

**PROPOSED STOCKYARD HILL WIND FARM
FLORA AND FAUNA ASSESSMENT**

Stockyard Hill Wind Farm Pty. Ltd.



Brett Lane & Associates Pty. Ltd.
Ecological Research & Management

25 Burwood Road, Hawthorn, Vic. 3122

P O Box 74, Richmond, Vic. 3121

Ph. (03) 9815 2111

Fax. (03) 9815 2685

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ACRONYMS

AusWEA	Australian Wind Energy Association
AVW	Atlas of Victorian Wildlife
BCS	Bioregional Conservation Status
BL&A	Brett Lane and Associates Pty. Ltd.
BOCA	Bird Observation and Conservation Australia
CAMBA	China-Australia Migratory Bird Agreement
CVU	Central Victorian Uplands bioregion
DBH	Diameter at Breast Height
DCNR	(former) Department of Conservation and Natural Resources (Vic.)
DEWHA	Department of the Environment, Water, Heritage and the Arts (C'wth)
DNRE	(former) Department of Natural Resources and Environment (Vic.)
DSE	Department of Sustainability and Environment (Vic.)
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999 (C'wth)
ESO1	Environmental Systems Overlay – Schedule 1
EVC	Ecological Vegetation Class
FFG Act	Flora and Fauna Guarantee Act 1988 (Vic.)
FIS	Flora Information System
FZ	Farming Zone
GIS	Geographic Information Systems
GPS	Global Positioning System
JAMBA	Japan-Australia Migratory Bird Agreement
NCR	Nature Conservation Reserve
NTGVVP	Natural Temperate Grasslands of the Victorian Volcanic Plain
NWCC	National Wind Coordinating Committee
PVA	Population Viability Assessment
RDZ1	Road Zone Category 1
RSA	Rotor Swept Area
VROTS	Victorian Rare or Threatened Species
VVP	Victorian Volcanic Plain bioregion

Definitions

- ‘Development footprint’: includes turbine sites, construction pads associated with each turbine, access tracks, underground powerline routes and other on-ground infrastructure;
- ‘Study area’: includes the proposed footprint and immediate surrounds on participating properties potentially impacted by foreseeable infrastructure, such as turbines, access roads and underground power cabling;
- ‘Search region’: represents a circular area 20 kilometres in radius from the approximate centre point of the study area (coordinates 37° 13' 14" S latitude and 143° 02' 34" E longitude) used to compile existing information on the occurrence of flora and fauna on and near the study area from relevant databases; and
- ‘Powerline route’: includes all over-ground powerlines associated with the project, both on-site and between the project and the grid connection point approximately 59 kilometres to the south of the project (including the terminal station site).
- ‘Bioregion’ is defined as “a geographic region that captures the patterns of ecological characteristics in the landscape, providing a natural framework for recognising and responding to biodiversity values” (DNRE 1997). In general, bioregions reflect underlying environmental features of the landscape.
- ‘Habitat zone’ is defined as a remnant patch of remnant native vegetation comprising indigenous plant species considered part of a clearly definable Ecological Vegetation Class (EVC), as defined under the state Native Vegetation Management Framework.
- ‘Micrositing’ is a process by which information from the survey results are used to precisely site a structure to avoid areas of ecological sensitivity.
- ‘Mast guys’ are cables which hold posts including the Anometre.

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EXECUTIVE SUMMARY

Chapter 1: Introduction

Stockyard Hill Wind Farm Pty. Ltd. engaged Brett Lane and Associates Pty. Ltd. (BL&A) to conduct detailed flora and fauna assessments for land at Stockyard Hill, the site proposed for the establishment of a wind farm.

Key elements of this work included:

- Initial vegetation mapping and flora assessment;
- Threatened flora survey, habitat hectare assessment and net gain analysis of the development footprint;
- Targeted survey of native vegetation affected by the development footprint for the EPBC Act listed threatened community Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP);
- Initial fauna assessment to define and locate habitats and short-list issues for further investigation;
- Targeted Striped Legless Lizard, Golden Sun Moth, bird, bat and Brolga investigations;
- Recommendations in relation to construction and operational management to avoid and minimise impacts on flora and fauna; and
- Assessment of flora and fauna along proposed powerline route options, including final assessment of the preferred route option, and terminal station.

In accordance with the ‘avoid, minimise, offset’ principles of net gain, the layout of the proposed wind farm, including generators, access roads and other infrastructure, was designed to avoid patches of native vegetation wherever possible.

All assessments have been undertaken to address the requirements of relevant legislation and planning policies, which include:

- Native Vegetation Management Framework;
- *Flora and Fauna Guarantee Act 1988*; and
- *Environment Protection and Biodiversity Conservation Act 1999*.

In addition, assessments have included species listed on the DSE’s Threatened Species Advisory Lists.

Wherever appropriate, a precautionary approach has been adopted in the discussion of implications. That is, where insufficient evidence is available on the occurrence or likelihood of occurrence of a species, it is assumed that it could be in an area of habitat, if suitable, and the implications under legislation and policy are considered accordingly.

Chapter 2 Vegetation and Flora Assessment

Introduction and Methods

The vegetation and flora assessment was undertaken using a two-phase approach. The first phase comprised vegetation characterisation and mapping to identify ecological constraints and then assist in designing the wind farm layout including turbines and associated infrastructure. In areas of native vegetation located in the development footprint, further investigations were then completed to identify threatened flora species, habitat hectare assessments and net gain analyses, and potential offset sites were identified. Finally, the limited areas of grassland on and near the development footprint were assessed to ascertain if they belonged to the EPBC Act threatened community NTGVVP protected by the EPBC Act.

Results

The vegetation assessment identified 21 remnant patches of native vegetation, referred to as habitat zones, in areas potentially affected by the proposed wind farm development. These belong to seven EVCs:

- Grassy Woodland (Central Victorian Uplands);
- Grassy Woodland/Heathy Dry Forest Complex (Central Victorian Uplands);
- Heathy Dry Forest (Central Victorian Uplands);
- *Heavier-soils* Plains Grassland (Victorian Volcanic Plains);
- Plains Grassy Wetland (Victorian Volcanic Plains);
- Plains Grassy Woodland (Central Victorian Uplands); and
- Stony Rises Woodland (Victorian Volcanic Plains).

An overview of the native vegetation present within the site is identified in Executive Summary Figure A.

Review of historical information indicated that 33 listed threatened plant species had the potential to occur within the proposed wind farm site. Field surveys indicated that of these, the following eleven species were likely to occur within the study area:

- Small Milkwort;
- Australian Anchor Plant;
- Clover Glycine;
- Ben Major Grevillea;
- Adamson's Blown-grass;
- White Sunray;
- Spiny Rice-flower;
- Salt-lake Tussock-grass;
- Hairy Tails;
- Button Wrinklewort; and

- Swamp Everlasting.

Ben Major Grevillea was limited to forest ecosystems and had limited potential to occur in the northern forest areas (EVC 20) and Clover Glycine was recorded near Black Lake. Golden Cowslips, listed as vulnerable on DSE’s Advisory List of Rare and Threatened flora was also recorded in the study area.

The survey also identified a potential for NTGVVP, a nationally listed threatened community, to occur within the development footprint. A targeted assessment was then undertaken in parts of the development footprint identified as Plains Grassland during the initial vegetation mapping to determine whether these qualified as NTGVVP. None of these areas were found to support NTGVVP. However, the access track leading to Turbine 173 was found to support native grassland at a State threshold. The location of the access track was subsequently moved to avoid this habitat, so this community is no longer affected by the proposal.

The design layout of the proposed wind farm, undertaken in collaboration with the proponent, followed the ‘avoid’ and ‘minimise’ principles of the Native Vegetation Management Framework. Six habitat zones supporting native vegetation were avoided by micro-siting turbines and associated structures away from these, thereby minimising impacts on these.

The habitat hectare assessment identified 21 habitat zones as being potentially impacted by the proposed wind farm development. Of these, five were of very high, eight of high, one of medium and seven of low conservation significance (Executive Summary Table A). Habitat Zones Y and W were identified as the Western (Basalt) Plains Grassland Community and Habitat Zone X was identified as the Western Basalt Plains (River Red Gum) Grassy Woodland Floristic Community both listed as threatened under the *FFG Act*. None of the areas affected qualified as NTGVVP.

Executive Summary Table A

Conservation Significance	Area (hectares)
Very High	1.67
High	1.2
Medium	0.33
Low	2.11
Total	5.31

Impacts and Offsets

A total of 5.31 hectares (2.25 percent) of native vegetation would need to be removed for the construction of the proposed wind farm. As impacts on these areas could not be avoided due to construction and operational constraints, this native vegetation removal will require offsetting. Calculations have indicated that 3.09 habitat hectares are required for offset. This is approximately equivalent to 16 hectares of remnant native

vegetation of equivalent EVCs meeting the like-for-like criteria (DNRE 2002). More specifically, the following areas of the specific EVCs are estimated to be required as offsets:

- 9.1 hectares of Heathy Dry Forest (EVC 20);
- 3.35 hectares Grassy Woodland/Heathy Dry Forest Complex (EVC 896);
- 0.05 hectares of Plains Grassy Woodland (EVC 55);
- 0.7 hectares of Grassy Woodland (EVC 175_61);
- 1.9 hectares of *Heavier-soils* Plains Grassland (EVC 132_61); and
- 0.2 hectares of Stony Rises Woodland (EVC 203).

Sites within the wind farm boundary that will not be affected by the development have been identified to meet these offset requirements, where possible. Alternatives have also been identified for habitats which cannot be offset onsite, such as offsite locations and / or financial contributions to local government.

Several trees have also been identified in Habitat Zones and scattered in the survey area. Two large trees in Habitat Zone Q will require removal. These will need to be offset by protecting four trees and planting 20 trees. Several trees have been identified in the Valley Grassy Forest vegetation in the north-western part of the study area. The fringes of this forest have been identified as a suitable location for the recruitment of new plants.

Eight scattered trees, including one very large and seven small trees all of low conservation significance, will require removal. These can be offset by planting 10 new trees. A suitable location for these is along the fringes of the Valley Grassy Forest described above.

Regulatory Implications and Licence Requirements

The removal of two threatened communities, Western (Basalt) Plains Grassland Community (Habitat Zones W and Y) and Western Basalt Plains (River Red Gum) Grassy Woodland Floristic Community 55-04 on public land will require a license under the FFG Act. A license under the FFG Act will be required to remove native vegetation from the following road reserves:

- Intersections of Thompsons Road with the proposed access tracks for Turbines 48 and 51; and
- Road reserve on Stockyard Hill Road along the proposed access track to Turbines 72, 71 and 69.

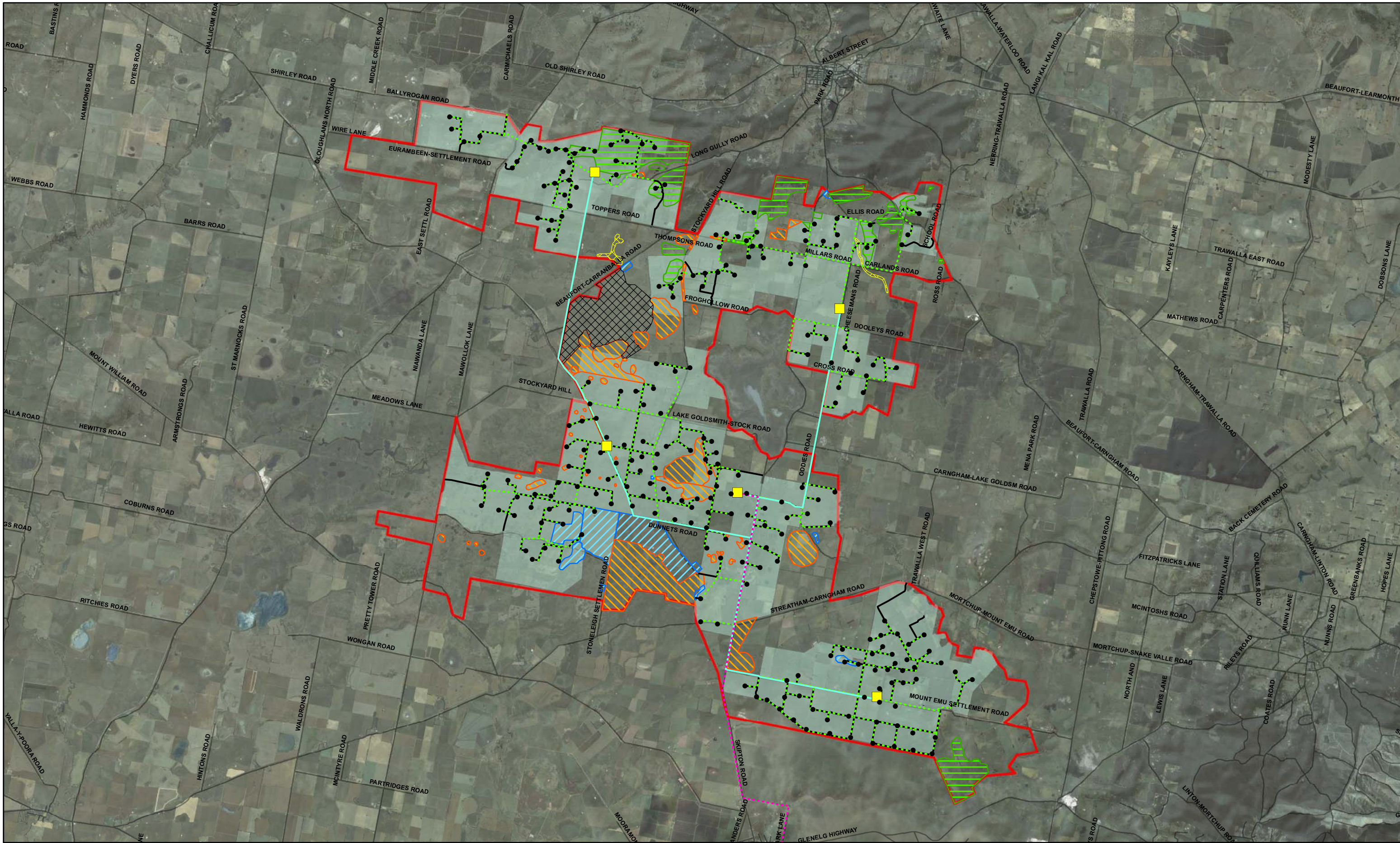
Several protected species under the FFG Act from the daisy, orchid and heath families were identified as being present on the Thompsons and Stockyard Hill Road reserves. A license will be required for the removal of these.

A planning permit is required under the local planning scheme to remove native vegetation, including scattered individuals occurring outside of remnant patch vegetation. Within Habitat Zones X and Y, a permit is likely to be required under the ESO1 to create cuts of greater than 1 metre in depth (e.g. for the construction of wind turbine footings).

No threatened flora species or vegetation communities listed on the EPBC Act were identified as being present in the wind farm development footprint and impacts are therefore not considered to be significant.

The proposed wind farm is situated adjacent to three lakes (Lake Goldsmith, Black Lake and Buln Gherin Meadow) and two creeks (Mount Emu Creek and Fiery Creek). Turbines and access tracks were sited away from these locations and no significant impacts were identified.

In addition to the measures implemented to satisfy the requirements of the Framework, best practice construction methods have been outlined to further minimise impacts on native vegetation and surface water in and adjacent to the wind farm boundary.



Legend

- Study Area
- Proposed Substations
- Wind Farm Site
- Proposed Turbines
- Roads
- Internal Powerlines
- External Powerlines
- Onsite UG Ret Cabling

Ecological Vegetation Class

- Heathy Dry Forest (EVC 20)
- Stony Rises Woodland (EVC 203)
- Plains Grassland (EVC 897)
- Creekline Riparian Vegetation
- Cleared Vegetation



Executive Summary Figure A: Native Vegetation Overview		
Project: Proposed Stockyard Hill Wind Farm		
Client: Stockyard Hill Wind Farm Pty. Ltd.		
Project No.: 7132	Date: 24/09/2009	Created by: Brett Lane / Syahrudin
Brett Lane & Associates Pty. Ltd. Ecological Research & Management		
Experience Knowledge Solutions	605 Nicholson Street PO Box 592, Carlton North VIC 3054 Australia	ph (03) 9387 5008 fax (03) 9387 6115 blane@ecologicalresearch.com.au www.ecologicalresearch.com.au

Chapter 3: Fauna Assessment

Introduction and Methods

The fauna assessment was also undertaken in two phases. First, broad habitat types were identified and the likely presence of listed threatened fauna species was ascertained. Targeted surveys were then undertaken on species for which potentially suitable habitat was likely to be affected by the proposed development to ascertain to what extent, if any, the proposed wind farm would impact these. Of note, as some of the species are coupled to native habitat the avoidance of such habitat during vegetation work, also reduced the risk to these species.

Results

Six fauna habitat types were identified in the study area:

- Remnant woodland of moderate quality for fauna;
- Cleared agricultural land of low habitat quality for fauna;
- Plantation woodland of moderate habitat quality for fauna;
- Aquatic habitats of high quality for fauna;
- Scattered planted trees of moderate quality for fauna; and
- Rocky rises of high quality for fauna.

Based on the habitats present within the proposed wind farm and historical information obtained, suitable habitat was found for the following eight listed threatened species:

- Australasian Shoveler;
- Brown Treecreeper;
- Hardhead;
- Brolga;
- Brush-tailed Phascogale;
- Fat-tailed Dunnart;
- Growling Grass Frog;
- Striped Legless Lizard; and
- Golden Sun Moth.

Due to the likelihood of these species being present in the study area, targeted surveys were undertaken for Striped Legless Lizards and Golden Sun Moth. Targeted surveys were not undertaken for Growling Grass Frogs as wind turbines and associated structures are to be constructed well away from areas of suitable habitat.

Striped Legless Lizard was identified twice at survey Grid 4, adjacent to Black Lake. Fat-tailed Dunnart were recorded six times at survey Grid 5. A total of 29 individuals were recorded. Tussock Skink was recorded nine times at survey Grids 1, 2 and 3 and Little Whip Snake was recorded once at survey Grid 1.

No Golden Sun Moths were identified during the targeted surveys. The results of targeted Brolga surveys are considered separately later within this report.

Results from the terrestrial fauna surveys indicated that national- and state-listed threatened species were present in the study area. Whilst results did not provide an indication of population size, they did assist in siting the turbines to avoid important habitats for these species.

Nine bat species were recorded during the survey, from seven recording sites. The species recorded at the wind farm site were not threatened or listed under any wildlife conservation legislation, nationally or in Victoria; however, one species was recorded the Inland Broad-nosed Bat. This species is uncommon but widespread in northern and western Victoria (Menkhorst 1995). The four sites where activity was recorded were located among or near remnant native vegetation, scattered trees or plantations (Sites 1, 2, 5 and 6). Bat calls recorded from sites in farmland (Sites 3, 4, and 7), where there were no trees or shrubs, had comparatively much lower bat activity.

Historical waterbird records were obtained from DSE at the following four lakes in close proximity to the proposed wind farm boundary: Lake Goldsmith, Black Lake, Buln Gherin Meadow and Slate Lake. During the survey period, the lakes were frequented by a number of state-listed threatened species. State-listed threatened species included Brolga, Gull-billed Tern and species listed on the DSE Advisory List of Threatened Fauna included Australasian Shoveler and Whiskered Tern.

Data from the BOCA indicated that between 1992 and 1994 nine shorebird migratory species frequented Lake Goldsmith when habitat conditions were temporarily suitable. These were Sharp-tailed Sandpiper, Red-necked Stint, Curlew Sandpiper, Marsh Sandpiper, Greenshank, Latham's Snipe, Pectoral Sandpiper, Long-toed Stint and Ruddy Turnstone. The average numbers found represent less than 0.3 percent of the Australian populations of the species concerned, and less than that of the migratory corridor East-Asian Australasian flyway population.

Results from the bird utilisation survey indicated that bird activity and species diversity was comparable between the wind farm survey location and reference location. Species richness and abundance at Stockyard Hill was similar to other sites with equivalent farmland habitat.

The majority of birds flew below Rotor Swept Area (RSA) with the majority of birds flying at RSA being Ravens, Long-billed Corellas, Common Starling, Yellow-tailed Black-Cockatoo and Galah, all of which are common farmland birds. Four birds of prey within the proposed wind farm were recorded at RSA height.

Important fauna habitats and a summary of fauna records are provided in Executive Summary Figure B.

Impacts

Four sources of impact were identified: habitat loss, disturbance, collision with wind turbines and collision with mast guys.

These impacts have not been found to be significant on the fauna observed in the study area. This is because the turbines have been sited to avoid suitable fauna habitat. Nevertheless there is still a possibility that listed threatened species may be present near a small number of turbines and associated access tracks near Stockyard Hill. Therefore salvage protocols have been recommended to avoid impacts to these. These

would be implemented when species are encountered and would ensure the safe translocation of the species from the source of impact.

Species using a nearby habitat can be disturbed by increased human and plant activity and respond to this by moving away from the source of disturbance. As with habitat loss, disturbance can either be temporary or permanent. Impacts during construction activities will be temporary, whilst impacts during operations, such as noise disturbance from the turbines, will last throughout the wind farm life-span.

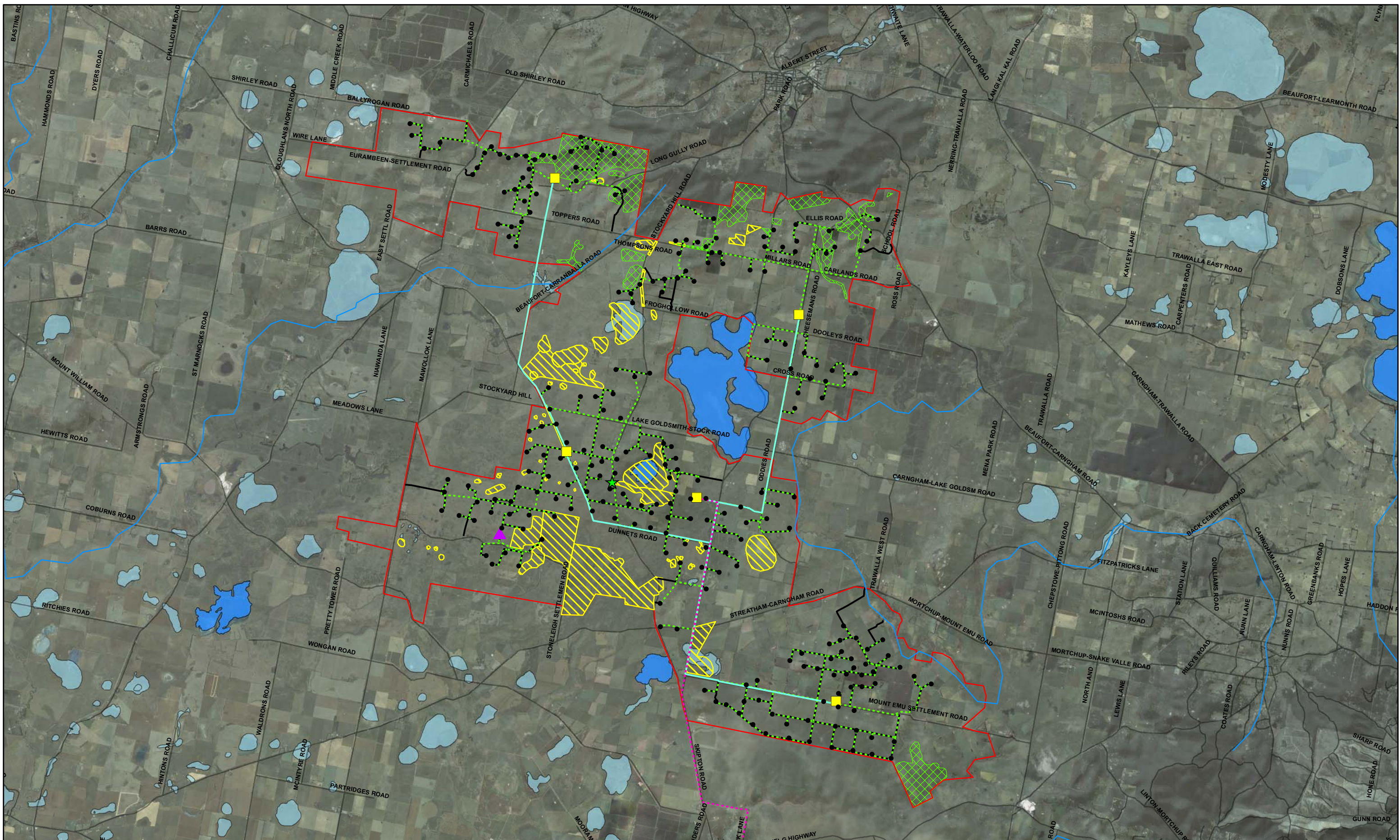
Birds and bats have the potential to collide with wind turbines and mast guys. Numerous studies have been undertaken to determine whether collisions with wind turbines and mast guys have a significant impact on bird populations. Observed collision rates in world-wide studies generally range between 0.04 and 4 birds per turbine per year. Factors that affect the rate of collision are site topography and habitat, which determine the species and size of bird populations which will be present in a given area. For example, low quality habitat which supports small populations of common birds will result in a smaller impact on bird population than those supporting a high quality habitat with a large diversity of birds. Taking into consideration bird population diversity and abundance, and the highly modified landscape, the proposed Stockyard Hill Wind Farm is unlikely to have a significant impact on bird populations.

In Australia, bird mortality from wind turbines is low and collision rates range between one and four birds per turbine per year, which is consistent with international studies.

Regulatory Implications and Licence Requirements

One EPBC Act listed threatened species, the Striped Legless Lizard, was identified as being present in the study area. Areas of moderate quality native grassland were found to have some potential to support Golden Sun Moth, and EPBC Act listed threatened species, though this was considered to be highly unlikely as the habitat was isolated from extensive areas of suitable habitat. The wind farm layout was designed to avoid these areas. Therefore, impacts to these species are assessed as not being significant based on the criteria for significant impact under the EPBC Act. Notwithstanding this, on the 15th of July the Commonwealth Minister for the Environment determined the proposal is a 'controlled action' under the Act, requiring assessment and approval.

One DSE Advisory List threatened species, the Fat-tailed Dunnart, was found to be present in the study area. Suitable habitat has been identified and avoided in the wind farm layout design and impacts on these species are not considered to be significant.



Legend

- Study Area
- Proposed Turbines
- Access Tracks
- Onsite UG Ret Cabling
- Internal Powerlines
- External Powerlines
- Proposed Substations
- Roads
- Streams

Fauna Habitats

- Woodland
- Grassland
- Lakes
- Wetlands
- Striped Legless Lizard Record
- Fat-tailed Dunnart Record



Executive Summary Figure B: Fauna Habitats and Results Overview		
Project: Proposed Stockyard Hill Wind Farm		
Client: Stockyard Hill Wind Farm Pty. Ltd.		
Project No.: 7132	Date: 24/09/2009	Created by: B. Lane / Syahrudin
Brett Lane & Associates Pty. Ltd. Ecological Research & Management		
Experience Knowledge Solutions	605 Nicholson Street PO Box 592, Carlton North VIC 3054 Australia	ph (03) 9387 5008 fax (03) 9387 6115 blane@ecologicalresearch.com.au www.ecologicalresearch.com.au

Chapter 4: Targeted Brolga Assessment

Introduction and Methods

Brolga is listed as a threatened species under the FFG Act and is considered vulnerable to collision with wind turbines. The presence of Brolga in close proximity to the proposed wind farm required a targeted survey and impact assessment to be undertaken. Whilst Brolga populations in the past were extensive, their distribution and numbers have declined and contracted in south eastern Australia. Currently, approximately 250, or 75% of breeding sites in Victoria, are found on the volcanic plains in the southwest of the state. Taking this into consideration, it is essential to ensure that the proposed wind farm does not further impact Brolga populations in this area.

Methods used for this assessment were undertaken in accordance with the interim risk assessment standards for wind farms and birds (AusWEA 2005). In addition, the assessment was undertaken as the DSE was developing guidelines for Brolga impact assessment at wind farms in south western Victoria and the approach adopted has both informed and been consistent with these guidelines.

During the overview fauna assessment a Level 1 assessment was undertaken during which suitable Brolga habitat was identified.

Two levels of survey were undertaken (Level 2 and Level 3). The aim of the Level 2 survey was to:

- Identify the number and quality of wetlands known to be frequented regularly by Brolgas;
- Determine how Brolgas may use the proposed wind farm site and surrounding areas (within 20 kilometres of the wind farm boundary); and
- Identify known and potential breeding, migration and flocking sites on the proposed wind farm site and surrounding areas (within 20 kilometres of the wind farm boundary).

Based on the results of the Level 2 survey, a Level 3 survey was undertaken within three kilometres of the proposed wind farm to:

- Establish the likely number of Brolga movements across the proposed wind farm in all seasons to inform collision-risk modelling; and
- Identify the number and quality of additional wetlands and potential breeding sites on and within three kilometres of the proposed wind farm site as a basis for estimating the number of breeding pairs potentially affected by the project (a significant input to collision risk modelling).

A detailed behavioural investigation during the breeding and flocking seasons (Level 3) was undertaken to gather data to address these questions.

Results

Historical records indicated 23 historical breeding records within three kilometres of the proposed wind farm and associated infrastructure.

The Level 2 breeding survey was undertaken in 2007. All wetlands within 20 kilometres of the proposed wind farm site assessable from public roads within 20 kilometres were