
Eucalyptus sieberi	Silvertop Ash
Genoplesium rufum	Rufous Midge Orchid
Gonocarpus tetragynus	
Goodenia hederacea	Forest Goodenia
Hibbertia obtusifolia	Hoary Guinea Flower
Hypericum gramineum	Small St. Johns Wort
*Hypochaeris radicata**	Catsear
Juncus bufonius	Toad Rush
Lissanthe strigosa	Peach Heath
Lomandra filiformis	Wattle Mat-rush
Luzula densiflora	
Melichrus urceolatus	Urn Heath

Species Name	Common Name
Microlaena stipoides	Weeping Grass
*Onopordum acanthium**	Scotch Thistle
Ozothamnus diosmifolius	Rice Flower
Patersonia sericea	Silky Purple-flag
*Phalaris sp.**	Canary Grass
*Pinus radiate**	Radiata Pine
Poa sieberiana	Snowgrass
Pteridium esculentum	Common Bracken
*Rumex sp.**	Dock
Rytidosperma sp.	Wallaby Grass
Rytidosperma pallidum	Redanther Wallaby Grass
Themeda australis	Kangaroo Grass
*Trifolium sp.**	Clover
Wahlenbergia gracilis	Spawling Bluebell
Wahlenbergia stricta	Tall Bluebell
*Exotic Species	

Fauna Species List

Class	Species Name	Common Name	Status TSC Act	Status EPBC Act
Amphibia	Crinia parinsignifera	Beeping froglet	-	
Amphibia	Litoria latopalmata	Broad-palmed rocket frog		
Amphibia	Crinia signifera	Clicking froglet		
Amphibia	Uperoleia laevigata	Eastern Gungan		
Amphibia	Limnodynastes tasmaniensis	Spotted marsh Frog		
Amphibia	Limnodynastes peronii	Striped marsh frog		
Amphibia	Litoria verreauxii	Whistling tree frog		
Aves	Tachybaptus novaehollandiae	Australasian Grebe		
Aves	Anthus novaeseelandiae	Australasian Pipit		
Aves	Cracticus tibicen	Australian Magpie		
Aves	Aegotheles cristatus	Australian Owlet-nightjar		
Aves	Corvus coronoides	Australian Raven		
Aves	Coracina novaehollandiae	Black-faced Cuckoo-shrike		
Aves	Falco berigora	Brown Falcon		
Aves	Acanthiza pusilla	Brown Thornbill		
Aves	Melithreptus brevirostris	Brown-headed Honeyeater		
Aves	Acanthiza reguloides	Buff-rumped Thornbill		

Class	Species Name	Common Name	Status TSC Act	Status EPBC Act
Aves	Phaps chalcoptera	Common Bronzewing		
Aves	Sturnus vulgaris	Common Starling		
Aves	Ocyphaps lophotes	Crested Pigeon		
Aves	Platycercus elegans	Crimson Rosella		
Aves	Artamus cyanopterus	Dusky Woodswallow		
Aves	Platycercus eximius	Eastern Rosella		
Aves	Acanthorhynchus tenuirostris	Eastern Spinebill		
Aves	Callocephalon fimbriatum	Gang-gang Cockatoo		
Aves	Pachycephala pectoralis	Golden Whistler		
Aves	Cracticus torquatus	Grey Butcherbird		
Aves	Rhipidura albiscapa	Grey Fantail		
Aves	Colluricincla harmonica	Grey Shrike-thrush		
Aves	Anas gracilis	Grey Teal		
Aves	Poliocephalus poliocephalus	Hoary-headed Grebe		
Aves	Dacelo novaeguineae	Laughing Kookaburra		
Aves	Myiagra rubecula	Leaden Flycatcher		
Aves	Hieraaetus morphnoides	Little Eagle	V	
Aves	Corvus mellori	Little Raven		
Aves	Grallina cyanoleuca	Magpie-lark		
Aves	Dicaeum hirundinaceum	Mistletoebird		
Aves	Falco cenchroides	Nankeen Kestrel		
Aves	Manorina melanocephala	Noisy Miner		
Aves	Anas superciliosa	Pacific Black Duck		
Aves	Strepera graculina	Pied Currawong		
Aves	Anthochaera carunculata	Red Wattlebird		
Aves	Pachycephala rufiventris	Rufous Whistler		
Aves	Todiramphus sanctus	Sacred Kingfisher		
Aves	Myiagra cyanoleuca	Satin Flycatcher		
Aves	Petroica boodang	Scarlet Robin	V	
Aves	Chalcites lucidus	Shining Bronze-Cuckoo		
Aves	Ninox novaeseelandiae	Southern Boobook		
Aves	Pardalotus punctatus	Spotted Pardalote		
Aves	Acanthiza lineata	Striated Thornbill		
Aves	Cacatua galerita	Sulphur-crested Cockatoo		
Aves	Malurus cyaneus	Superb Fairy-wren		
Aves	Petrochelidon nigricans	Tree Martin		
Aves	Daphoenositta chrysoptera	Varied Sittella	V	

Class	Species Name	Common Name	Status TSC Act	Status EPBC Act
Aves	Malurus lamberti	Variegated Fairy-wren		
Aves	Aquila audax	Wedge-tailed Eagle		
Aves	Haliastur sphenurus	Whistling Kite		
Aves	Sericornis frontalis	White-browed Scrubwren		
Aves	Lichenostomus leucotis	White-eared Honeyeater		
Aves	Egretta novaehollandiae	White-faced Heron		
Aves	Epthianura albifrons	White-fronted Chat	V	
Aves	Ardea pacifica	White-necked Heron		
Aves	Gerygone albogularis	White-throated Gerygone		
Aves	Hirundapus caudacutus	White-throated Needletail		Mi
Aves	Cormobates leucophaea	White-throated Treecreeper		
Aves	Rhipidura leucophrys	Willie Wagtail		
Aves	Lichenostomus chrysops	Yellow-faced Honeyeater		
Aves	Acanthiza chrysorrhoa	Yellow-rumped Thornbill		
Aves	Corcorax melanorhamphos	White-winged Chough		
Mammalia	Macropus robustus	Common Wallaroo		
Reptilia	Tiliqua nigrolutea	Blotched blue-tongued skink		
Reptilia	Tiliqua scincoides	Common blue-tongued skink		
Reptilia	Egernia cunninghami	Cunningham's skink		
Reptilia	Pseudonaja textilis	Eastern brown snake		
Reptilia	Notechis scutatus	Tiger snake		

Threatened Species List

Class	Species name	Common Name	Status TSC Act	Status EPBC
Aves	Hieraaetus morphnoides	Little Eagle	V	
Aves	Petroica boodang	Scarlet Robin	V	
Aves	Daphoenositta chrysoptera	Varied Sittella	V	
Aves	Epthianura albifrons	White-fronted Chat	V	
Aves	Callocephalon fimbriatum	Gang-gang Cockatoo	V	
Aves	Hirundapus caudacutus	White-throated Needletail		Mi

Annex C

EP& A ACT: 7-PART TESTS

TSC Act 7-part test	**Gang-gang Cockatoo, Hooded Robin, Varied Sittella, Scarlet Robin, Diamond Firetail (Vulnerable)**

The habitat assessments carried out over the Study Area identified areas of woodland habitat that support or are likely to support seven threatened species.

Gang-gang Cockatoo

The species was recorded in the Study Area in an area close to Red Stringybark Open Forest. This species is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, they may occur at lower altitudes in drier, more open Eucalypt forests and woodlands. The Gang-gang Cockatoo's occurrence within the Study Area could be that of a stopover on its way down to its lower altitude wintering grounds.

Hooded Robin

The Hooded Robin prefers lightly wooded country, usually open Eucalypt woodland, Acacia scrub and mallee, often in or near clearings or open areas. It requires structurally diverse habitats featuring mature Eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. This species was not recorded in the Study Area, however, suitable habitat has been identified in the patches of woodland that exist in the Study Area.

Varied Sittella

The species was recorded in an area of Red Stringybark Open Forest within the Study Area. This species is sedentary and inhabits Eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.

Scarlet Robin

The Scarlet Robin was recorded in the woodland within the Study Area and prefers dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.
This species lives in both mature and regrowth vegetation.

Diamond Firetail

The species was not recorded during field surveys. There is a record of this species from Crookwell Rd on the south western end of Pejar Dam and another from Woodhouselee Rd to the east of the Study Area (ALA 2013). This species is found in grassy Eucalypt woodlands, including Box-Gum Woodlands and Snow Gum *Eucalyptus pauciflora* Woodlands. Suitable habitat has been identified within the Study Area in the patches of woodland.

Speckled Warbler

The Speckled Warbler was not recorded during field surveys. This species lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.

Brown Treecreeper

The Brown Treecreeper was not recorded during field surveys. This species is found in Eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range. It mainly inhabits woodlands dominated by stringybarks or other rough-barked Eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species this species requires hollow bearing trees for breeding habitat.

a) *in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*	The woodland areas are relatively small patches but they are in good condition, with an intact structure and diverse species composition. No contiguous woodlands with high species richness were recorded in the Study Area. The woodland areas would provide foraging and shelter habitat for the Gang-gang Cockatoo, Hooded Robin, Varied Sittella, Scarlet Robin, Diamond Firetail, Speckled Warbler, and potential breeding habitat for the Brown Treecreeper. The proposal would result in the removal of a combined 3.9 ha of identified woodland that includes 1.89 ha of Silvertop Ash Open Forest, 1.37 ha of Red Stringybark Open Forest and 0.64 ha of Box Gum Woodland associated with the development footprint, and approximately eight hollow bearing trees in the vicinity of TA18. The removal of the above resources from the study area is a small portion of

		the habitat available to these species within the Study Area and the greater Locality. The removal of 3.9 ha of woodland and eight hollow bearing trees is unlikely to have an adverse effect on the lifecycle of any of the above species such that a viable local population is likely to be placed at risk of extinction. To mitigate any potential harm to individual species that utilise those hollows, a tree felling protocol will be developed for all hollow bearing trees to be removed.
b)	*in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species likely to be placed at risk of extinction.*	None of the above mentioned species belong to an endangered population in the area of concern.
c)	*in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:* *i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*	N/A
d)	*in relation to the habitat of a threatened species, population or ecological community:* *i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*	i) As a result of the proposal it is likely that eight hollow bearing trees in the vicinity of TA18 and a total of 3.9 ha of woodland would be removed. ii) The areas of woodland that occur in the Study Area comprise fragments that are already isolated from other areas of woodland. No contiguous woodlands with high species richness were recorded in the Study Area. The proposed action would not result in further fragmentation or isolation of habitat. iii) The habitat that would be removed as part of the proposal comprises a small portion of potential foraging habitat for the Gang-gang Cockatoo, and potential breeding and foraging habitat for the Hooded Robin, Varied Sittella, Scarlet Robin, Diamond Firetail, Speckled Warbler and the Brown Treecreeper. Similar habitat features occur throughout the woodland patches in the Study Area and Locality and these areas will not be affected by the proposed action. Therefore, the habitat to be removed is not considered to be important to the long term survival of the Gang-gang Cockatoo, Hooded Robin, Varied Sittella, Scarlet Robin, Diamond Firetail, Speckled Warbler, and the Brown Treecreeper.
e)	*whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).*	No Critical habitats for the Gang-gang Cockatoo, Hooded Robin, Varied Sittella, Scarlet Robin, Diamond Firetail, Speckled Warbler, and the Brown Treecreeper have been identified within the Study Area. Due to previous land use and agricultural clearing, there are no contiguous woodland areas with high species richness located within the Study Area. Therefore the proposed action will not have an adverse effect on any critical habitat for the above mentioned species (either directly or indirectly).

f)	*whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.*	No recovery or threat abatement plans have been produced for the Gang-gang Cockatoo, Hooded Robin, Varied Sittella, Scarlet Robin, Diamond Firetail, Speckled Warbler, and the Brown Treecreeper. The mitigation hierarchy of avoid, mitigate and offset has been applied throughout the design and assessment of the proposed action. This has included removal of a turbine and its infrastructure to avoid habitat removal. A series of mitigation measures are proposed, which aim to protect the remaining areas of habitat and reduce the impacts associated with habitat loss. An offset strategy will be prepared prior to construction works occurring for the proposed action to provide alternative areas of habitat for native species.
g)	*whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*	There are currently 37 key threatening processes listed under the Threatened Species Conservation Act 1995. Two are relevant to the proposal and are discussed below: <u>Clearing of Native Vegetation</u> Clearing, as defined by the determination, refers to the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation. There are numerous impacts as a result of clearing native vegetation including destruction of habitat causing a loss of biological diversity, and may result in total extinction of species or loss of local genotypes, fragmentation of populations resulting in limited gene flow between small isolated populations, reduced potential to adapt to environmental change and loss or severe modification of the interactions between species, riparian zone degradation, such as bank erosion leading to sedimentation that affects aquatic communities, disturbed habitat which may permit the establishment and spread of exotic species which may displace native species and loss of leaf litter, removing habitat for a wide variety of vertebrates and invertebrates. The proposal will result in the removal of 3.9 ha of woodland habitat. The removal of the woodland will involve the operation of this key threatening process, however, mitigation measures such as the removal and relocation of turbines and adjustment of access roads into areas that are cleared will minimise the impact of this process on native vegetation. <u>Loss of Hollow Bearing Trees</u> The proposal will result in the removal of eight hollow-bearing trees. Hollow-bearing trees were common in remnant woodland patches. The removal of hollow-bearing trees will result in the operation of this key threatening process. Both of these key threatening processes will occur as part of the proposed action and will result in a small reduction of foraging and roosting habitat. However, the proposed action involves minimal clearing, with one turbine and its associated infrastructure removed from the Project to reduce habitat removal. A series of mitigation measures are proposed, which aim to protect the remaining areas of habitat and reduce the impacts associated with habitat loss. An offset strategy will be prepared for the proposed action to provide alternative areas of habitat for native species. Therefore, the operation of these key threatening processes have been minimised and the residual impact is considered to be minimal.

TSC Act 7-part test	**Booroolong Frog (Endangered)**
The Booroolong Frog lives along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. They shelter under rocks or amongst vegetation near the ground on the stream edge and lay their eggs in submerged rock crevices in slow flowing connected or isolated pools. This species sometimes bask in the sun on exposed rocks near flowing water during summer. This species was not recorded during field investigations, and there are no records of this species within the Study Locality. Suitable habitat for this species was identified in an area associated with a creek crossing.	
a) *in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*	There is development proposed within an area of potential habitat for this species. The development would entail the construction of a crossing to traverse the creek in this location. Such destructive works would have an impact on the habitat identified for the Booroolong Frog in this location, which could have an adverse effect on the lifecycle of this species if it were to exist in this location. To mitigate any potential impacts to the Booroolong Frog it is recommended that proposed creek crossing works are to avoid habitat for the Booroolong Frog where possible, or suitable mitigation measures such as conducting works in these areas outside of the breeding season, and avoiding disturbance to the rock shelf and vegetated banks are put in place to minimise the impact on habitat resources. The mitigation measures proposed will ensure that the actions will not affect the life cycle of the Booroolong Frog such that a viable local population of the species is likely to be placed at risk of extinction.
b) *in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species likely to be placed at risk of extinction.*	The Booroolong Frog does not belong to an endangered population in the area of concern.
c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*	N/A

d) in relation to the habitat of a threatened species, population or ecological community: *i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*	i) Earthworks would be required to modify a section of creek to the width of a vehicle lane, along with the removal of riparian and fringing vegetation. Some form of scour protection and creek stabilisation may also be required. ii) The modification of the creek line may fragment the habitat available for the Booroolong Frog. iii) The habitat areas have been identified as potential habitat only as no Booroolong Frogs were identified in the Study Area. These areas do have habitat components such as a rock shelf, fringing vegetation, isolated and connected pools and a rocky substrate that are important for this species. Mitigation measures to avoid disturbance in the prime habitat areas, conducting works outside of the breeding season and avoiding disturbance to the rock shelf and vegetated banks will be put in place to minimise the impact on habitat resources. These measures will ensure that the modification of these areas will not impact on habitat that is important to the long-term survival of the Booroolong Frog.
e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).	No Critical habitat for these species has been identified within the Study Area. The creek crossing assessment identified one crossing over First Creek that would provide suitable habitat for the Booroolong Frog. This species was not observed on site, therefore the habitat is not considered critical. Mitigation measures will be undertaken to reduce any adverse effects on potential habitat.
f) *whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.*	There is a national recovery plan for the Booroolong Frog. This plan identifies actions to be undertaken to ensure the long-term viability of the species in nature, and current stakeholders involved in this recovery program. Factors identified as contributing to the historic and continued decline of the Booroolong Frog include disease (chytridiomycosis) caused by infection with the amphibian chytrid fungus (*Batrachochytrium dendrobatidis*), habitat degradation, altered stream flows, and stream drying associated with recent severe droughts. The introduction of exotic predatory fish is also likely to have impacted on the Booroolong Frog in the wild and this impact may be continuing. The proposed actions are taking into account the management of important areas of habitat and the mitigation measures will ensure that the proposed action is consistent with the recovery plan for this species.
g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	There are currently 37 key threatening processes listed under the Threatened Species Conservation Act 1995. Three are relevant to the proposal: <u>Predation by *Gambusia holbrooki* Girard, 1859 (plague minnow or mosquito fish)</u> *Gambusia holbrooki* is a small freshwater fish originally introduced into Australia in the 1920s and is now widespread in NSW. This species is an aggressive and voracious predator of native fauna, particularly threatened frogs and has been linked to the decline of the Green and Golden Bell Frog, the New England Bell Frog, Southern Bell Frog, and the Southern Tablelands Bell Frog. The proposed action is unlikely to increase the predation of *Gambusia holbrooki* on threatened frogs within the Study Area.

	Infection of frogs by amphibian chytrid causing the disease chytridiomycosis Chytridiomycosis is a fatal disease of amphibians and is caused by the chytrid *Batrachochytrium dendrobatidis*. Chytridiomycosis is a global epidemic. In NSW, 22 species have been diagnosed with the disease. Chytridiomycosis has been reported from a number of endangered frog species and populations including the Booroolong Frog. Vehicle washdown will be undertaken during earthworks to control the transfer of water and soil between sites. The proposed action is unlikely to increase the spread of chytrid. Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands Alteration to natural flow regimes refers to reducing or increasing flows, altering seasonality of flows, changing the frequency, duration, magnitude, timing, predictability and variability of flow events, altering surface and subsurface water levels and changing the rate of rise or fall of water levels. Three human processes have predominantly altered flows in streams, rivers and their floodplains, and wetlands in NSW. These are: building of dams, diversion of flows by structures or extraction, and alteration of flows on floodplains with levees and structures. The creek crossing will be designed to ensure there is no alteration to the flow of the creeks within the Study Area.

TSC Act 7-part test	**Little Eagle (Vulnerable), White Fronted Chat (Vulnerable)**
Little Eagle – Vulnerable: The Little Eagle was recorded flying over the Study Area during the day. The habitat preference of the Little Eagle is open Eucalypt forest, woodland or open woodland. The Little Eagle preys on birds, reptiles and mammals, occasionally adding large insects and carrion. This species nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. White Fronted Chat - Vulnerable: This species was recorded in an open grassy area in the Study Area and is usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. The White Fronted Chat is known to build nests in low vegetation and they are insectivorous, feeding mainly on the ground. The open grasslands and paddocks include areas of derived native grassland and pasture. These areas provide habitat for the White Fronted Chat.	
a) *in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*	The proposal would involve the installation of up to 29 individual wind towers standing up to 150 m at the top of the blade and associated construction compounds, crane pads and access tracks. The placement of these elements has taken into consideration the geographical and environmental constraints of the site. The woodland areas of the Study site are relatively small patches but are in good condition with an intact structure and diverse species composition. No contiguous woodlands with high species richness were recorded in the Study Area and the Little Eagle would not be dependent on the resources available within the Study Area for any part of its lifecycle. The habitats within the Study Area would provide an occasional flyover point for this species during hunting. Blade strike to birds and bats is an inherent risk to any wind energy installation. The instances of blade strike on another native species, the Swift Parrot have been studied through collision risk modelling

		undertaken by Biosis Research in 2005 (Smales 2005). The study concluded that there is actually a very low (approximately 0.08 – 0.13 birds per year) chance of Swift Parrots mortality from blade strike. To apply the same collision avoidance rates to the Little Eagle would have similar or less results due to the relative population being spread out over a large geographic area and thus less likely to come into the path of a wind farm installation. Therefore, the proposed actions will not affect the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction. Areas of breeding habitat for the White Fronted Chat do not occur in the development footprint. The majority of the open grassland areas have undergone improvement and suffer from previous impacts of farming. The proposed action will not affect the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
b)	*in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species likely to be placed at risk of extinction.*	None of the above mentioned species belong to an endangered population in the area of concern.
c)	*in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:* *i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*	N/A
d)	*in relation to the habitat of a threatened species, population or ecological community:* *i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*	i) As a result of the proposal, a total of 3.9 ha of woodland, 5.55 ha of derived native grassland and a portion of improved pasture would be removed. ii) No contiguous woodlands with high species richness were recorded in the Study Area; therefore the good quality woodland habitat is already considered fragmented. The proposed action would not increase this fragmentation. Open grasslands and paddock trees will undergo minimal impact. iii) The areas of woodland and open pasture areas that would be removed or modified as part of the proposal are parts of fragmented patches of woodland that would make up a small portion of foraging habitat for the Little Eagle. Areas of derived native grassland and improved pasture that provide foraging habitat for the White Fronted Chat are widespread in the Study Area and Locality. The habitat resources in the Development Footprint do not constitute important habitat to the long term survival of the Little Eagle or the White Fronted Chat.
e)	*whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).*	No Critical habitat for these species has been identified within the Study Area. Due to previous land use and agricultural clearing, there are no contiguous woodland areas with high species richness located within the Study Area. Similarly the majority of the open grassland areas have undergone improvement and suffer previous impacts of farming. Therefore the proposed action is not likely to have an adverse

		effect on any critical habitat for the above mentioned species (either directly or indirectly).
f)	*whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.*	There are no current recovery plans or threat abatement plans for the Little Eagle or the White Fronted Chat. The mitigation hierarchy of avoid, mitigate and offset has been applied throughout the design and assessment of the proposed action. This has included removal of a turbine and its infrastructure to avoid habitat removal. A series of mitigation measures are proposed, which aim to protect the remaining areas of habitat and reduce the impacts associated with habitat loss. An offset strategy will be prepared for the proposed action to provide alternative areas of habitat for native species.
g)	*whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*	There are currently 37 key threatening processes listed under the Threatened Species Conservation Act 1995. Two are relevant to the proposal: <u>Clearing of Native Vegetation</u> Clearing, as defined by the determination, refers to the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation. There are numerous impacts as a result of clearing native vegetation, including destruction of habitat causing a loss of biological diversity, and may result in total extinction of species or loss of local genotypes, fragmentation of populations resulting in limited gene flow between small isolated populations, reduced potential to adapt to environmental change and loss or severe modification of the interactions between species, riparian zone degradation, such as bank erosion leading to sedimentation that affects aquatic communities, disturbed habitat which may permit the establishment and spread of exotic species which may displace native species and loss of leaf litter, removing habitat for a wide variety of vertebrates and invertebrates. The proposal will result in the removal of 3.9 ha of woodland habitat and 5.55 ha of derived native grassland. The removal of the woodland will involve the operation of this key threatening process however mitigation measures such as the removal and relocation of turbines and adjustment of access roads into areas that are cleared will minimise the impact of this process on native vegetation. <u>Loss of Hollow Bearing Trees</u> The proposal will result in the removal of eight hollow-bearing trees. Hollow-bearing trees are common in remnant woodland patches in the Study Area. The removal of hollow-bearing trees will increase the impact of the loss of hollow-bearing trees key threatening process listed on Schedule 3 of the TSC Act. Both of these key threatening processes will occur as part of the proposed action and will result in a small reduction of foraging and roosting habitat. However, the proposed action involves minimal clearing, with one turbine and its associated infrastructure removed from the Project to reduce habitat removal. A series of mitigation measures are proposed, which aim to protect the remaining areas of habitat and reduce the impacts associated with habitat loss. An offset strategy will be prepared for the proposed action to provide alternative areas of habitat for native species. Therefore, the operation of these key threatening processes have been minimised and the residual impact is considered to be minimal. .

TSC Act 7-part test	**Swift Parrot (Endangered), Regent Honeyeater (Critically Endangered)**
Swift Parrot This species was not recorded during field investigations and has not been recorded within the Locality. The nomadic nature of this species means it is hard to assess. This species migrates to the Australian south-east mainland between March and October, and occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*) and White Box (*E. albens*). Regent Honeyeater This species was not recorded during field investigations. There have been no recordings of this species within the Locality. The Regent Honeyeater inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Potential foraging habitats for this species in the form of the remnant woodland patches that exist in the Study Area have been identified.	
a) *in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*	The proposal would involve the installation of up to 29 individual wind towers standing up to 150m at the top of the blade and associated construction compounds, crane pads and access tracks. The placement of these elements has taken into consideration the geographical and environmental constraints of the site. To facilitate the installation of the above infrastructure the proposal would result in the removal of a combined 3.9 ha of woodland that includes 1.89 ha of Silvertop Ash Open Forest, 1.37 ha of Red Stringybark Open Forest and 0.64 ha of Box Gum Woodland associated with the development footprint. These woodland remnants in the Study Area provide sub optimal foraging areas for the Regent Honeyeater (Critically Endangered) and the Swift Parrot (Endangered). The small patches of woodland habitats available in the Study Area are unlikely to provide habitat essential to the survival of either the Regent Honeyeater or the Swift Parrot, and at best the habitats within the Study Area would provide an occasional stopover point for these migratory species. Blade strike to birds and bats is an inherent risk to any wind energy installation. The instances of blade strike on the Swift Parrot have been study through collision risk modelling undertaken by Biosis research in 2005 (Smales 2005). The study concluded that there is actually a very low (approximately 0.08 – 0.13) chance of Swift Parrots mortality from blade strike. Similar rates could be applied to the Regent Honeyeater, however these would represent a worst case scenario as the regent honeyeater's flight paths are generally much lower generally canopy height, than those of the Swift Parrot. Furthermore the Study Area is not in a known migratory path for either of these species thus the proposed actions will not affect the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
b) *in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species likely to be placed at risk of extinction.*	None of the above mentioned species belong to an endangered population in the area of concern.

c)	*in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:* *i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*	N/A
d)	*in relation to the habitat of a threatened species, population or ecological community:* *i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*	i) The proposal would result in the removal of a combined 3.9 ha of woodland habitat. ii) No contiguous woodlands with high species richness were recorded in the Study Area; therefore the woodland habitat is already considered fragmented. The proposed action would not increase this fragmentation. iii) The woodland within the Study Area would at best, provide an occasional stopover foraging point for these migratory species. The Proposed actions will therefore not affect the long-term survival of the species within the Locality.
e)	*whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).*	No Critical habitat for these species has been identified within the Study Area. Due to previous land use and agricultural clearing, there are no contiguous woodland areas with high species richness located within the Study Area. The woodland within the Study Area would at best, provide an occasional stopover point for these migratory species. Therefore the proposed action is not likely to have an adverse effect on any critical habitat for the above mentioned species (either directly or indirectly).
f)	*whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.*	There are national recovery plans for both the Swift Parrot and the Regent Honeyeater. <u>Swift Parrot</u> The plan considers the conservation requirements of the species across its range, identifies the actions to be taken to ensure its long-term viability in nature and the parties who will undertake these actions. This species is mainly threatened by loss and alteration of habitat from forestry activities including firewood harvesting, clearing for residential, agricultural and industrial developments, attrition of old growth trees in the agricultural landscape, suppression of forest regeneration, and frequent fire. The species is also threatened by the effects of climate change, food and nest source competition, flight collision hazards, psittacine beak and feather disease, and illegal capture and trade. The overall objective of this plan is to prevent further population decline of the Swift Parrot and to achieve a demonstrable sustained improvement in the quality and quantity of Swift Parrot habitat to increase carrying capacity. These objectives will be achieved by implementing recovery actions for each of the following specific recovery objectives: Objective 1: To identify and prioritise habitats and sites used by the species across its range, on all land tenures.

		Objective 2: To implement management strategies to protect and improve habitats and sites on all land tenures Objective 3: To monitor and manage the incidence of collisions, competition and Beak and Feather Disease (BFD). Objective 4: To monitor population trends and distribution throughout the range. <u>Regent Honeyeater</u> The objectives, criteria and actions proposed in the recovery plan for this species are based on a thorough review of the biological and ecological information available at the time of writing. However, it is emphasised that our knowledge of the habitat requirements of the Regent Honeyeater, and of seasonal or drought-induced movements, is still deficient, and that the adequacy of these actions will need to be reassessed as new information becomes available. Long-term objectives [to be achieved within two decades] include: 1. To ensure that the species persists in the wild. 2. To achieve a down-listing from nationally endangered to vulnerable by stabilising the population and securing habitat extent and quality in the main areas of occupancy. 3. Achieve increasing reporting rates (5%) in areas previously used regularly, e.g. Munghorn Gap, Bendigo, north-east Melbourne, Eildon area. The proposed actions have taken into account the management of areas of habitat and the impacts have been reduced as much as possible through the application of the mitigation hierarchy. Therefore, the proposed action is not inconsistent with the objectives of the above recovery plans.
g)	*whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*	There are currently 37 key threatening processes listed under the Threatened Species Conservation Act 1995. One is relevant to the proposal under this assessment: <u>Clearing of native vegetation</u> Clearing, as defined by the determination, refers to the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation. There are numerous impacts as a result of clearing native vegetation, including destruction of habitat causing a loss of biological diversity, and may result in total extinction of species or loss of local genotypes, fragmentation of populations resulting in limited gene flow between small isolated populations, reduced potential to adapt to environmental change and loss or severe modification of the interactions between species, riparian zone degradation, such as bank erosion leading to sedimentation that affects aquatic communities, disturbed habitat which may permit the establishment and spread of exotic species which may displace native species and loss of leaf litter, removing habitat for a wide variety of vertebrates and invertebrates. The proposal would increase the instance of this key threatening process within the Study Locality. This key threatening process will occur as part of the proposed action and will result in a small reduction of foraging habitat. However, the proposed action involves minimal clearing, with one turbine and its associated infrastructure removed from the Project to avoid habitat

	removal. A series of mitigation measures are proposed, which aim to protect the remaining areas of habitat and reduce the impacts associated with habitat loss. An offset strategy will be prepared for the proposed action to provide alternative areas of habitat for native species. Therefore, the operation of these key threatening processes have been minimised and the residual impact is considered to be minimal. .

	TSC Act 7-part test	**Box-Gum Woodland (Endangered Ecological Community)**
a)	*in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*	N/A
b)	*in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species likely to be placed at risk of extinction.*	N/A
c)	*in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:* *i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*	i) The current development footprint generally avoids areas of Box-Gum Woodland, however, TA26 occurs in an area of degraded Box-Gum Woodland comprising derived native grassland. An area of 0.03 ha of Box-Gum Woodland would be removed as part of the proposed action, however, this area is degraded and occurs as part of a cleared paddock that has undergone ploughing in the past. Other areas of Box-Gum Woodland occur, however, the development footprint has been adjusted to avoid these areas. Mitigation measures will be implemented to protect these areas. The removal of the small area of degraded Box-Gum Woodland would not have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction. ii) An area of 0.03 ha of Box-Gum Woodland would be removed as part of the proposed action. This occurrence of the ecological community has already undergone substantial modification as the native canopy has been cleared and the ground has been ploughed and pasture improved. The development footprint has been adjusted to avoid other more intact occurrences of Box-Gum Woodland. The proposed action would not substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

d)	*in relation to the habitat of a threatened species, population or ecological community:* *i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*	i) An area of 0.03 ha of Box-Gum Woodland would be removed as part of the proposed action. This occurrence of the ecological community is highly disturbed as the native canopy has been cleared and the ground has been ploughed and pasture improved. Other areas of Box-Gum Woodland occur in better condition. The development footprint has been adjusted to avoid these areas. ii) The occurrence of Box-Gum Woodland is already a fragment that is surrounded by cleared paddocks comprising improved pasture isolated from other areas of native vegetation. The removal of 0.03 ha of this ecological community will not result in further fragmentation or isolation. iii) This occurrence of the ecological community is highly disturbed as the native canopy has been cleared and the ground has been ploughed and pasture improved. Other more intact areas of the ecological community occur in the Study Area and these will not be affected by the proposed action. Therefore, the habitat to be removed is not important to the long-term survival of the ecological community.
e)	*whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).*	No Critical habitat for this ecological community has been identified within the Study Area.
f)	*whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.*	A recovery plan has not been prepared for Box-Gum Woodland. The proposed actions will avoid unnecessary impacts to the ecological community by using existing infrastructure where possible and avoiding areas of more intact Box-Gum Woodland.
g)	*whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*	One key threatening process is relevant to the ecological community: • Clearing of Native Vegetation. This key threatening process will occur as part of the proposed action. However, clearing will be minimal and will occur in an area of Box-Gum Woodland that is highly degraded. Other areas of Box-Gum Woodland in better condition will be retained, with mitigation measures implemented to protect these areas. An offset strategy will be prepared for the proposed action to compensate for the areas of Box-Gum Woodland that will be affected. Therefore, the operation of this key threatening process has been minimised and the residual impact is considered to be minimal. .