# *FLORA AND FAUNA ASSESSMENT*
# *FINAL REPORT*

## *CAPITAL WIND FARM STAGE 2*
## *SOUTHERN TABLELANDS, NSW*

prepared by

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Cover Photograph. Plate 1: Typical landscape where Capital Wind Farm Stage 2 is located. The low ridge in the foreground supports native pasture or occasionally native grassland amongst the rocky outcrop, while the lowland flats in the distance are ploughed and cropped. Photograph shows the site of proposed towers 26 to 35, looking north.

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***Contents***

## 1. Introduction

Kevin Mills & Associates were engaged by Infigen Energy to undertake a field investigation and assessment of the flora and fauna located on the land being considered for Stage 2 of the Capital Wind Farm. The first stage was also investigated by the consultant in 2005; that part of the project is now completed and is operational. The rural properties involved are adjacent to the existing Stage 1 wind farm; as shown in **Figure 1**.

The purpose of this report is to assess the impact of the proposed Stage 2 developments on flora and fauna. The report contains:

1. a description of the vegetation and fauna habitat on all land involved in the project;
2. identification of all relevant threatened species, populations and communities under state and commonwealth legislation;
3. an assessment of the potential impact of the developments on flora and fauna, including:
   - species, populations and communities listed under the New South Wales *Threatened Species* Conservation Act 1995;
   - matters of national environmental significance listed under the Commonwealth *Environment* Protection and Biodiversity Conservation Act 1999; and
   - Koala habitat, as required under State Environmental Planning Policy No.44 - Koala Habitat Protection; and
4. a discussion of what measures should be taken to reduce the impact of the proposals on flora and fauna.

This project is being considered under Part 3A of the EP&A Act 1979. The *Threatened Species Conservation Act 1995* is therefore turned off, but the lists of threatened species, etc are still relevant. The assessments made here are in accordance with the document prepared by DECCW titled "Guidelines for Threatened Species Assessment." (DECC/DPI 2005).

## 2. The Study Area

The district to the east of Lake George has had a long history of sheep grazing, commencing well before 1850. The land is almost totally cleared of its original woodland cover and much has been pasture improved, seeded with pasture species and fertilised. Much of the lowland has recently been ploughed; see cover photograph. Remnant woodland is largely restricted to small areas on the higher ridges.

The proposed development areas associated with Stage 2 are summarised in **Table 1**; see also **Figure 1.** These are the areas where field investigations were concentrated, although all of the envelope as shown on **Figure 1** was studied.

***Table 1***
***Components of the proposed Stage 2 developments***

| Component | No. Towers | Length | Topography |
|---|---|---|---|
| Tower Arrays | | | |
| No. 1, 2 4 to 11 | 10 | 2,000 metres | Lakeside flat; three most southern on low ridge. |
| No. 17 | 1 | one site | Low ridge. |
| No. 19 to 21 | 3 | 500 metres | Lowland flat. |
| No. 24, 25 | 2 | 250 metres | Lowland flat. |
| No. 26 to 35 | 10 | 1,750 metres | Lakeside flats; three most southern on low knoll. |
| No. 37 to 39 | 3 | 500 metres | Low ridge. |
| No. 40 to 51 | 13 | 3,000 metres | Lakeside flat. |
| Un-numbered | 8 | 1,500 metres | Lakeside flat. |

Access Tracks (other than along rows)
Approx. 6.5 kilometres in addition to those tracks linking the rows of towers.

Buried Cable Routes
Approx. 9 kilometres in addition to route linking the rows of towers.

Overhead Cable Routes
Approx. 13 kilometres of line.

# 3. Survey Methods

## 3.1 Flora Methods

*Dates of Survey*
The study areas at Capital Wind Farm were investigated during visits on 28 and 29 April and 12 and 13 May 2010. The consultant has carried out various surveys since 2005, so that the area is well known to the consultant.

*Purpose*
The main purpose of the flora survey was to classify and describe the vegetation, to identify the distribution of the plant communities, to record as many as possible of the plant species present and to search for threatened plant species.

*Survey Techniques*
Bearings were taken from colour aerial photographs and maps showing the extent of the study area. The vegetation survey techniques combined multiple traverses of the study areas with disciplined vegetation sampling on selected sites. The traverses, which were undertaken on foot, covered the study areas several times during the survey period; special attention was given to searching of native grassland and wherever indigenous plants were likely to be found. Both indigenous (native) and exotic (weed) species were identified and recorded.

Vegetation survey plots were temporarily established in patches of grassland that exhibited at least some native plant growth; the plots were 20 metre by 20 metre plot (400 $m^2$). The plots were selected to sample the best quality native grassland in the area. A *pro forma* or standard survey sheet was completed on each plot to record the following data:

Plot data: plot identification number
- date of survey
- plot size
- plot location (including GPS reading at centre of plot)
- land tenure
- landform, geology and soil type
- slope (gentle, moderate, steep, very steep), aspect, altitude

Floristic data: height and proportional coverage (% of each layer or stratum (tree canopy, middle storey, shrub understorey, ground cover)
- species present in each stratum
- abundance score for each species, as set out below
- if treeless, the closest tree species to the plot.

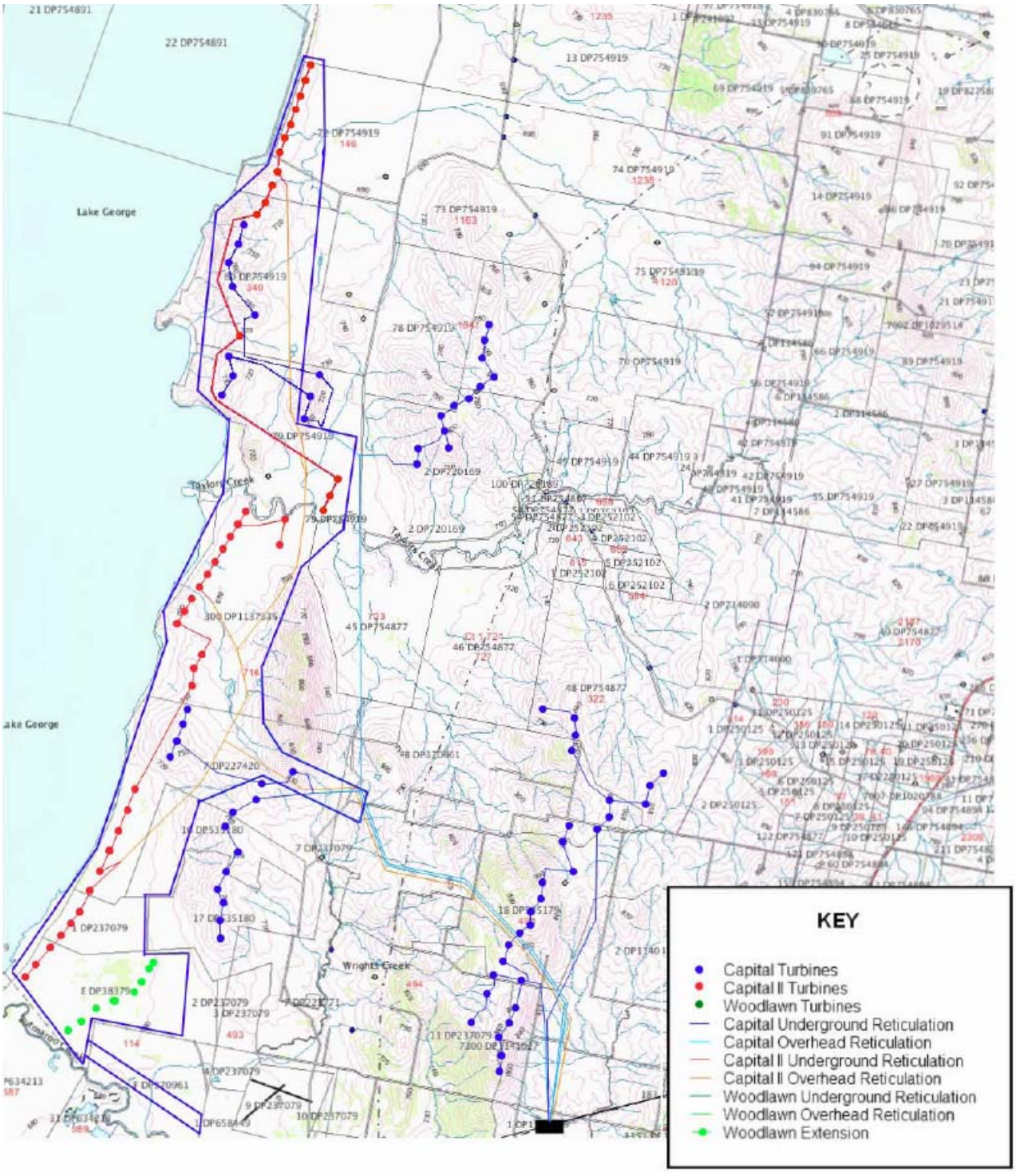


***Figure 1. Location of Stage 2 of the Capital Wind Farm.***

Floristic data for each species within each plot was gathered using a subjective abundance score based upon the following range of cover scores:

1 <5% uncommon to rare
2 <5% common
3 5% - 25% foliage cover
4 25% – 50% foliage cover
5 50% - 75% foliage cover
6 75% -100% foliage cover.

The quality of the grassland was determined using the system developed by Rehwinkel (2007), where a 400 $m^2$ plot is given a 'site quality score' based on the native species present on the plot.

*Vegetation Classification*

The vegetation communities on the study area were classified on the basis of their structure and the name(s) of the dominant species in the tallest stratum, using the structural classification system devised by Walker and Hopkins (1990). Of most importance is the definitions of grassland types. The following definitions used in this report are widely accepted in the botanical literature; most of those relating to grasslands are largely from the report by Rehwinkel (1997).

Woodland: a community of well spaced trees (projective foliage cover 10-30%) growing to a height of 4 to 30 metres.

Open Woodland: a community of scattered trees (projective foliage cover <10% growing to a height of 4 to 30 metres.

Grassland: vegetation dominated by grasses and forbs, with <10% tree and/or shrub cover.

Native Grassland: grassland with >50% of vegetation cover composed of indigenous species, >50% of all species are native, and the minimum vegetation cover, alive or dead, is >10%.

Natural Grassland: native grassland considered to have had <10% tree and/or shrub cover at the time of European settlement.

Secondary Grassland: a native grassland remaining after the removal or dieback of previously occurring trees and/or shrubs, where these occupied >10% cover.

Native Pastures: containing native and introduced species, where introduced species occupy >50%, but <75% of both cover and species present, where pasture species have often been mechanically sown.

Exotic Grassland: where >75% of species and cover are composed of introduced plants.

Natural Temperate Grassland: a threatened grassland community listed under the Commonwealth *Environment Protection and Biodiversity Conservation* Act. The Recovery Plan for Natural Temperate Grassland (Environment ACT 2006) provides the following information:

> "The community is dominated by moderately tall (25-50cm) to tall (50cm – 1.0m), dense to open tussock grasses with up to 70% of the species being forbs. The community may be treeless or contain up to 10% cover of trees, shrubs or sedges. In the Southern Tablelands, Natural Temperate Grasslands are located at altitudes between 560 and 1200 metres in valleys influenced by cold air drainage and in broad plains. The community occurs within the geographical region of the Southern Tablelands of NSW and ACT, which extends southwards from the Abercrombie River to the Victorian Border, from Boorowa and Jindabyne to the west and Goulburn to Braidwood and Bombala to the east."
>
> "Natural Temperate Grassland is a native ecological community that is dominated by native species of perennial tussock grasses. The dominant grasses are *Themeda triandra* [*australis*], *Austrodanthonia*

> species, *Bothriochloa macra* and *Poa* species. The upper canopy stratum generally varies in height from mid-high (0.25-0.5m) to tall (0.5-1.0m). There is also a diversity of native herbaceous plants (forbs), which may comprise up to 70% of species present. The community is naturally treeless or has less than 10% projective foliage cover of trees or shrubs in its tallest stratum. The ecological community that makes up NTG-ST [Natural Temperate Grassland – Southern Tablelands] is defined by the vegetation structure thought to have been present at the time of European settlement."

*Targeted Surveys*

In addition to general flora surveys in the study area, the survey program targeted threatened plant species known to occur in the local area. Those species listed in **Table 3** later in this report were targeted by careful searches of possible habitat within the study area. Part of the survey included habitat assessment to determine if the above species would be likely to occur in the study area. Species other than those appearing in **Table 3** and that were identified in the DECW submission to the DoP are discussed in **Appendix 1**.

*Plant Species Nomenclature*

The plant species names in this report are the current names published by the National Herbarium of New South Wales in the *Flora of New South Wales* (Harden 1992-2002). Most of the common names are from the *Flora of New South Wales* (op. cit.), *Australian Plant Genera* by Baines (1981) and *Weeds of the South-east* by Richardson, Richardson and Shepherd (2006).

### *3.2 Fauna Methods*

*Dates of Survey*

The study area at Capital Wind Farm was investigated during visits on 28 and 29 April and 12 and 13 May 2010. As noted above, the consultant has had considerable experience in the district since 2005.

*Techniques*

Mammals were identified by sight and by interpreting their distinctive calls. The mammal survey also involved a ground search for scats, tracks and diggings. Given the lack of trees and wetlands in the study area and the highly modified land involved, no night time surveys were undertaken. There is no habitat for nocturnal mammals in the area and the one watercourse in the area, Taylors Creek, is not affected in any way so there could be no impact on frog species. There are, in any case, no threatened nocturnal species in the area, other than bats that are being investigated by others.

The birds on the study areas were identified by sight and by identifying their calls. On each study area, the following information was recorded on each survey: date and time of the survey, the species recorded and their number, the height class in which they were recorded and other relevant notes such as weather conditions. The habitats present in each area are described elsewhere in this report.

Reptiles were searched for under rocks and debris such as logs. The frogs in the study area were identified by interpreting their distinctive calls, although no night-time surveys were carried out. A search was conducted for frogs in moist areas and habitat niches, especially under rocks, wood and debris.

*Targeted Surveys*

In addition to general fauna surveys in the study areas, the survey program carried out targeted surveys for threatened species known to occur in the local area; techniques varied according to the species targeted. The document *Threatened Species Survey & Assessment: Guidelines for Developments and Activities* (DECC 2004) was consulted when determining survey requirements.

The key listed threatened species known and likely to occur in the locality are birds. Bird surveys in the study area consisted of total area searches, as noted above. The study area was searched with particular attention given to habitat that could support the target species, e.g. treed areas and creek lines. These surveys, along with habitat assessment, are sufficient to determine if the listed threatened birds occur or are likely to occur in the study areas.

Rock searches were carried out for reptiles, although the minor occurrence of rock in the area and lack of native grassland are likely to mean that the listed threatened species would not occur in the locality.

*Animal Species Nomenclature*

The fauna species nomenclature in this report is based on the Australian Museum's *The Mammals of Australia* (Strahan 1995), *Australian Bats* (Churchill 1998), *Systematics and Taxonomy of Australian Birds* (Christidis & Boles 2008) and *Reptiles and Amphibians of Australia* (Cogger 1992).

# 4. Site Descriptions

## 4.1 An Overview of Vegetation and Habitats

### Original Vegetation

The original vegetation in the area generally can be ascertained by studying the remnant vegetation that exists in the area and through observations made elsewhere on the tablelands. Essentially, there were three vegetation zones: (i) woodland of the higher and often rocky ridges and slopes; (ii) woodland and open woodland on the gentle to level land of the valleys and lower slopes; and (iii) the largely treeless grassland of the broad flats adjacent to Lake George.

The woodland on the higher country contained the trees Inland Scribbly Gum *Eucalyptus rossii*, Broad-leaved Peppermint *Eucalyptus dives*, Red Stringybark *Eucalyptus macrorhyncha* and Brittle Gum *Eucalyptus mannifera*. Stands of Drooping She-oak *Allocasuarina verticillata,* Black She-oak *Allocasuarina littoralis* and Hickory Wattle *Acacia falciformis* occur in some places. The understorey is often shrubby and mostly dominated by large tussock grasses, particularly Silvertop Wallaby Grass *Joycea pallida*.

The lowland woodland to open woodland is usually quite distinct from the above woodland, which it adjoins but is restricted to the lower topography. The key trees are Yellow Box *Eucalyptus melliodora* and Blakely's Red Gum *Eucalyptus blakelyi*, with Apple Box *Eucalyptus bridgesiana* often along gullies. This woodland is commonly known as Box-Gum Woodend and is a part of the widespread White Box - Yellow Box - Blakely's Red Gum Woodland community complex. Stands of woodland dominated by other species occur in a few places; the species involved are Snow Gum *Eucalyptus pauciflora* and Ribbon Gum *Eucalyptus viminalis*. The latter grows on deep sand at the edges of the Lake George flats. The understorey to this woodland is grassland, similar to that described below.

The natural grassland in the region covered large sections of the flat land across valley floors and around Lake George. This grassland is known as Natural Temperate Grassland and it merged gradually with the above Box-Gum Woodland. Trees were largely absent. The dominant grasses were Wallaby Grasses *Austrodanthonia* spp, Tussock Grasses *Poa* spp.. and Kangaroo Grass *Themeda australis*. The diversity in herbaceous species was high, but shrubs were rare. The dominance of Spear-grasses *Austrostipa* spp. and the presence of some trees on low ridges suggest that the areas above the valley floors supported open woodland, i.e. Box-Gum Woodland, not natural temperate grassland.

### Existing Vegetation

Today, the remnants of the above broad vegetation pattern can be discerned by careful observation of the landscape, although the original boundaries between the communities are open to speculation. The Stage 2 area would have originally had woodland on the higher parts, most of the flat land in the valleys probably supported Natural Temperate Grassland. This native grassland has all but disappeared under farm management practices, in fact most has been cropped for decades and the original grassland has gone altogether. Quite extensive areas of native pasture exist adjacent to the flats; see **Figure 2**. It is suggested here that those areas once supported open woodland rather than natural temperate grassland.

Most of the study area is covered in exotic grassland and cropped land. The quality of the grassland depends upon the grazing and management history of individual paddocks; see **Plate 2**. As noted elsewhere, particular attention was given in this study to the quality of the grassland in the development areas. During the study, five grassland survey plots were sampled on sites that exhibited some native plant diversity; exotic grassland was not surveyed in this way. The results gained from these surveys are provided in **Appendix 2**. These plots sampled the best quality grassland encountered during the study in each part of the development area. A summary of these plots is provided in **Table 2**, and their locations are shown on **Figure 2**.

***Table 2***
***Summary of grassland plot surveys***

| No. | Native Species | Exotic Species | Community | Floristic Value Score[1] |
|---|---|---|---|---|
| CWF01 | 10 | 13 | Native pasture | 0 |
| CWF02 | 16 | 18 | Native pasture | 6 |
| CWF03 | 22 | 8 | Native grassland | 3 |
| CWF04 | 27 | 4 | Native grassland | 3 |
| CWF05 | 8 | 8 | Native pasture | 0 |

1. Determined using the method developed by Rehwinkel (2007).

The 'floristic value score' and observations throughout the study area indicate that that the native grassland in the area is of low quality. Because of the presence of a few indicator species amongst rocks on plot CWF02, it receives an inflated score of 6. This score is still of only low to moderate floristic value.

Native plants are often associated with rock outcrops, where grazing cannot eliminate them; see photograph for plot CWF2 in **Appendix 2**. Larger rock outcrops can contain many native and most of the natives in a paddock. Species regularly encountered among rocks in this study include Necklace Fern *Asplenium flabellifolium*, Weeping Grass *Microlaena stipoides*, Dwarf Skullcap *Scutellaria humilis*, Spiny-headed Mat-rush *Lomandra longifolia*, Prickly Starwort *Stellaria pungens* and Nodding Saltbush *Einadia nutans*.

*Plate 2. Differential management between individual paddocks; the grassland to the right*

*is native grassland with few weeds, that to the left is native pasture and exotic grassland.*

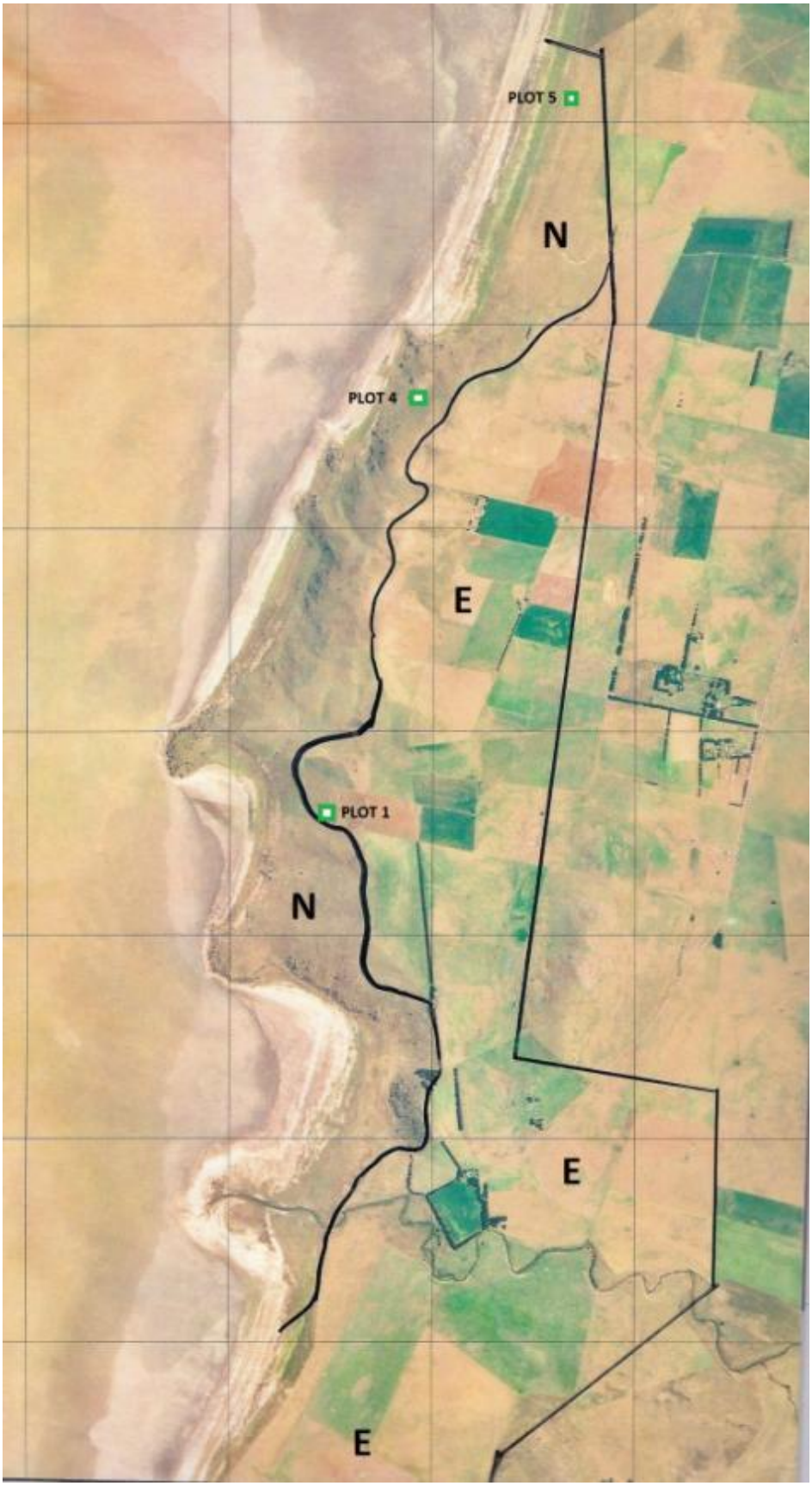


**Figure 2a. Vegetation map and location of survey plots (north).**
**(N = native pasture with some native grassland.**

**E = exotic grassland, cropped land.)**

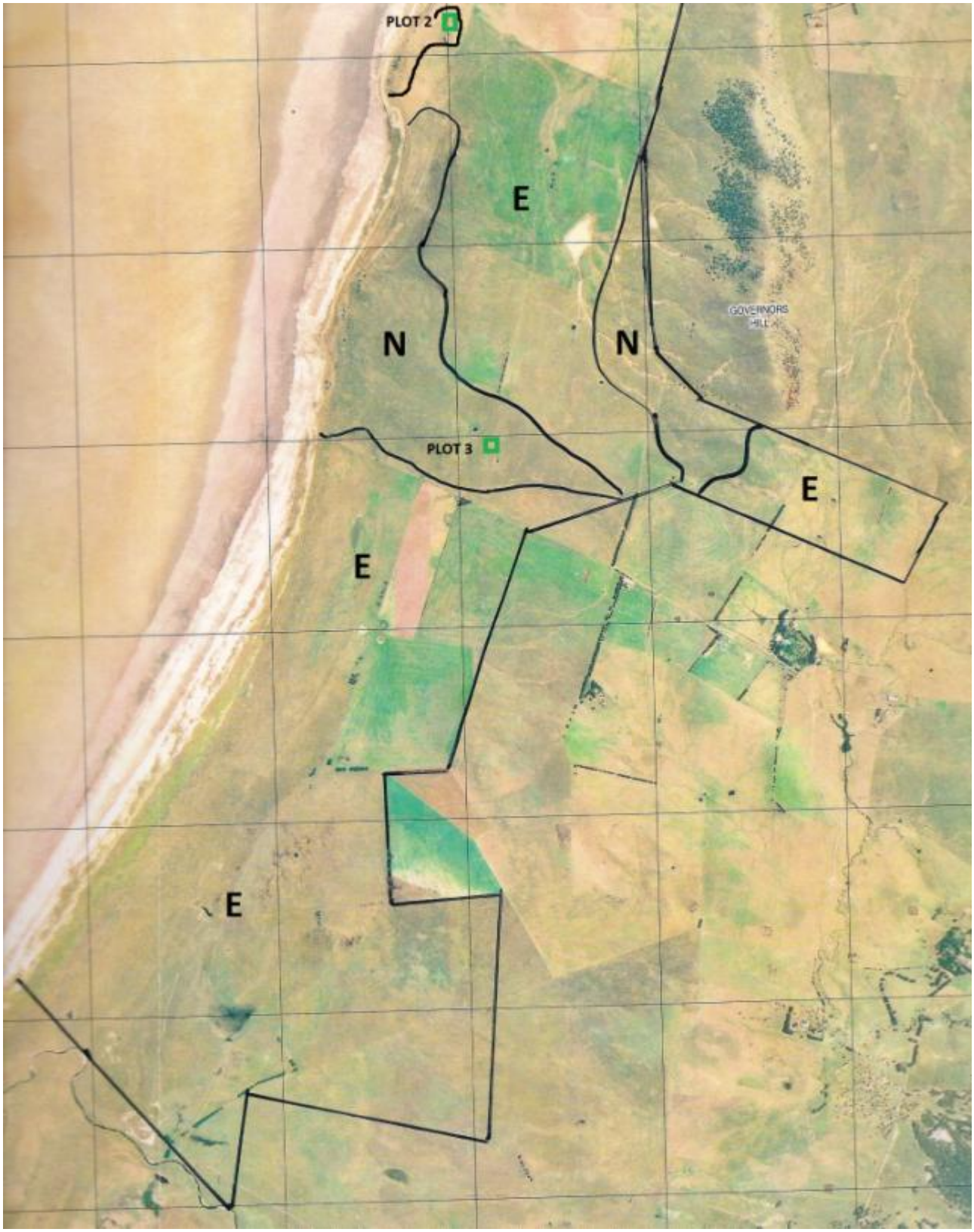


**Figure 2a. Vegetation map and location of survey plots (south).**
**(N = native pasture with some native grassland.**
**E = exotic grassland, cropped land.)**

***Habitats***

The habitats in the area are dominated by exotic grassland across almost all of the low-lying and more level topography; most of this land is currently ploughed or has been ploughed and cropped in the past. The hilly land supports native pasture with some native grassland. Woodland is absent from the study area,; the closest being on Governor's Hill just to the east. Rock outcrops are a feature of some areas, particularly the ridges and knolls near the lake. These areas mainly support native pasture, with some native grassland.

### *4.2 Individual Site Assessments*

The following descriptions have been prepared of the vegetation and habitats associated the sites proposed for each component of Stage 2 of the wind farm. The sites are described from north to south.

***Northern Array - Towers No. 1,2,4 to 11***

No. of Towers: 10
Length of Array: 2,000 metres.
Location: Far western paddocks of property "Lakoona"; one tower in the property to the south. The closest towers to the lake are 200 metres from the highest recorded lake level.
Topography: Mainly on lakeside flat; three most southern towers on low ridge.
Access: Northwards from existing wind farm track at WTG 67.
Description of Vegetation and Habitat: The southern end of the row is located on the ridge extending north of the ridge supporting existing tower WTG 67. The most southern tower is in a paddock supporting native grassland; see survey plot CWF04. The other two towers on this ridge are in a paddock supporting some native pasture; there are rock outcrops in this area also. Most of the row is along a shore-parallel sand dune, probably of wave generated ridge known as a chenier. That area supports mostly native pasture and exotic grassland, with patches of low diversity native grassland here and there; see plot data for CWF05. The main natives here are Spear-grasses *Austrostipa* spp. and Wallaby Grasses *Austrodanthonia* spp. Native plant diversity is low, although the above species dominate quite large areas. On the edge of the upper foreshore of the lake, patches of the sedge *Carex bichinoviana* and other semi-wetland species are found.
Grassland Plots: CWF04, CWF05
Significant Environmental Features: The most southern paddock supports quite good native grassland, although it has a low floristic vale score; this paddock would contain one tower at the far southern end of the row. The remainder of the area is as described above; the areas of native pasture/native grassland are of generally low value.

***Individual Tower: No. 17***

Towers: 1
Length of Array: not applicable
Location: A single additional tower between existing WTG 01 and WTG 68.
Topography: Low ridge.
Access: Access from the existing wind farm track between the above two towers.
Description of Vegetation and Habitat: The vegetation plot for this site is provided in **Appendix 2**. The grassland is native pasture, that is it has a high proportion of exotic plants and exotic cover, but native plants (often a single species) dominates the cover.
Grassland Plot: CWF01
Significant Environmental Features: There are no special environmental features on or adjacent to this site.

***Central East Arrays - Towers No. 19 to 21 and Towers No. 24, 25***

Towers: 4
Length of Array: 500 metres and 250 metres

Location: Nos 19 to 21 are immediately north of Taylors Creek; Nos 24 and 25 are immediately south of Taylors Creek.
Topography: Lowland flat.
Access: Access is readily available from the existing wind farm track just to the west of both locations.
Description of Vegetation and Habitat: The paddocks in this area are mostly cropped and support exotic grassland. The paddock south of Taylors Creek was ploughed in early May 2010 (Nos 24 and 25). The exotic grassland is as described for other sites.
Grassland Plot: not applicable
Significant Environmental Features: There are no special environmental features on or adjacent to these sites.

***Central West Arrays - Towers No. 26 to 35***
Towers: 10
Length of Array: 1,750 metres
Location: East of the lake edge to the south of Taylors Creek.
Topography: Lowland flat.
Access: Readily available to the northern or southern ends from the existing parallel wind farm track south of Taylors Creek.
Description of Vegetation and Habitat: The majority of the row is across ploughed paddocks. The most southern end of the row is a low ridge woith rock outcrops. That area supports native pasture; see plot CWF02. Several generally uncommon native plants occur among the rocks, but the quality of the grassland is low.
Grassland Plot: CWF02
Significant Environmental Features: There are no special environmental features on or adjacent to these sites.

***Central South Array - Towers No. 37 to 39***
Towers: 3
Length of Array: 500 metres.
Location: On low ridge to north of existing tower no. WTG18.
Topography: Low ridge.
Access: readily available from the adjacent existing wind farm track.
Description of Vegetation and Habitat: Most of the area was ploughed in May 2010; a small area of native pasture/exotic grassland occurs north of existing tower WTG 18.
Grassland Plot: not applicable
Significant Environmental Features: There are no special environmental features on or adjacent to these sites.

***Southern Array (East) - Towers No. 40 to 51***
Towers: 12
Length of Array: 3,000 metres.
Location: Immediately east of Lake George, in the far southern part of the study area, north of Butmaroo Creek. The closest towers to the lake are 200 metres from the highest recorded lake level.
Topography: Lakeside flat.
Access: From a new track to the southern end of the line to be constructed parallel to Butmaroo Creek and from a new track to the northern end below existing WTG 21.
Description of Vegetation and Habitat: The paddocks in this area are either ploughed and cropped (northern one third of row) or are exotic grassland. There are very few native grassland plants in this area. The common exotic species include Scotch Thistle *Onopordium acanthium*, Saffron Thistle *Carthamus lanatus* and Serrated Tussock *Nassella trichotoma*. There are patches of the native species Couch Grass *Cynodon dactylon*, Wallaby Grasses *Austrodanthonia* spp. and Spear-grasses *Austrostipa* spp.
Grassland Plot: not applicable

Significant Environmental Features: There are no special environmental features on or adjacent to the tower sites. The slopes in the far north, across which access will be constructed, support native grassland (see below).

***Southern Array (West) - Towers un-numbered***
Towers: 8
Length of Array: 1,500 metres.
Location: East of Lake George and the above towers, in the far southern part of the study area, north of Butmaroo Creek.
Topography: Lakeside flat.
Access: From a new track to the southern end of the line to be constructed parallel to Butmaroo Creek.
Description of Vegetation and Habitat: The paddocks in this area have been ploughed and cropped, they are now covered in exotic grassland. There are very few native grassland plants in this area. The common exotic species include Scotch Thistle *Onopordium acanthium*, Saffron Thistle *Carthamus lanatus* and Serrated Tussock *Nassella trichotoma*. There are patches of the native species Couch Grass *Cynodon dactylon*, Wallaby Grasses *Austrodanthonia* spp. and Spear-grasses *Austrostipa* spp.
Grassland Plot: not applicable
Significant Environmental Features: There are no special environmental features on or adjacent to the tower sites.

***Major Access Tracks***
Vehicle access routes are primarily short stretches of proposed track extending from the existing wind farm track network to one or both ends of a row of towers. One long access track is proposed to the most southern row of towers, parallel to the northern side of Butmaroo Creek. That route is across paddocks that have been recently ploughed or that almost totally support exotic grassland. Native grassland is completely absent, although there are some patches of native pasture. Prominent weeds in the these southern paddocks are Scotch Thistle *Onopordium acanthium*, Saffron Thistle *Carthamus lanatus* and Serrated Tussock *Nassella trichotoma*..

The track down the slope southeast of existing tower WTG21 crosses native grassland; see grassland survey sheet CWF03 in **Appendix 2**. This was assessed as having low floristic value.

***Buried Cable Routes***
Buried cable routes are between individual towers and linking tower rows. Nearly all of these routes are across ploughed paddocks or exotic grassland, as described above. A short distance across native grassland on the slope near existing WTG21 will be traversed.

***Overhead Cable Routes***
The proposed overhead distribution lines extend from the northern row (nos 1 to 11) to the southern end of Governor's Hill to link a new line heading east around existing WTG 22. A line also extends from the middle of the southern row (nos 40 to 52) to the same location. Almost all of these routes cross ploughed lowland paddocks or exotic grassland. The upland area around the southern end of Governor's Hill supports native grassland, but it is not Natural Temperate Grassland.

### *4.3 Plant Species Recorded*

A complete list of the plant species recorded in the study area in April and May 2010 is provided in **Appendix 3**. The list indicates whether the species are indigenous and which are exotic (introduced). In all 53 indigenous and 37 introduced species were recorded. No rare or threatened plants were found and none are expected to occur there; all of the indigenous species recorded are common and widespread in the region. The results of the targeted surveys for threatened plant species are discussed in Section 6 of the report.

### *4.4 Fauna Species*

The fauna species recorded during previous studies on the Capital Wind Farm site and those recorded during this study are listed in **Appendix 4**. The species recorded in this study are typical of the tableland's rural landscape. The lack of woodland in the current study area has generally restricted the species recorded to those that inhabit treeless grasslands and farmland.

Three species of listed threatened bird were recorded during the current survey, namely the Diamond Firetail, Gang-gang Cockatoo and Flame Robin; these are discussed later in this report.

Bird surveys were carried out during the main field days; the results are presented in **Appendix 5**. The survey recorded the height of activity of the birds observed. The results clearly show that all but a few birds are restricted in their activity to heights below 20 metres. This is below the lowest tip of the blades on the wind turbines.

The bird surveys included the general recording of species noted above, along with some targeted surveys throughout the study area. In those areas, transects were walked and sometimes partially driven on ridges and other places in the study area, and all birds, their numbers and their flight heights were recorded during all targeted surveys. The survey sheets are provided in **Appendix 1**.

Targeted bird counts at 12 counts spread throughout the Capital Wind Farm site undertaken in 2004 and 2010 recorded 893 observations of 49 species over a total observation time of 20.8 hours. The results of these surveys are provided in **Table 3.**

***Table 3***
***Summary of bird survey data***

| Count | Time | | Height Class (No. of birds) | | | | |
|---|---|---|---|---|---|---|---|
| **No.** | **(mins)** | **No. species** | **Ground** | **<10m** | **10-20m** | **20-50m** | **>50m** |
| 2004 | | | | | | | |
| 1 | 60 | 12 | 4 | 13 | 5 | 1 | 3 |
| 2 | 60 | 9 | 9 | 9 | 2 | 2 | - |
| 3 | 50 | 9 | 5 | 10 | 4 | 2 | - |
| 4 | 40 | 8 | 18 | 6 | - | - | - |
| 5 | 30 | 8 | 12 | 2 | 2 | - | 3 |
| 6 | 60 | 11 | 14 | 4 | 2 | 2 | - |
| 7 | 45 | 12 | 6 | 7 | 3 | 1 | - |
| 8 | 30 | 12 | 11 | 5 | 2 | 1 | - |
| 9 | 60 | 18 | 1 | 19 | 3 | 1 | - |
| 2010 | | | | | | | |
| 1 | 360 | 21 | na | 184 | 7 | 6 | - |
| 2 | 300 | 22 | na | 176 | 40 | 2 | 2 |
| 3 | 150 | 16 | na | 250 | 18 | 4 | - |
| All | 1245 mins | 49 | 90 | 685 | 88 | 22 | 8 |
| Sites | 20.8 hrs | - | | (87%) | (10%) | (2%) | (1%) |

The results of the bird surveys indicate that of the 893 individual bird observations, 87% were observed below 10 metres in height. Few birds fly higher than 50 metres from the ground, representing less than one percent of observations (8 birds out of 893 observations). Larger birds of prey are the main birds seen at higher levels. The only species observed flying above 50 meters in the current study was the Wedge-tailed Eagle. Those species previously observed flying above 50 metres were the Wedge-tailed Eagle and Australian Raven (KMA 2005).

# 5. Presence of Threatened Species, Populations and Communities

## 5.1 Threatened Species

Threatened species in New South Wales are listed on schedules under the New South Wales *Threatened Species Conservation Act 1995* (TSC Act), where they are classified "endangered" (Schedule 1, Part 1), "vulnerable" (Schedule 2) or "presumed extinct" (Schedule 1, Part 4). Nationally threatened species are listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as "extinct", "critically endangered", "endangered", "vulnerable" or "conservation dependent".

Threatened species with potential to occur in the Capital Wind Farm project area were identified during the previous study from the following sources of information (Kevin Mills & Associates 2005):

- correspondence dated 7 September 2004 from the Department of Environment and Conservation (DEC), now the Department of Environment, Climate Change and Water (DECCW);
- the NSW Wildlife Atlas available on line (NSW NPWS); and
- from previous studies, referred to in our previous report.

Since that time, further listings have occurred and other studies have been carried out; these were all considered in compiling the list of subject species. The resulting list appears below, in **Table 4**. Habitat assessment militates against the probability of almost all of these species occurring in the study area. The only species likely to be present are some of the woodland birds that range more widely than woodland, and a few other incidental species such as the Little Eagle. In making these assessments, it was noted that there is no woodland on or adjacent to any component of the neither proposed wind farm nor are there any areas of good quality native grassland in the area of likely impact. The sites proposed for the wind farm, such as turbine locations and access track routes, were searched as part of this study and each site was assessed as to the likelihood of threatened plants or animals being present.

***Table 4***
***Threatened species occurring in the local area***

| Species | TSC Act[+] | EPBC Act[+] | Potential to occur on the study areas |
|---|---|---|---|
| Plants | | | |
| *Diurus aequalis* Buttercup Double-tail | E | V | This small ground orchid occurs in woodland and forest with a grassy understorey. It would not occur in the study area; there is no suitable habitat. |
| *Dodonaea procumbens* Creeping Hop Bush | V | V | A prostrate shrub, *D. procumbens* grows in woodland on sandy soils. There is no suitable habitat in the study area. |
| *Swainsona sericea* Silky Swainson-pea | V | - | A small herb occurring in native grassland. Very unlikely to occur in the highly modified grasslands in the study area. |
| *Thesium australe* Austral Toad flax | V | - | There are no *Themeda* grasslands or other suitable native grasslands in the area; the species was not found during surveys of grassland areas. |
| Mammals | | | |
| Koala *Phascolarctos cinereus* | V | - | Koalas would not occur in the study area; there is no woodland or forest or food trees. |
| Birds | | | |
| Brown Treecreeper | V | - | No suitable woodland habitat present in or adjacent to the study |

| | | | |
|---|---|---|---|
| *Climacteris picumnus* | | | area. May occur elsewhere on Capital Wind Farm site. |
| Hooded Robin<br>*Melanodryas cucullate* | V | - | May occur in the general area, particularly in and near woodland; forages widely in paddocks with some native grassland. |
| Speckled Warbler<br>*Chthonicola sagittata* | V | - | No suitable woodland habitat present in or adjacent to the study area. May occur elsewhere on Capital Wind Farm site. |
| White-fronted Chat<br>*Epthianura albifrons* | V | - | Habitat occurs on and around Lake George. Small areas of habitat occur elsewhere in the area, e.g. near creeks. Recorded on the Woodlawn site (K. Mills, 2010). |
| Little Eagle<br>*Hieraaetus morphnoides* | V | - | May occur in the area. Forages over a wide area; there is no breeding habitat in the study area. |
| Flame Robin<br>*Petroica phoenicea* | V | - | Recorded 28 and 29 April 2010. Probably no breeding habitat in the study area. |
| Scarlet Robin<br>*Petroica multicolor* | V | - | Forages widely in paddocks with some native grassland. Probably no breeding habitat in the study area. |
| Diamond Firetail<br>*Stagonopleura guttatai* | V | - | Recorded 29 April 2010. Probably resident in the locality, foraging widely in paddocks with some native grassland. Probably no breeding habitat in the study area. |
| Regent Honeyeater<br>Xanthomyza phrygia | E | E | There are no preferred food trees, such as Yellow Box, in the area. |
| Freckled Duck<br>*Stictonetta naevosa* | V | - | Freckled Ducks occasionally occur on Lake George and Lake Bathurst. Lake George is immediately west of the study area. |
| Gang-gang Cockatoo<br>*Callocephalon fimbriatum* | V | - | Recorded on the far eastern side of Capital Wind Farm on 30 April 2010. Not likely in the current study area, which is treeless. |
| Glossy Black-Cockatoo<br>*Calyptorhynchus lathami* | V | - | Glossy Black-Cockatoos would not occur in the study area. There is no suitable habitat. |
| Magpie Goose<br>*Anseranas semipalmate* | V | - | Magpie Geese are not expected to occur in the study area, although the species has been recorded at Lake Bathurst. |
| <u>Reptiles</u> | | | |
| Little Whip Snake<br>*Suta flagellum* | V | - | Little Whip Snakes are not expected to occur on the study area, as they are unlikely to be in highly modified grassland. |
| Striped Legless Lizard<br>*Delmar impar* | V | V | There is no suitable habitat in the study area for Striped Legless Lizards; they occur in or near reasonable quality natural temperate grassland, which does not occur in the study area. |
| Pink-tailed Worm-lizard<br>*Aprasia parapuchella* | V | V | Pink-tailed Worm-lizards would not occur in the study area. The species does not occur in highly modified grassland. |
| Grassland Earless Dragon<br>*Tympanocryptus lineata pinguicolla* | E | E | This species would not occur in the study area, there is no suitable habitat. It occurs in natural temperate grassland of reasonable quality, which does not occur in the study area. |

| | | | |
|---|---|---|---|
| Frogs | | | |
| Green and Golden Bell Frog *Litoria aurea* | E | V | This species would not occur on the subject land. There are no wetlands suitable for this species on any of the development sites or nearby to them |
| Invertebrates | | | |
| Golden Sun Moth *Synemon plana* | E | CE | The Golden Sun Moth occurs in natural temperate grassland. It would be unlikely to occur in the area because of the lack of suitable native grassland habitat |

[+] V = vulnerable; E = endangered; CE = critically endangered; - = not listed.

Two threatened birds were recorded in the study area during the current investigation, namely the Flame Robin and Diamond Firetail. These species range widely outside woodland habitat, particularly in the cooler months, including across farmland. Threatened waterbird species, e.g. the Freckled Duck, could occasionally occur in Lake George to the west; however, since Lake George is usually dry, this would be a rare event. The study area is almost entirely covered by ploughed paddocks and heavily grazed exotic grassland/forbland, which rarely contain threatened plant species and rarely attract threatened fauna species. Two additional threatened birds were recorded in the vicinity of the Capital Wind Farm, namely White-fronted Chat and Gang-gang Cockatoo; as with the above two recorded species, these birds are only likely to be itinerant visitors in the current study area.

Several other threatened species listed in **Appendix 4** in the "previous" column had previously been recorded in the vicinity of the Capital Wind Farm site (KMA 2005), but not so far on the site itself.

### *5.2 Migratory Species*

In addition to threatened species, the EPBC Act provides for the listing of internationally protected migratory species, i.e. species listed under the Japan - Australia Migratory Bird Agreement (JAMBA), the China - Australia Migratory Bird Agreement (CAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Various internationally protected migratory species have been recorded in the vicinity of Capital Wind Farm, species such as the Australian Wood Duck, Australian Shelduck, Pacific Black Duck, Nankeen Kestrel, Brown Falcon and Wedge-tailed Eagle. However, there is no important habitat in the study area for such species and the habitat on the area is not likely to support an ecologically important proportion of a population of such species.

### *5.3 Endangered Populations*

Endangered populations in New South Wales are listed under the TSC Act (Schedule 1, Part 2). There are no provisions under the EPBC Act for the listing of endangered populations. No endangered populations have been declared in the study area.

### *5.4 Endangered Ecological Communities*

Endangered ecological communities in New South Wales are listed under the TSC Act (Schedule 1, Part 3). Nationally threatened ecological communities are listed under the EPBC Act. Several endangered ecological communities and nationally threatened ecological communities occur on the Southern Tablelands of New South Wales; i.e. White Box - Yellow Box - Blakely's Red Gum Woodland, Natural Temperate Grassland of the Southern Tablelands and Montane Bogs and Fens. Much of the low-lying country in the vicinity of the sites investigated here once supported Yellow Box - Blakely's Red Gum Woodland or, on broad valley floors near Lake George, native grassland with few if any trees (i.e. Natural Temperate Grassland). Very few remnants of these communities remain on and near the proposed

development areas, although many paddocks support a native pasture where some native perennial grasses are common.

An assessment of the quality of the native grassland was undertaken using the method developed and described by Rehwinkel (2007), where a "floristic value score" is calculated using information from 20m by 20m survey plots. The resultant survey sheets are provided in **Appendix 2**. Rehwinkel (2007) states that 'if the score derived using this method is 4 or above, then the site has moderate to high floristic value".

The native grassland in this area is part of the listed endangered ecological community known as White Box Yellow Box Blakely's Red Gum Woodland (under the *TSC Act 1995*) and as part of the Commonwealth listed White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (under the *EPBC Act 1999*).

The map at **Figure 3** shows the locations of the components of the proposed wind farm in relation to the mapped grassland types, as mapped on **Figure 2**; it should be appreciated that the scale of the map is such that the boundaries are indicative and need to be confirmed on the ground. Of the 55 proposed turbine locations, two sites are on sites supporting native pasture to native grassland; the remaining turbines are in paddocks with exotic grassland or crops. Access tracks and buried cable routes are also primarily existing or across intensively managed farmland.

Natural Temperate Grassland of the Southern Tablelands of NSW and the ACT community, listed under the Commonwealth act but not the NSW legislation, appears to have been obliterated from the area. The original vegetation in the study area is so decimated that it is impossible to determine the exact distribution of plant communities that occurred there. In any case, the vegetation today is of low to very low floristic value.

Because the description of the listed EEC is constructed so broadly by the NSW Scientific Committee, we cannot exclude any grassland that has native species from being part of the listed community, even though it may be of poor condition. The quality of the grassland (i.e. based on native species diversity and cover as in the scheme of Rehwinkel (2007) used here) must be taken into account when assessing the value of a site. Clearly, the grassland in the study area is of low quality (see **Table 1**, last column); this certainly applies to the grassland at the two turbine sites referred to above. Low grassland quality together with the small area involved, it is considered that the impact on the Yellow Box – Red Gum Woodland community is not significant. However, it is considered appropriate to micro-site the turbine locations within the proposed 100 metres leeway sought in the application prior to construction to avoid native grassland.

A community with a Preliminary Determination from the NSW Scientific Committee is Tablelands Frost Hollow Grassy Woodlands. There are no woodlands in the study area; this community is therefore not present.

### *5.5 Significant Habitats*

Wetlands

There are no wetlands on the development sites. The edge of Lake George is at least 200 metres from the closest component of the development; it is extremely rare for the lake to contain water along its far eastern shoreline. One watercourse, Taylors Creek, is crossed by an overhead distribution line that does not involve disturbing the reek or its environs.

Woodland and habitat corridors

There are no woodland habitat corridors in the area; the whole area is bereft of trees. The closest stands of woodland are well away to the east on Governors Hill, and is completely unaffected by the proposal. The movement patterns of the local fauna will not be affected by the proposal in any way.

***Figure 3. Grassland types showing locations of turbines and major access tracks.***

Rock Outcrops

Rock outcrops are important for retiles and other native species. This habitat is common on the higher land and ridges in the study area. Components of the wind farm occasionally occur on land that contains rocky habitat; mostly the wind farm is on the lower land where the paddocks are ploughed an there are no rocks.

# 6. Impact Assessment

## 6.1 Overview of Impact

General

The construction of Stage 2 of the Capital Wind Farm will have virtually no impact on native flora and fauna. The proposed developments are entirely located on highly modified land, most are situated in paddocks that have recently been ploughed. No woodland or even individual native trees need be removed because the development areas are treeless. At most a few small areas of native pasture and some native grassland (by definition) will be affected. No "over-cleared" vegetation types will be affected; the listed endangered ecological communities are assessed below.

Habitat Connectivity

The land is almost entirely used for agricultural pursuits, most is cropping land. There is little opportunity to enhance habitat connectivity through the study area. The proposed wind farm will not interfere in a significant way to habitat connectivity or wildlife habitat corridors.

Riparian and Wetland Habitats

The proposed developments associated with Capital Stage 2 wind farm do not involve removing or modifying any creeks, streams, water courses or wetlands.

## 6.2 Assessment under Part 3A

Guidelines for Threatened Species Assessment

Guidelines that identify matters relevant to the assessment of potential impact on threatened species, populations or ecological communities of proposed development under Part 3A of the *Environmental Planning and Assessment Act 1979* (NSW) have been prepared by the Department of Environment and Conservation (now Department of Environment, Climate Change and Water) and the Department of Primary Industries (DEC July 2005).

The document *Guidelines for Threatened Species Assessment* identifies the following objectives in regard to conserving threatened species, etc.:

- "Maintain or improve biodiversity values (i.e. there is no net impact on threatened species or native vegetation).
- Conserve biological diversity and promote ecologically sustainable development.
- Protect areas of high conservation value (including areas of critical habitat).
- Prevent the extinction of threatened species.
- Protect the long-term viability of local populations of a species, population nor ecological community.
- Protect aspects of the environment that are matters of national environmental significance."

The *Guidelines* outline a broad five-step process for assessing impacts on threatened species. Note that 'threatened species' refers here to species, populations and communities listed as threatened under the *Threatened Species Conservation Act 1995* (NSW) or the *Fisheries Management Act 1994* (NSW). As this project is being assessed under Part 3A of the *EP&A* Act, this investigation and report follow the *Guidelines* where relevant.

Note that matters of national environmental significance (NES) are those matters listed under the *Environment Protection & Biodiversity Conversation Act 1999* (Commonwealth); these matters are not listed under state legislation, although there is considerable overlap in the species and communities that area listed.

*Step 1 – Preliminary Assessment*

"The main purpose of a preliminary assessment is to determine the likelihood of the study area and subject site supporting threatened species" (*Guidelines*, page 2). As noted in the *Guidelines*, this step is primarily a 'desktop' study, using existing information, literature and data bases to identify relevant threatened species. The *Guidelines* state that the following matters should be included in the preliminary assessment:

> a description of the location and nature of the proposed development;
> a description of dominant vegetation types;'
> a description of habitat features;
> a list of threatened species that are known or likely to occur within the study area;
> an assessment of which of the threatened species that are known or likely to occur are likely to be directly or indirectly affected by the proposal provides a list of factors for consideration in identifying adverse impacts. This list is not necessarily exhaustive and is not development-specific." (*Guidelines,* page 3)

*Step 2 – Field Survey and Assessment*

As noted in the *Guidelines*, "the required intensity and extent of survey will vary greatly depending upon the species likely to be present, size of the development area, the level of biological and habitat diversity on the site, and the type and complexity of vegetation on the site." (*Guidelines*, page 3)

The *Guidelines* point out the need "to ensure that a reliable assessment of the presence or absence of threatened species can be made" (*Guidelines*, page 3). It is also noted that consideration needs to be given to the relevance of climatic or seasonal conditions for the target species.

Where relevant, the survey methods set out in the document titled *Threatened Biodiversity Survey & Assessment: Guidelines for Developments and Activities* (DECC 2004) should be followed. As noted above, the level of the survey will very much depend upon site conditions.

The outcome of Step 2 should be that adequate field surveys are undertaken for all target species identified in Step 1 such that confident statements can be made regarding the potential for the presence of the species on the subject site. In some instances, the precautionary principle should be adopted and the presence of a species assumed for the purposes of impact assessment.

*Step 3 – Evaluation of Impact*

This step involves identifying the potential magnitude and extent of the impact, if any, the development will have on each of the target species.

The *Guidelines* suggest that "impacts will be more significant if:

- areas of high conservation value are affected;
- individual animals and/or plants and/or subpopulations that are likely to be affected by the proposal play an important role in maintaining the long-term viability of the species, population or ecological community;
- habitat features that are likely to be affected by the proposal play an important role in maintaining the long-term viability of the species, population or ecological community;
- the duration of impacts are long-term;
- the impacts are permanent and irreversible." (*Guidelines* page 4)

*Step 4 – Avoid, mitigate and then offset*

Where there is a potential to impact on threatened species, this should be addressed through, firstly, avoiding the impact; this may mean making some changes to the proposed development. If avoidance is not possible, then some form of mitigation may be required. Finally, if neither avoidance nor mitigation are possible, then some form of offset or compensation will be required. This could entail the rehabilitation of similar habitat nearby.

*Step 5 – Key thresholds*

The *Guidelines* state that "the development application needs to contain a justification of the preferred option based on:

- whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values.
- whether or not the proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community.
- whether or not the proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction.
- whether or not the proposal will adversely affect critical habitat." (*Guidelines* page 4)

Appendix 3 to the *Guidelines* contains more detail for identifying potential impacts on threatened species.

The assessment process under the *TSC Act 1995* commonly known as the 'seven part test' is not used for Part 3A matters. The matters to be considered in the assessment of a Part 3A development are determined by the Minister for Planning for each development. The following discussion addresses the five steps as set out above from the Part 3A *Guidelines*.

*Step 1 – Preliminary Assessment*

The *Guidelines* state that certain matters should be included in the preliminary assessment. These are primarily concerned with descriptions of the development, the vegetation types, habitats, the threatened species known and likely to occur in the area and those threatened species that may be impacted by the proposed development. Descriptions of the Project Site and its environment are provided in this report at **Sections 2** and **4**. For detailed descriptions of the proposed development, reference should be made to the other documents accompanying this application. **Section 3** describes the survey methods employed in the study.

*Step 2 – Field Survey and Assessment*

Field surveys were undertaken on the study areas from April to May 2010. These surveys included general flora and fauna surveys of the entire study area, where all species were identified and documented, including plant communities and habitats; see **Section 4** of this report. The assessment of the survey results, particularly in regard to the presence of threatened species, etc. are provided in **Section 5**. All known or potential threatened species and communities are discussed in that section.

*Step 3 – Evaluation of Impact*

The impact of the proposed development is assessed under several key headings below; see **Section 6.**

Threatened Plant Species

The surveys of the study areas did not find any threatened plant species and none are expected to be occur there. The highly disturbed land, much of which is regularly ploughed, and the exotic grassland cover of most areas, precludes the likelihood of threatened plants occurring in the study area.

Threatened Animal Species

The only occurrence of threatened animals in the study area is likely to be occasional visits by listed woodland birds. Their occurrence in the study area is not unique; they range widely across the landscape and would not find high value habitat in the study area. Woodland is the most important habitat for these species. No woodland occurs on or near any of the proposed components of the Stage 2 wind farm.

Threatened Communities
The patches of native grassland found here and there are remnants of the Yellow Box - Red Gum listed endangered ecological community. The quality of the patches of native grassland is low to very low, according to the scheme developed by Rehwinkel (2007). This grassland is low in plant species diversity and dominated by one or two native grasses.

*Step 4 – Avoid, mitigate and then offset*
There is no need for modification of the Stage 2 wind farm development to avoid high value vegetation or habitats. Mitigation and offset are therefore not required. The components of the wind farm are located to avoid impacts on all important native habitats. The development will be mitigated in those areas where there is some native habitat by minimising the footprint of the development and micro-siting components to avoid local habitat features. As there is no significant impact on native habitat or habitat likely to be important to threatened birds or other species there is no need for an offset. The 'maintain or improve' test is met in this case, i.e. "there is no net impact on threatened species or native vegetation". However, the proponent has committed up to a maximum of $100,000 to go towards a conservation offset for this project to improve biodiversity values as a way of compensating for any unavoidable impacts."

*Step 5 – Key thresholds*
The *Guidelines* require justification of the preferred option based on:

*whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values*
The proposed wind farm extension will not diminish biodiversity values in the area. The land affected is almost entirely highly modified from its original character. In fact, most of the land impacted is either currently ploughed or has been ploughed and/or cropped in the past. No wetlands or watercourses will be affected and no stands of woodland will be modified or removed.

*whether or not the proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community*
The proposal is not likely to reduce the long-term viability of a local population, etc. as the species known to occur in the general area do not depend upon highly disturbed farmland for their survival. There are no endangered populations or endangered communities in the area impacted by the wind farm development.

*whether or not the proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction*
The wind farm development is located in paddocks that have been almost entirely cleared of their original natural vegetation and habitats. Most of the land involved is ploughed paddock or exotic grassland. The expanded wind farm is not likely to accelerate the extinction of any species, population or ecological community or place any such species, population or community at risk of extinction.

*whether or not the proposal will adversely affect critical habitat."*
There is no declared critical habitat in or in the vicinity of the development areas.

### *6.3 Environment Protection and Biodiversity Conservation Act*

Matters of National Environmental Significance
The impact of a proposed action on matters of national environmental significance is assessed under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Matters of national environmental significance are:

- World Heritage properties,
- National Heritage places,
- wetlands of international importance (RAMSAR wetlands),

- listed threatened species and ecological communities
- migratory species;
- Commonwealth marine areas;
- Great Barrier Reef Marine Park;
- nuclear actions (including uranium mining).

An "action" is a project, a development, an undertaking, an activity or a series of activities, and an alteration of any of the above. An action can be on Commonwealth land, State land council land, private land, or water.

Approval is required from the Commonwealth Environment Minister for actions that are likely to have a significant impact on a matter of national environmental significance; these are called "controlled actions". A proposed action is a "controlled action" if it:

- is likely to have a significant impact on a matter of national environmental significance,
- is likely to have a significant impact on the environment of Commonwealth land,
- is to be undertaken on Commonwealth land and is likely to have a significant impact on the environment anywhere, and
- is an action to be taken by the Commonwealth that is likely to have a significant impact on the environment anywhere.

Only the Commonwealth can advise definitively whether a proposed action is a controlled action; however, the Department of the Environment and Heritage has prepared guidelines to help proponents decide whether an action is likely be a controlled action that should be referred to the Minister for assessment and approval; these are known as the *Significant Impact Guidelines: Matters of National Environmental Significance* (DEH 2006).

Presence of Matters of National Environmental Significance

The study area does not contain any threatened species, as assessed earlier in this report. Migratory species do occur in the study area, as all species of native duck and all native diurnal birds of prey are listed. The native grassland here and there may be remnants of natural temperate grassland.

Significant Impact Criteria for Critically Endangered and Endangered Ecological Communities

An action is likely to have a significant impact on a critically endangered or endangered community if there is a real chance or possibility that it will:

- reduce the extent of an ecological community;
- fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;
- adversely affect habitat critical to the survival of an ecological community;
- modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;
- cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;
- cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
  - assisting invasive species, that are harmful to the listed ecological community, to become established; or
  - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; or
  - interfere with the recovery of an ecological community.

Impact of the Proposal on Endangered Ecological Communities

The wind farm development is not likely to have a significant impact on the White Box – Yellow Box – Blakely's Red Gum Woodland and Derived Grasslands because the low quality and the small amount of native grassland on the footprint of the wind farm. In fact, these areas do not meet the minimum criteria established for the community in the document by DEH (2006).

Listed migratory species

The EPBC Act allows for the listing of internationally protected migratory species, i.e. species listed under the Japan - Australia Migratory Bird Agreement (JAMBA), the China - Australia Migratory Bird Agreement (CAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Significant Impact Criteria for Listed Migratory Species

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or

seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

An area of "important habitat" for a migratory species is:

habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or

habitat that is of critical importance to the species at particular life-cycle stages; and/or

habitat utilised by a migratory species which is at the limit of the species range; and/or

habitat within an area where the species is declining.

Listed migratory species cover a broad range of species with different life cycles and population sizes. An "ecologically significant proportion" of a population therefore varies from species to species. In relation to migratory species, "population" means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.

Impact of the Proposed Development on Listed Migratory Species

Many internationally protected migratory species occur in general area, as many common and widespread species are listed. Some of these species occur in the area from time to time. The construction of the proposed wind farm is not likely to have a significant impact on listed migratory species. There is no "important habitat" on the development sites for such species and the habitats are not likely to support an "ecologically important proportion" of a population of a migratory species.

Conclusion, EPBC Act

In our opinion, the proposed Stage 2 wind farm at the Capital Wind Farm is not likely to have a significant impact on any matters of national environmental significance listed under the *Environment Protection and Biodiversity Conservation Act 1999*. Referral to the Commonwealth Minister for the Environment for assessment is, in our view, unwarranted.

### *6.4 SEPP No.44 - Koala Habitat Protection*

*State Environmental Planning Policy No.44 - Koala Habitat Protection* (SEPP 44) (New South Wales 1995) encourages the conservation and management of natural vegetation providing habitat for Koalas, to ensure a permanent free-living population over the species' present range and to reverse the current

trend of Koala population decline. SEPP 44 applies in the local government areas listed under Appendix 1 of the policy.

SEPP 44 helps to identify "potential Koala habitat", i.e. "areas of native vegetation where the trees of the types listed in Schedule 2 [of SEPP 44] constitute at least 15% of the total number of trees in the upper or lower strata of the tree component". If no Schedule 2 tree species are present or if they constitute less than 15% of the total number of trees present, then no further provisions of the Policy apply.

If more than 15% of the trees in the area are Schedule 2 tree species, then an assessment must be made by a qualified person to determine whether the area contains "core Koala habitat", a term applied to "an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population".

*State Environmental Planning Policy No.44 - Koala Habitat Protection* (SEPP 44) applies in this area, but no Schedule 2 Koala food trees were recorded in the study area. The area is therefore not "potential Koala habitat" and no further provisions of the Policy apply.

### *6.5 Blade-Strike and Birds*

Turbine blade-strike on birds is often cited as a potential impact of wind farms. Various bird species and groups of birds are commonly thought to collide with wind turbines, a phenomenon referred to as "blade-strike". Birds of prey and species that form large flocks and fly well above the tree canopy are thought to be most at risk. Overseas studies have found that the magnitude of the impact is strongly influenced by the physical characteristics of the site, particularly the type of habitat on the site and in the surrounding area (Jacobs 1994; Curry 1994; Still, Little, Lawrence & Carver 1994; Harrison 1996).

The greatest impacts seem to occur near large wetlands and at sites on important migration routes, i.e. where large flocks of birds are regularly present. One such location was in California, where birds of prey were affected where they congregated in a mountain pass. An early study also found that an impact on birds of prey was at least partly due to the lattice framework construction of the towers, which provided perching sites for the birds. Modern towers, however, are enclosed and have no perching sites.

So far, the data suggest that wind farms in Australian have little impact on native birds. No dead or injured birds were found during surveys at selected turbine sites (e.g. Crookwell Wind Farm, PPI Environmental Services 1999). Similarly, no bats were killed at Crookwell by blade-strike (Richards 1999). No carcasses were found below the turbines during a monitoring study between August 1998 and January 1999. However, 20 birds were killed by blade-strike during the first 14 months of operation at the Woolnorth Wind Farm in Tasmania (quoted in URS 2004). AusWEA (2002) report on several studies in the early 2000s that found very few bird deaths on wind farms in Victoria and Tasmania. All studies in Australia found bird mortality associated with wind farms to be very low.

The Policy Statement by DEWHA (2009) notes that some bird and bat species are prone to collide with turbines or above-ground transmission lines than others. The document cites large souring raptors and large waterbirds as more likely to collide with turbines than agile or lower flying species. In assessing potential impacts, local topography, large wetlands and seasonal factors should also be considered. Species that travel in flocks are also more likely to be impacted. Flight corridors are identified as potentially important locations for impact. Such corridors may be associated with:

- "prominent headlands or peninsulas where migrating species depart or landfall;
- near approaches to wetlands or bat caves;
- along ridges, rivers and vegetated corridors; and
- through gaps between habitat patches."

The above document states that 'all infrastructure, including turbines, roads, transmission lines and fences should avoid both direct and indirect damage to significant areas of natural habitat, such as:

- "wetlands;
- dune systems
- important breeding, roosting or feeding habitat for listed threatened species and/or migratory species;
- listed threatened ecological communities;
- a population of as listed threatened species of plant."

None of the above habitats occur on or are impacted by the Capital Wind Farm Stage 2. The Capital Wind Farm site is adjacent to Lake George. That very large lake is almost always dry; if it does have water in it, this is well out from the shoreline where the turbines are located.

The Australian Wind Energy Association Report entitled '*Wind Farms and Birds – Interim Standards for Risk Assessment*' provides a framework for determining the levels of investigation of bird impacts at wind farm sites and a set of systematic and structured protocols for the different levels of investigation that guide the choice and application of bird collection data and analysis methods. We have undertaken bird surveys on the area of the wind farm on several occasions since 2005, and have a good understanding of the species present and the habits they are using. As noted earlier in this report, we have also recorded the heights at which birds were flying. The results indicate that the vast majority of birds fly below the lower tip of the blade.

After a review of the threatened bird species known and potentially present in the study area, the relevant species are either ground species or are unlikely to occur in the area because of a lack of suitable habitat, e.g. woodland. This being the case, the potential risk to threatened species from blade-strike is very low to negligible.

As noted above, birds of prey and birds that form large flocks, are potentially at risk of collision with turbine blades. Observations on the Capital Wind Farm over several years suggest that birds are little affected or disturbed by the presence of turbines. For example, during this study, a pair of Wedge-tailed Eagles was observed gliding among rotating blades, obviously able to identify and avoid the turning blades. Similar observations for this species were reported by AusWEA (2002) on a wind farm in South Gippsland, although blade-strike affecting eagles has been reported elsewhere. Problems with wind farms and waterbirds have arisen elsewhere, such as in Europe, because the turbines are located at sites where large flocks of birds move or migrate through the area of the turbines Small flocks of waterbirds were observed in the area over the past few years, visiting the farm dams here and there across the properties. None of these birds were observed to be flying high enough to come into contact with the blades and the flocks were very small. As far as has been observed over several years working on the Capital Wind Farm site, large flocks of waterbirds, or any other species for that matter, have never been observed in the area.

### *6.6 Response to Issues Raised*

The report addresses those issues raised by the Department of Planning in their Director-General's requirements, as well as those identified by government authorities in correspondence to the Department in September 2010. The issues are summarised in **Appendix 6**, where the section(s) of this report dealing with those issues are identified.

### *6.7 Spread of Weeds*

The study area contains various weds typical of tablelands agricultural land, including Scotch Thistle, Paterson's Curse and African Love Grass. The earthworks associated with the development of the wind farm have the potential to exacerbate the weed problem and require management. There is no evidence that Capital Stage 1 Wind Farm has caused an increase in weed problems.

# 7. Conclusion and Recommendations

This report provides a description of the flora and fauna occurring on the eastern part of the Capital Wind Farm properties where it is proposed to construct additional turbines and associated access tracks and cabling routes (overhead and buried). The project is a Part 3A application and the project has been assessed in accordance with the Director-General's Requirements from the Department of Planning and under DECCW guidelines for such developments. It was determined that the proposal will not have a significant impact upon listed threatened species or communities. At most, there are occasional visits by woodland birds, although there is no breeding or special habitat for such species on the development sites. Woodland does not occur on or near any parts of the proposed wind farm extension.

The potential to impact upon matters of national environmental significance listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* has also been assessed by employing guidelines provided by the Commonwealth. The native grassland in the area is likely to be part of the Natural Temperate Grassland community, listed under the *Environment Protection and Biodiversity Conservation* Act. This grassland is very patchy in its occurrence, covers only small areas and is of low floristic quality. An assessment concluded that the impact of constructing the wind farm in the study area is not likely to be significant; i.e. not likely to have a significant impact on matters of national environmental significance. In our view, referral to the Commonwealth Minister for the Environment for assessment and approval is not warranted.

The following recommendations are made to minimise and avoid impacts on flora and fauna arising from the Capital Wind Farm Stage Two proposal.

1. When constructing the access tracks, cable routes and the hardstands, care should be taken to ensure that the construction activities do not cause excessive erosion. Permanent tracks should be stabilised as soon as possible and temporary tracks and buried cable routes rehabilitated to the satisfaction of the relevant government department. Rehabilitation work on the existing Capital Wind Farm has proven to be very successful, so similar methods should be employed on Stage 2.

2. Weed control on the properties is not the responsibility of the operator or contractors associated with the wind farm. However, measures need to be taken to ensure that the wind farm, particularly during the construction period, does not exacerbate the weed problem on the properties involved. This is particularly important in regard to the spreading of invasive weeds to new locations. Advice from the relevant property owners would be worthwhile in this regard.

3. As with the previous wind farm at Capital, the construction phase should be monitored by someone experienced in environmental management. Issues to be monitored include:
- soil stabilisation works and their effectiveness;
- advice on micro-siting of wind farm components;
- creation of rocky habitat where rock is excavated.

4. As it is designed at present, no trees need to be removed to construct the wind farm. Some trees, mainly exotic species, do occur nearby to some of the proposed infrastructure; although they have little habitat value, these trees should be retained for their landscape value because trees are rare in this landscape.

5. Large rock outcrops should be avoided, because they provide valuable habitat for reptiles and other native animals; in a cleared landscape such as this, rock outcrops are sometimes the only habitat available for reptiles. If possible, micro-siting of towers should be used to avoid rocky areas. If turbines are located among rock outcrops, the excavated rock should be deposited nearby in a 'natural' formation to re-create rocky habitat.

6. Many kilometres of buried cable will be installed throughout the wind farm site to link turbines and the existing cable network. Observations on cable routes within the existing Capital Wind Farm indicate that erosion control and subsequent revegetation has been very successful. The following recommendations relate to the installation of these cables.
- Disturbance should be minimised and rehabilitation undertaken as soon as possible after back-filling of the trench.
- Care should be taken on steep slopes to ensure that erosion does not occur. Any problems should be rectified immediately.
- The on-site maintenance crew should be responsible for regularly checking the cable routes for erosion until the routes have been stabilised and revegetated.
- The property owners or relevant government authority should be contacted to identify a suitable cover crop for sites requiring seeding to accelerate revegetation.

7. Steps can be taken to minimise the potential to impact on birds of prey, i.e. avoid blade-strike.
- the turbines should have no perching places;
- dead animals (e.g. sheep carcasses) within 200 metres of a turbine should be removed as soon as possible.
- lambing should not occur in paddocks with turbines;
- roadkills should be removed if they are within 200 metres of a turbine;
- the turbine and other facilities should not have lights, other than safety lights for aircraft as required by government authorities, because lights attract nocturnal birds and bats.
- buildings, poles or other structures should not be constructed within 200 metres of turbines as they provide perching opportunities for birds of prey.

8. Monitoring the impact of blade-strike on birds and bats should be undertaken following completion of the wind farm; this would be an extension of the existing monitoring being done on Capital Stage 1. The monitoring methods to be utilised should be discussed with the DECCW before they are commenced.

9. No large dams should be constructed within one kilometre of turbines.

10. If trees and other plants are planted around buildings and other facilities, then ideally these should be locally indigenous species.

11. A Soil and Water Management Plan should be prepared for the construction phase of the project. This should be developed in conjunction with the relevant State government department.

12. The two turbines that are in or close to the mapped area of native grassland/native should be micro-sited within the proposed 100 metres leeway sought in the application to avoid native grassland.

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## *Appendix 1*
### *Initial Review of List of Subject Species*

The attached list of species comes from the DECCW submission to the DoP; species in bold are dealt with in detail in this report.

| ***Common Name*** | ***Scientific Name*** | ***Status under TSC Act*** | ***Likelihood of presence in the study area*** |
|---|---|---|---|
| **FAUNA** | | | |
| Little Whip Snake | *Suta flagellum* | Vulnerable | Very unlikely; no habitat present. |
| Pink-tailed Worm-lizard | *Aprasia parapulchella* | Vulnerable | Rocky areas present, must be surveyed. |
| Rosenberg's Goanna | *Varanus rosenbergi* | Vulnerable | Very unlikely; no habitat present. |
| Striped Legless Lizard | *Delma impar* | Vulnerable | Very unlikely; no habitat present. |
| Grassland Earless Dragon | *Tympanocryptis pinguicolla* | Endangered | Very unlikely; no habitat present. |
| Little Eagle | *Hieraaetus morphnoides* | Vulnerable | Possible occasional visitor. Requires assessment. |
| Spotted Harrier | *Circus assimilis* | Vulnerable | Very rare visitor, no assessment required. |
| **Flame Robin** | *Petroica phoenicea* | Vulnerable | Recorded. Requires assessment. |
| **Scarlet Robin** | *Petroica boodang* | Vulnerable | Likely. Requires assessment. |
| Varied Sittella | *Daphoenositta chrysoptera* | Vulnerable | Very unlikely; no habitat present. |
| Brown Treecreeper | *Climacteris picumnus victoriae* | Endangered | Very unlikely; no habitat present. |
| **Diamond Firetail** | *Stagonopleura guttata* | Vulnerable | Recorded. Requires assessment. |
| Hooded Robin | *Melanodryas cucullata cucullata* | Vulnerable | Unlikely; no habitat present on or near site. |
| Speckled Warbler | *Pyrrholaemus sagittatus* | Vulnerable | Very unlikely; no habitat present. |
| **White-fronted Chat** | *Epthianura albifrons* | Vulnerable | Possibly present; requires assessment. |
| Gang-gang Cockatoo | *Callocephalon fimbriatum* | Vulnerable | Very unlikely; no habitat present. |
| Glossy Black-Cockatoo | *Calyptorhynchus lathami* | Vulnerable | Very unlikely; no habitat present. |
| Eastern Bentwing Bat | *Miniopterus schreibersii oceanensis* | Vulnerable | No roosting habitat present, surveys not required. |
| Eastern False Pipstrelle | *Falsistrellus tasminienssi* | Vulnerable | No roosting habitat present, surveys not required. |
| Yellow Bellied Sheathtailed Bat | *Saccolaimus flaviventris* | Vulnerable | No roosting habitat present, surveys not required. |
| Greater Long eared Bat | *Nyctophilus timorlensis* | Vulnerable | No roosting habitat present, surveys not required. |
| Greater Broad Nosed Bat | *Scoteanax rueppellii* | Vulnerable | No roosting habitat present, surveys not required. |
| Large Footed Myotis | *Myotis adversus* | Vulnerable | No roosting habitat present, surveys not required. |
| Powerful Owl | *Ninox strenua* | Vulnerable | Very unlikely; no habitat present. |
| Barking Owl | *Ninox connivens* | Vulnerable | Very unlikely; no habitat present. |

| | | | |
|---|---|---|---|
| Golden Sun Moth | *Synemon plana* | Endangered | Small areas of habitat present; assessment required. |
| Koala | *Phascolarctos cinereus* | Vulnerable | Very unlikely; no habitat present. |
| Squirrel Glider | | Vulnerable | Very unlikely; no habitat present. |
| Spotted-tailed Quoll | *Dasyurus maculates* | Vulnerable | Very unlikely; no habitat present. |
| Turquoise Parrot | *Neophema pulchella* | Vulnerable | Very unlikely; no habitat present. |
| Superb Parrot | *Polytelis swansonii* | Endangered | Very unlikely; no habitat present. |
| Little Lorikeet | *Glossopsitta pusilla* | Vulnerable | Very unlikely; no habitat present. |
| Regent Honeyeater | *Xanthomyza phrygia* | Endangered | Very unlikely; no habitat present. |
| White-browed Woodswallow | *Artamus superciliosus* | Preliminary listing as vulnerable. | Irruptions into region occur occasionally. No useful habitat present in area. |
| Bush Stone Curlew | | | Very unlikely; no habitat present. |
| Green and Golden Bell Frog | *Litoria aurea* | Endangered | Very unlikely; no habitat present. |
| Booroolong Frog | *Litoria booroolongensis* | Endangered | Very unlikely; no habitat present. |
| Littlejohn's Tree Frog | *Litoria litteljohni* | Vulnerable | Very unlikely; no habitat present. |
| Southern Bell Frog | *Litoria raniformis* | Endangered | Very unlikely; no habitat present. |
| Yellow-spotted Frog | *Litoria castanea* | Endangered | Very unlikely; no habitat present. |
| **FLORA** | | | |
| Austral Toad Flax | *Thesium australe* | Endangered | Suitable grassland unlikely to be present; surveys required. |
| Button Wrinklewort | *Rutidosis leptorrhynchoides* | Vulnerable | Very unlikely; no habitat present. |
| Creeping hopbush | *Dodonea procumbens* | Vulnerable | Very unlikely; no habitat present. |
| Silky Swainson Pea | *Swainsona sericea* | Vulnerable | Native grassland present; surveys required. |
| Mountain Swainson Pea | *Swainsona recta* | Endangered | Native grassland present; surveys required. |
| - | *Pelagonium sp.* | Endangered | Very unlikely; no habitat present. |
| Mauve burr daisy | *Calotis glandulosa* | Endangered | Some native grassland present; surveys required. |
| Dwarf Kerrawang | *Rulingia prostrata* | Endangered | Very unlikely; no habitat present. |
| Buttercup Doubletail | *Diuris aequalis* | Endangered | Very unlikely; no habitat present. |
| Tarengo Leek orchid | *Prasophyllum petilum* | Endangered | Only known from four sites in NSW, closest is Captains Flat, well away from the study area. No suitable habitat present in study area. |
| Small-leaved Gum | *Eucalyptus parvula* | Endangered | Restricted to several populations in swamps well away from the study area. No habitat present. |
| Pale Golden Moths | *Diuris ochroma* | Endangered | Very unlikely; no habitat present. |
| Nerriga Grevillea | *Grevillea renwickiana* | Endangered | Only occurs in the Nerriga area well away from the study area; no habitat present. |
| Crimson Spider Orchid | *Caladenia concolor* | Endangered | Very unlikely; no habitat present. |
| **ENDANGERED ECOLOGICAL COMMUNITIES** | | | |

| | | | |
|---|---|---|---|
| White Box - Yellow Box - Blakely's Red Gum Woodland | - | Endangered | Native grassland may be remnants of this community; requires assessment. |
| Tablelands Frost Hollow Grassy Woodlands (Preliminary determination) | - | Endangered | Not present; no woodland of any kind occurs in the study area. |
| Natural Temperate Grassland of the Southern Tablelands | - | Not listed | This commonwealth matter is dealt with in the report. |

## *Appendix 2*
## *Native Grassland Survey Sheet*

| Survey Sheet - Vegetation Plot | | Plot Size: 20m x 20m Kevin Mills & Associates | |
|---|---|---|---|
| Site Name: Capital Wind Farm Stage 2 | | Plot No. CWF01 | Photo: yes |
| Location: Turbine site WTG 17, east of Rocky Point. | | Recorder: Kevin Mills | |
| Date: 28.04.10 | Community: Native pasture. | | |
| GPS(centre): 55 0725690 6113616 (WGS84) | | Soil: Clayey | |
| Land Tenure: Freehold | Alt: 720 m | Geology: granite | |
| Slope: Flat | Aspect: West | **Topography:** Low ridge crest | |
| Species Cover: 1:<5% (uncommon); 2:<5% (common), 3:5-25%; 4:25-50%; 5:50-75%; 6:75-100%. | | | |
| **Natives** | | **Exotics** | |
| *Austrodanthonia caespitosa* | 3 | *Acetosella vulgaris* | 3 |
| *Austrostipa bigeniculata* | 4 | *Carthamus lanatus* | 1 |
| *Chenopodium pumilio* | 3 | *Cucumis myriocarpus* | 1 |
| *Chloris trunctata* | 2 | *Dactylus glomerata* | 3 |
| *Concolvulus erubescens* | 1 | *Echium plantagineum* | 1 |
| *Crassula sieberiana* | 1 | *Erodium sp.* | 1 |
| *Einadia nutans* | 1 | *Hirschfeldia incana* | 1 |
| *Erodium crinitum* | 1 | *Hordeum sp.* | 1 |
| *Oxalis* sp. | 1 | *Lepidium sp.* | 1 |
| *Rumex brownii* | 2 | *Malva parviflora* | 2 |
| | 1 | *Onopordium acanthium* | 2 |
| | 1 | *Trifolium subterranean* | 1 |
| | | Unident. Grasses | 4 |
| | | | |
| Site quality score | 0 | | |
| No. species | 10 | No. species | 13 |
| Native cover – 50 % | | | |

| Survey Sheet - Vegetation Plot | | Plot Size: 20m x 20m Kevin Mills & Associates | |
|---|---|---|---|
| Site Name: Capital Wind Farm Stage 2 | | Plot No. CWF02 | Photo: yes |
| Location: Rocky knoll north of existing WTG 18. | | Recorder: Kevin Mills | |
| Date: 28.04.10 | Community: Native pasture. | | |
| GPS(centre): 55 0725084 6110185 (WGS84) | | Soil: clayey | |
| Land Tenure: Freehold | Alt: 710 m | Geology: granite | |
| Slope: gentle | Aspect: north | Topography: knoll crest | |
| Species Cover: 1:<5% (uncommon); 2:<5% (common), 3:5-25%; 4:25-50%; 5:50-75%; 6:75-100%. | | | |
| **Natives** | | **Exotics** | |
| *Acaena sp.* | 1 | *Acetosella vulgaris* | 2 |
| *Asplenium flabellifolium* | 1 | *Avena sp.* | 1 |
| *Austrodanthonia caespitosa* | 3 | *Dactylis glomerata* | 1 |
| *Austrodanthonia carphoides* | 1 | *Carthamus lanatus* | 3 |
| *Austrostipa bigeniculata* | 2 | *Erodium sp.* | 1 |
| *Bothriochloa macra* | 5 | *Hirschfeldia incana* | 1 |
| *Cheilanthes sieberi* | 1 | *Hypocheiros radicata* | 1 |
| *Chenopodium pumilio* | 1 | *Lepidium sp.* | 1 |
| *Concolvulus erubescens* | 1 | *Malva parviflora* | 1 |
| *Desmodium varians* | 1 | *Modiola caroliniana* | 1 |
| *Dichondra repens* | 1 | *Nassella trichotoma* | 3 |
| *Dodonaea viscosa* | 1 | *Onopordium acanthium* | 2 |
| *Glycine sp.* | 1 | *Paronychia brasiliana* | 2 |
| *Lomandra longifolia* | 1 | *Pentaschistis airoides* | 1 |
| *Microlaena stipoides* | 3 | *Petrorhagia nanteuilii* | 1 |
| *Scutellaria humilis* | 1 | *Rosa rubiginosa* | 1 |
| | | *Rubus fruticosus sp. agg.* | 1 |
| | | *Trifolium subterranean* | 1 |
| Site quality score | 6 | | |
| No. species | 16 | No. species | 18 |
| Native cover – 50 % | | | |

| Survey Sheet - Vegetation Plot | | Plot Size: 20m x 20m Kevin Mills & Associates | |
|---|---|---|---|
| Site Name: Capital Wind Farm Stage 2 | | Plot No. CWF03 | Photo: yes |
| Location: Southeast of existing WTG 21. | | Recorder: Kevin Mills | |
| Date: 29.04.10 | Community: Native grassland. | | |
| GPS(centre): 55 0725134 6107959 (WGS84) | | Soil: clayey | |
| Land Tenure: Freehold | Alt: 730 m | Geology: dolerite | |
| Slope: moderate | Aspect: west | Topography: mid-slope | |
| Species Cover: 1:<5% (uncommon); 2:<5% (common), 3:5-25%; 4:25-50%; 5:50-75%; 6:75-100%. | | | |

| **Natives** | | **Exotics** | |
|---|---|---|---|
| *Asperula conferta* | 1 | *Carthamus lanatus* | 2 |
| *Austrodanthonia racemosa* | 2 | *Cirsium vulgare* | 1 |
| *Austrodanthonia carphoides* | 2 | *Hypocheiros radicata* | 1 |
| *Austrostipa bigeniculata* | 6 | *Nassella trichotoma* | 2 |
| *Austrostipa scabra* | 1 | *Onopordium acanthium* | 1 |
| *Bothriochloa macra* | 3 | *Petrorhagia nanteuilii* | 1 |
| *Cheilanthes austrotenuifolia* | 1 | *Trifolium arvense* | 1 |
| *Chenopodium pumilio* | 1 | *Trifolium subterranean* | 1 |
| *Chloris truncata* | 1 | | |
| *Chrysocephalum apiculatum* | 1 | **Natives cont...** | |
| *Concolvulus erubescens* | 1 | *Goodenia pinnatifida* | 1 |
| *Crassula sieberiana* | 1 | *Lomandra filiformis* | 2 |
| *Cymbonotus lawsonianus* | 1 | *Panicum effusum* | 2 |
| *Desmodium varians* | 1 | *Vittadinia gracilis* | 1 |
| *Dichondra repens* | 1 | *Wahlenbergia communis* | 1 |
| *Enneapogon nigricans* | 1 | *Wahlenbergia luteo* | 1 |
| *Glycine tabacina* | 1 | | |
| Site quality score | 3 | | |
| No. species | 22 | No. species | 8 |
| Native cover – 100 % | | | |

| Survey Sheet - Vegetation Plot | | Plot Size: 20m x 20m Kevin Mills & Associates | |
|---|---|---|---|
| Site Name: Capital Wind Farm Stage 2 | | Plot No. CWF04 | Photo: yes |
| Location: Low ridge, northwest corner of property *Luckdale*. | | Recorder: Kevin Mills | |
| Date: 29.04.10 | Community: Native grassland. | | |
| GPS(centre): 55 0726146 6115633 (WGS84) | | Soil: clayey | |
| Land Tenure: Freehold | Alt: 720 m | Geology: dolerite | |
| Slope: very gentle | Aspect: north | Topography: ridge crest | |
| Species Cover: 1:<5% (uncommon); 2:<5% (common), 3:5-25%; 4:25-50%; 5:50-75%; 6:75-100%. | | | |
| **Natives** | | **Exotics** | |
| *Asperula conferta* | 1 | *Carthamus lanatus* | 2 |
| *Austrodanthonia caespitosa* | 3 | *Lepidium sp.* | 1 |
| *Austrodanthonia carphoides* | 3 | *Sonchus ? aspera* | 1 |
| *Austrostipa bigeniculata* | 3 | *Trifolium subterranean* | 1 |
| *Austrostipa scabra* | 4 | | |
| *Bothriochloa macra* | 1 | **Natives cont...** | |
| *Brachycome sp.* | 1 | *Glycine tabacina* | 1 |
| *Chenopodium pumilio* | 1 | *Goodenia pinnatifida* | 1 |
| *Chamesacye drummondi* | 1 | *Calocephalus citreus* | 1 |
| *Chrysocephalum apiculatum* | 4 | *Panicum effusum* | 1 |
| *Chloris truncata* | 1 | *Plantago varia* | 2 |
| *Concolvulus erubescens* | 1 | *Rumex brownii* | 1 |
| *Crassula sieberiana* | 1 | *Solenogyne dominii* | 1 |
| *Cymbonotus lawsonianus* | 1 | *Vittadinia cuneaa* | 1 |
| *Desmodium varians* | 1 | *Vittadinia muelleri* | 1 |
| *Enneapogon nigricans* | 3 | *Wahlenbergia comunis* | 1 |
| *Erodium crinitum* | 2 | | |
| Site quality score | 3 | | |
| No. species | 27 | No. species | 4 |
| Native cover – 90% (remainder mostly bare ground) | | | |

| Survey Sheet - Vegetation Plot | | Plot Size: 20m x 20m Kevin Mills & Associates | |
|---|---|---|---|
| Site Name: Capital Wind Farm Stage 2 | | Plot No. CWF05 | Photo: yes |
| Location: Lake side flat west of property *Lakoona*. | | Recorder: Kevin Mills | |
| **Date:** 29.04.10 | **Community:** Native pasture. | | |
| **GPS(centre):** 55 0726916 6117016 (WGS84) | | Soil: sand | |
| Land Tenure: Freehold | Alt: 670 m | Geology: sand dune | |
| Slope: flat | Aspect: north | Topography: lowland flats | |
| Species Cover: 1:<5% (uncommon); 2:<5% (common), 3:5-25%; 4:25-50%; 5:50-75%; 6:75-100%. | | | |

| **Natives** | | **Exotics** | |
|---|---|---|---|
| *Austrodanthonia racemosa* | 3 | *Carthamus lanatus* | 2 |
| *Austrostipa bigeniculata* | 6 | *Eleusine tristachya* | 1 |
| *Cynodon dactylon* | 1 | *Erodium sp.* | 1 |
| *Cynoglossum suaveolens* | 1 | *Lepidium sp.* | 2 |
| *Chenopodium pumilio* | 3 | *Malva parviflora* | 1 |
| *Concolvulus erubescens* | 1 | *Onopordium acanthium* | 2 |
| *Glycine tabacina* | 1 | *Phalaris aquatica* | 1 |
| *Vittadinia gracilis* | 1 | *Trifolium subterranean* | 1 |
| Site quality score | 0 | | |
| No. species | 8 | No. species | 8 |
| Native cover – 95% | | | |

## *Appendix 3*
## *List of Plant Species*

| Family<br>Species | Common Name |
|---|---|
| **Asteraceae** | |
| *Brachycome sp.* | Daisy |
| *Chrysocephalum apiculatum* | Common Everlasting |
| *Cymbonotus lawsonianus* | Austral Bears-ear |
| *Calocephalus citreus* | Lemon Beautyheads |
| *Solenogyne dominii* | Smooth Solenogyne |
| *Vittadinia cuneata* | Fuzzy New Holland Daisy |
| *Vittadinia gracilis* | Woolly New Holland Daisy |
| *Vittadinia muelleri* | Narrow-leaf New Holland Daisy |
| **Arctotheca calendula* | Capeweed |
| **Carthamus lanatus* | Saffron Thistle |
| **Chondrilla juncea* | Skeleton Weed |
| **Cirsium vulgare* | Spear Thistle |
| **Hypochaeris radicata* | Flatweed |
| **Onopordium acanthium* | Scotch Thistle |
| **Sonchus oleraceus* | Common Sow Thistle |
| **Boraginaceae** | |
| *Cynoglossum suaveolens* | Sweet Hound's Tongue |
| **Echium plantagineum* | Paterson's Curse |
| **Brassicaceae** | |
| **Hirschfeldia incana* | Hairy Brassica |
| **Lepidium* sp. | Peppercress |
| **Campanulaceae** | |
| *Wahlenbergia communis* | Tufted Bluebell |
| *Wahlenbergia luteola* | Yellowish Bluebell |
| **Caryophyllaceae** | |
| *Stellaria pungens* | Prickly Starwort |
| **Paronychia brasiliana* | Brazilian Whitlow |
| **Petrorhagia nanteuilii* | Proliferous Pink |
| **Chenopodiaceae** | |
| *Chenopodium pumilio* | Clammy Goosefoot |
| *Einadia nutans* | Nodding Saltbush |
| **Convolvulaceae** | |
| *Convolvulus erubescens* | Australian Bindweed |
| *Dichondra repens* | Kidney Weed |
| **Crassulaceae** | |
| *Crassula sieberiana* | Stonecrop |
| **Cyperaceae** | |
| *Carex bichinoviana* | Sedge |
| *Eleocharis sphacelata* | Tall Spike Rush |

| | |
|---|---|
| **Fabaceae** | |
| **Faboideae (subfamily)** | |
| *Desmodium varians* | Slender Tick-trefoil |
| *Glycine tabacina* | Vanilla Glycine |
| **Trifolium arvense* | Haresfoot Clover |
| **Trifolium subterraneum* | Subterranean Clover |
| **Mimosoideae (subfamily)** | |
| *Acacia dealbata* | Silver Wattle |
| *Acacia melanoxylon* | Blackwood |
| **Geraniaceae** | |
| *Erodium crinitum* | Blue Stork's-bill |
| *Geranium solanderi* | Native Geranium |
| **Erodium cicutarium* | Common Stork's-bill |
| **Goodeniacaeae** | |
| *Goodenia pinnatifida* | Scrambled Eggs |
| **Lamiaceae** | |
| *Scutellaria humilis* | Dwarf Skullcap |
| **Marrubium vulgare* | Horehound |
| **Salvia verbenaca* | Wild Sage |
| **Lomandraceae** | |
| *Lomandra filiformis* | Wattle Mat-rush |
| *Lomandra multiflora* | Many-flowered Mat-rush |
| **Malvaceae** | |
| **Malva parviflora* | Small-flowered mallow |
| **Modiola caroliniana* | Red-flowered Mallow |
| **Oxalidaceae** | |
| *Oxalis* sp. | Wood Sorell |
| **Phormiaceae** | |
| *Dianella revoluta* | Spreading Flax-lily |
| **Pinaceae** | |
| **Pinus radiata* | Radiata Pine |
| **Plantaginaceae** | |
| *Plantago varia* | Variable Plantain |
| **Plantago lanceolata* | Ribbed Plantain |
| **Poaceae** | |
| *Austrodanthonia carphoides* | Short Wallaby Grass |
| *Austrodanthonia racemosa* | Wallaby Grass |
| *Austrostipa bigeniculata* | Tall Speargrass |
| *Austrostipa scabra* | Corkscrew |
| *Bothriochloa macra* | Red-leg Grass |
| *Chloris truncata* | Windmill Grass |
| *Cynodon dactylon* | Couch Grass |

| | |
|---|---|
| *Elymus scaber* | Wheatgrass |
| *Enneapogon nigricans* | Nineawn Grass |
| *Panicum effusum* | Hairy Panic |
| *Phragmites australis* | Common Reed |
| *Poa labillardieri* | River Tussock |
| *Poa sieberiana* | Poa Tussock |
| **Avena* sp. | Oats |
| **Bromus cartharticus* | Prairie Grass |
| **Dactylis glomerata* | Cocksfoot |
| **Eleusine tristachya* | Goose Grass |
| **Eragrostis curvula* | African Lovegrass |
| **Lolium* sp. | Rye Grass |
| **Nassella trichotoma* | Serrated Tussock |
| **Paspalum dilatatum* | Paspalum |
| **Pentaschistis airoides* | False Hair Grass |
| **Phalaris aquatica* | Phalaris |
| **Polygonaceae** | |
| *Rumex brownii* | Swamp Dock |
| **Acetosella vulgaris* | Sheep Sorrel |
| **Polygonum aviculare* | Wireweed |
| **Rosaceae** | |
| *Acaena* sp. | Sheep's Burr |
| **Rosa rubiginosa* | Sweet Briar |
| **Rubus fruticosus* sp. agg. | Blackberry |
| **Rubiaceae** | |
| *Asperula conferta* | Common Woodruff |
| **Sapindaceae** | |
| *Dodonaea viscosa* | Hop Bush |
| **Salicaceae** | |
| **Salix babylonica* | Weeping Willow |
| **Sinopteridaceae** | |
| *Cheilanthes austrotenuifolia* | Rock Fern |
| *Cheilanthes sieberi* | Mulga Fern |
| **Solanaceae** | |
| *Solanum linearifolium* | Mountain Kangaroo Apple |
| **Lycium ferocissimum* | African Boxthorn |
| **Solanum nigrum* | Nightshade |
| **Typhaceae** | |
| *Typha orientalis* | Cumbungi |

* Introduced species.

## *Appendix 4*
## *List of Animal Species*

| Group<br>FAMILY/Species | | Previous[1] | This Study |
|---|---|---|---|
| **Mammals** | | | |
| **Tachyglossidae** | | | |
| Short-beaked Echidna | *Tachyglossus aculeatus* | 1 | |
| **Phascolarctidae** | | | |
| Koala | *Phascolarctos cinereus* | 1 | |
| **Vombatidae** | | | |
| Common Wombat | *Vombatus ursinus* | 1 | 2 |
| **Pseudocheiridae** | | | |
| Common Ringtail Possum | *Pseudocheirus peregrinus* | 1 | |
| **Phalangeridae** | | | |
| Common Brushtail Possum | *Trichosurus vulpecula* | 1 | |
| **Macropodidae** | | | |
| Eastern Grey Kangaroo | *Macropus giganteus* | 1 | 2 |
| Common Wallaroo | *Macropus robustus* | 1 | |
| Red-necked Wallaby | *Macropus rufogriseus* | 1 | |
| Swamp Wallaby | *Wallabia bicolor* | 1 | |
| **Muridae** | | | |
| Black Rat* | *Rattus rattus* | 1 | |
| **Canidae** | | | |
| Fox* | Vulpes vulpes | 1 | 2 |
| **Leporidae** | | | |
| Rabbit* | *Oryctolagus cuniculus* | 1 | 2 |
| Brown Hare* | *Lepus capensis* | 1 | |
| **Equidae** | | | |
| Domestic Horse* | *Equus caballus* | 1 | |
| **Bovidae** | | | |
| Domestic Cattle* | *Bos taurus* | 1 | 2 |
| Domestic Sheep* | *Ovis aries* | 1 | 2 |
| **Cervidae** | | | |
| Sambar Deer* | *Cervus unicolor* | 1 | 2 |
| **Birds** | | | |
| **CASUARIIDAE** | | | |
| Emu | *Dromaius novaehollandiae* | 1 | |

| | | | |
|---|---|---|---|
| **PHASIANIDAE** | | | |
| Stubble Quail | *Coturnix pectoralis* | 1 | |
| **ANSERANATIDAE** | | | |
| Magpie-goose | *Anseranas semipalmata* | 1 | |
| **ANATIDAE** | | | |
| Blue-billed Duck | *Oxyura australis* | 1 | |
| *Greylag Goose | *Anser* sp. | 1 | |
| Musk Duck | Biziura lobata | 1 | |
| Black Swan | Cygnus atratus | 1 | |
| Australian Shelduck | *Tadorna tadornoides* | 1 | 2 |
| Australian Wood Duck | *Chenonetta jubata* | 1 | 2 |
| Freckled Duck | *Stictonetta naevosa* | 1 | |
| Pacific Black Duck | *Anas superciliosa* | 1 | 2 |
| Pink-eared Duck | *Malacorhynchus membranaceus* | 1 | |
| Australian Shoveler | *Anas rhynchotis* | 1 | |
| Grey Teal | *Anas gracilis* | 1 | 2 |
| Chestnut Teal | *Anas castanea* | 1 | 2 |
| Hardhead | *Aythya australis* | 1 | |
| **PODICIPEDIDAE** | | | |
| Australasian Grebe | *Tachybaptus novaehollandiae* | 1 | 2 |
| Hoary-headed Grebe | *Poliocephalus poliocephalus* | 1 | |
| **PHALACROCORACIDAE** | | | |
| Little Pied Cormorant | *Phalacrocorax melanoleucos* | 1 | |
| **ARDEIDAE** | | | |
| White-faced Heron | Egretta novaehollandiae | 1 | 2 |
| White-necked Heron | *Ardea pacifica* | 1 | |
| Intermediate Egret | *Ardea intermedia* | 1 | |
| **THRESKIORNITHIDAE** | | | |
| Australian White Ibis | *Threskiornis molucca* | 1 | |
| Straw-necked Ibis | *Threskiornis spinicollis* | 1 | |
| **ACCIPITRIDAE** | | | |
| White-bellied Sea-Eagle | *Haliaeetus leucogaster* | 1 | |
| Brown Goshawk | *Accipiter fasciatus* | 1 | |
| Collared Sparrowhawk | *Accipiter cirrhocephalus* | 1 | |
| Wedge-tailed Eagle | *Aquila audax* | 1 | 2 |
| Little Eagle | *Hieraaetus morphnoides* | 1 | |
| **FALCONIDAE** | | | |
| Brown Falcon | *Falco berigora* | 1 | 2 |
| Peregrine Falcon | *Falco peregrinus* | 1 | |
| Nankeen Kestrel | *Falco cenchroides* | 1 | 2 |
| **RALLIDAE** | | | |
| Australian Spotted Crake | *Porzana fluminea* | 1 | |
| Purple Swamphen | *Porphyrio porphyrio* | 1 | |
| Eurasian Coot | *Fulica atra* | 1 | |

| | | | |
|---|---|---|---|
| **SCOLOPACIDAE** | | | |
| Marsh Sandpiper | *Tringa stagnatilis* | 1 | |
| Common Greenshank | *Tringa nebularia* | 1 | |
| Ruddy Turnstone | *Arenaria interpres* | 1 | |
| Pectoral Sandpiper | *Calidris melanotos* | 1 | |
| Curlew Sandpiper | *Calidris ferruginea* | 1 | |
| **RECURVIROSTRIDAE** | | | |
| Banded Stilt | *Cladorhynchus leucocephalus* | 1 | |
| Red-necked Avocet | *Recurvirostra novaehollandiae* | 1 | |
| **CHARADRIIDAE** | | | |
| Red-capped Plover | *Charadrius ruficapillus* | 1 | |
| Double-banded Plover | *Charadrius bicinctus* | 1 | |
| Black-fronted Dotterel | *Elseyornis melanops* | | *2* |
| Grey Plover | *Pluvialis squatarola* | 1 | |
| Pacific Golden Plover | *Pluvialis fulva* | 1 | |
| Red-kneed Dotterel | *Erythrogonys cinctus* | 1 | |
| Banded Lapwing | *Vanellus tricolor* | 1 | |
| Masked Lapwing | *Vanellus miles* | 1 | |
| **LARIDAE** | | | |
| Silver Gull | *Larus novaehollandiae* | 1 | |
| **COLUMBIDAE** | | | |
| Rock Dove* | *Columba livia* | 1 | |
| Common Bronzewing | *Phaps chalcoptera* | 1 | |
| Crested Pigeon | *Ocyphaps lophotes* | 1 | 2 |
| **CACATUIDAE** | | | |
| Glossy Black-Cockatoo | *Calyptorhynchus lathami* | 1 | |
| Yellow-tailed Black-Cockatoo | *Calyptorhynchus funereus* | 1 | |
| Gang-gang Cockatoo | *Callocephalon fimbriatum* | | 2 |
| Galah | *Cacatua roseicapilla* | 1 | 2 |
| Sulphur-crested Cockatoo | *Cacatua galerita* | 1 | 2 |
| **PSITTACIDAE** | | | |
| Crimson Rosella | *Platycercus elegans* | 1 | |
| Eastern Rosella | *Platycercus eximius* | 1 | |
| Red-rumped Parrot | *Psephotus haematonotus* | 1 | |
| **CUCULIDAE** | | | |
| Pallid Cuckoo | *Cuculus pallidus* | 1 | |
| **PODARGIDAE** | | | |
| Tawny Frogmouth | *Podargus strigoides* | 1 | |
| **HALCYONIDAE** | | | |
| Laughing Kookaburra | *Dacelo novaeguineae* | 1 | |
| Sacred Kingfisher | *Todiramphus sanctus* | 1 | |
| **MEROPIDAE** | | | |

| | | | |
|---|---|---|---|
| Rainbow Bee-eater | *Merops ornatus* | 1 | |
| **CLIMACTERIDAE** | | | |
| White-throated Treecreeper | *Cormobates leucophaeus* | 1 | |
| **MALURIDAE** | | | |
| Superb Fairy-wren | *Malurus cyaneus* | 1 | 2 |
| **PARDALOTIDAE** | | | |
| Spotted Pardalote | *Pardalotus punctatus* | 1 | |
| Striated Pardalote | *Pardalotus striatus* | 1 | |
| White-browed Scrubwren | *Sericornis frontalis* | 1 | |
| Weebill | *Smicrornis brevirostris* | 1 | |
| White-throated Gerygone | *Gerygone olivacea* | 1 | |
| Brown Thornbill | *Acanthiza pusilla* | 1 | |
| Buff-rumped Thornbill | *Acanthiza reguloides* | 1 | |
| Yellow-rumped Thornbill | *Acanthiza chrysorrhoa* | 1 | 2 |
| Yellow Thornbill | *Acanthiza nana* | 1 | |
| Striated Thornbill | *Acanthiza lineata* | 1 | |
| Southern Whiteface | *Aphelocephala leucopsis* | 1 | |
| **MELIPHAGIDAE** | | | |
| Red Wattlebird | *Anthochaera carunculata* | 1 | 2 |
| Noisy Friarbird | *Philemon corniculatus* | 1 | |
| Noisy Miner | *Manorina melanocephala* | 1 | |
| Yellow-faced Honeyeater | *Lichenostomus chrysops* | 1 | |
| White-eared Honeyeater | *Lichenostomus leucotis* | 1 | |
| White-plumed Honeyeater | *Lichenostomus penicillatus* | 1 | |
| Brown-headed Honeyeater | *Melithreptus brevirostris* | 1 | |
| White-naped Honeyeater | *Melithreptus lunatus* | 1 | |
| Eastern Spinebill | *Acanthorhynchus tenuirostris* | 1 | |
| Scarlet Honeyeater | *Myzomela sanguinolenta* | 1 | |
| **PETROICIDAE** | | | |
| Scarlet Robin | *Petroica boodang* | 1 | |
| Flame Robin | *Petroica phoenicea* | | 2 |
| **NEOSITTIDAE** | | | |
| Varied Sittella | *Daphoenositta chrysoptera* | 1 | |
| **PACHYCEPHALIDAE** | | | |
| Golden Whistler | Pachycephala pectoralis | 1 | |
| Rufous Whistler | Pachycephala rufiventris | 1 | |
| Grey Shrike-thrush | *Colluricincla harmonica* | 1 | |
| **DICRURIDAE** | | | |
| Satin Flycatcher | *Myiagra cyanoleuca* | 1 | |
| Restless Flycatcher | *Myiagra inquieta* | 1 | |
| Magpie-lark | *Grallina cyanoleuca* | 1 | 2 |
| Grey Fantail | *Rhipidura fuliginosa* | 1 | 2 |
| Willie Wagtail | *Rhipidura leucophrys* | 1 | 2 |
| Spangled Drongo | *Dicrurus bracteatus* | 1 | |
| **CAMPEPHAGIDAE** | | | |

| | | | |
|---|---|---|---|
| Black-faced Cuckoo-shrike | *Coracina novaehollandiae* | 1 | |
| White-winged Triller | *Lalage sueurii* | 1 | |
| **ORIOLIDAE** | | | |
| Olive-backed Oriole | *Oriolus sagittatus* | 1 | |
| **ARTAMIDAE** | | | |
| Dusky Woodswallow | *Artamus cyanopterus* | 1 | 2 |
| Grey Butcherbird | *Cracticus torquatus* | 1 | |
| Australian Magpie | *Gymnorhina tibicen* | 1 | 2 |
| Pied Currawong | *Strepera graculina* | 1 | |
| Grey Currawong | *Strepera versicolor* | 1 | |
| **CORVIDAE** | | | |
| Australian Raven | *Corvus coronoides* | 1 | 2 |
| Little Raven | *Corvus mellori* | 1 | 2 |
| **CORCORACIDAE** | | | |
| White-winged Chough | *Corcorax melanorhamphos* | 1 | |
| **ALAUDIDAE** | | | |
| Skylark* | *Alauda arvensis* | 1 | |
| **MOTACILLIDAE** | | | |
| Australasian Pipit | *Anthus novaeseelandiae* | 1 | 2 |
| **PASSERIDAE** | | | |
| House Sparrow* | *Passer domesticus* | 1 | 2 |
| Red-browed Finch | *Neochmia temporalis* | 1 | |
| Diamond Firetail | *Stagonopleura guttata* | | 2 |
| **FRINGILLIDAE** | | | |
| European Goldfinch* | *Carduelis carduelis* | 1 | 2 |
| **HIRUNDINIDAE** | | | |
| Welcome Swallow | *Hirundo neoxena* | 1 | 2 |
| Tree Martin | *Hirundo nigricans* | 1 | |
| **ZOSTEROPIDAE** | | | |
| Silvereye | *Zosterops lateralis* | 1 | 2 |
| **MUSCICAPIDAE** | | | |
| Common Blackbird* | *Turdus merula* | 1 | |
| **STURNIDAE** | | | |
| Common Starling* | *Sturnus vulgaris* | 1 | 2 |

**Frogs**

| | | | |
|---|---|---|---|
| **MYOBATRACHIDAE** | | | |
| Common Eastern Froglet | *Crinia signifera* | 1 | 2 |
| Eastern Banjo Frog | *Limnodynastes dumerilii* | 1 | |
| Spotted Grass Frog | *Limnodynastes tasmaniensis* | 1 | |
| Smooth Toadlet | *Uperoleia laevigata* | 1 | |

| | | | |
|---|---|---|---|
| **HYLIDAE** | | | |
| Green and Golden Bell Frog | *Litoria aurea* | 1 | |
| Verreaux's Tree Frog | *Litoria verreauxii* | 1 | |
| **Reptiles** | | | |
| **CHELIDAE** | | | |
| Long-necked Tortoise | *Chelodina longicollis* | 1 | |
| **AGAMIDAE** | | | |
| Jacky Lizard | *Amphibolurus muricatus* | 1 | |
| **SCINCIDAE** | | | |
| Striped Skink | *Ctenotus robustus* | | 2 |
| Copper-tailed Skink | *Ctenotus taeniolatus* | 1 | |
| Cunningham's Skink | *Egernia cunninghami* | 1 | |
| Three-toed Skink | *Saiphos equalis* | 1 | |
| Eastern Blue-tongued Lizard | *Tiliqua scincoides* | 1 | |
| Blotched Blue-tongued Lizard | *Tiliqua nigrolutea* | 1 | |
| **ELAPIDAE** | | | |
| Eastern Tiger Snake | *Notechis scutatus* | 1 | |
| Eastern Brown Snake | *Pseudonaja textilis* | 1 | |
| Little Whip Snake | *Suta flagellum* | 1 | |

* Introduced Species

1. Recorded on the Capital Wind Farm site and vicinity; see KMA (2005).
2. Stage 2 Capital Wind Farm, 2010.

## *Appendix 5*
## *Bird Survey Results*

**Location: Whole of area associated with Capital Wind Farm Stage 2.** **Date: 28.04.10**
**Time**: 09.30 to 15.30 (6 hours)

| **Species** | **0-10 m** | **10-20 m** | **20-50 m** | **>50 m** |
|---|---|---|---|---|
| Australasian Grebe | 2 (dams) | | | |
| Australasian Pipit | 20 | | | |
| Australian Kestrel | | 1 | | |
| Australian Magpie | 15 | 2 | | |
| Australian Raven | 13 | 2 | 1 | |
| Australian Shelduck | 2 (dams) | | | |
| Australian Wood Duck | 64 (dams) | | | |
| Brown Falcon | 2 | | | |
| Common Starling* | 183 | | | |
| Crested Pigeon | 11 | | | |
| European Goldfinch* | 1 | | | |
| Flame Robin | Pair | | | |
| House Sparrow* | 1 | | | |
| Magpie-lark | 2 | | | |
| Pacific Black Duck | 40 (dams) | | | |
| Sulphur-crested Cockatoo | | | 5 | |
| Superb Fairy-wren | 3 | | | |
| Welcome Swallow | | 2 | | |
| White=faced Heron | 1 | | | |
| Willie Wagtail | 2 | | | |
| Yellow-rumped Thornbill | 5 | | | |

**Location: Whole of area associated with Capital Wind Farm Stage 2.** **Date: 29.04.10**
Time: 10.30 to 15.30 (5 hours)

| **Species** | **0-10 m** | **10-20 m** | **20-50 m** | **>50 m** |
|---|---|---|---|---|
| Australasian Grebe | 6 (dams) | | | |
| Australasian Pipit | 17 | | | |
| Australian Magpie | 44 | | | |
| Australian Raven | 12 | | | |
| Australian Wood Duck | 67 (dams) | | | |
| Chestnut Teal | 2 (dam) | | | |
| Common Starling* | | 160 | | |
| Crested Pigeon | 1 | | | |
| Diamond Firetail | 5 | | | |
| European Goldfinch* | 5 | | | |
| Flame Robin | 4 | | | |
| Galah | 18 | | | |
| Grey Fantail | 1 | | | |
| Grey Teal | 2 (dam) | | | |
| Little Raven | 50 | 40 | 2 | |
| Magpie-lark | 4 | | | |
| Pacific Black Duck | 6 (dams) | | | |
| Silvereye | 20 | | | |
| Superb Fairy-wren | 4 | | | |
| Wedge-tailed Eagle | | | | 2 |
| Willie Wagtail | 9 | | | |
| Yellow-rumped Thornbill | 4 | | | |

**Location: Whole of area associated with Capital Wind Farm Stage 2.** **Date: 14.05.10**

Time: 10.00 to 12.30 (2.5 hours)

| **Species** | **0-10 m** | **10-20 m** | **20-50 m** | **>50 m** |
|---|---|---|---|---|
| Australasian Pipit | 25 | 4 | 2 | |
| Australian Kestrel | | 1 | | |
| Australian Magpie | 96 | | 2 | |
| Australian Raven | 6 | | | |
| Australian Wood Duck | 32 (dam) | | | |
| Black-fronted Dotterel | 1 (dam) | | | |
| Brown Falcon | 1 | | | |
| Common Starling* | 164 | 30 | | |
| Galah | 65 | | | |
| House Sparrow* | 1 | | | |
| Little Raven | 6 | | | |
| Magpie-lark | 5 | | | |
| Pacific Black Duck | 2 (dam) | | | |
| Welcome Swallow | 7 | 12 | | |
| Willie Wagtail | 2 | | | |
| Yellow-rumped Thornbill | 2 | 1 | | |

***Appendix 6***
***Response to Issues Raised by Authorities***

| Issue (Authority ID) | Section(s) of this report |
|---|---|
| Use of draft guidelines for Threatened Species Assessment (DECC 2005) (DoP; DECCW; Council) | 6.2 |
| Description and condition of vegetation (DoP; Council; CMA) | 4; 5.4 |
| Level of impact on native vegetation (DoP; DECCW; Council) | 6.1 |
| Impact on following threatened species and Communities: | |
| a. Box-Gum Woodland (DoP; DECCW; CMA) | 4.2; 5.4 |
| b. Natural Temperate Grassland (DoP; DECCW) | 3.1; 4.1; 4.2; 5.4; 6.3 |
| c. Tablelands Frost Hollow Grassy Woodlands (Preliminary listing of community) (DoP; DECCW) | 5.4 |
| d. Silky Swainson-pea (DoP; DECCW) | 5.1; Appendix 1. |
| e. Austral Toad Flax (DoP; DECCW) | 5.1; Appendix 1. |
| f. Tarengo Leek Orchid (DoP; DECCW) | Appendix 1. |
| g. Pink-tailed Work Lizard (DoP; DECCW) | 5.1; Appendix 1. |
| h. Grassland Earless Dragon (DoP; DECCW) | 5.1; Appendix 1. |
| i. Striped Legless Lizard (DoP; DECCW) | 5.1; Appendix 1. |
| j. Little Whip Snake (DoP; DECCW) | 5.1; Appendix 1. |
| k. Woodland bird species (DoP; DECCW) | 5.1; Appendix 1. |
| l. Superb Parrot (DoP; DECCW) | Appendix 1. |
| m. Squirrel Glider (DoP; DECCW) | Appendix 1. |
| n. Golden Sun Moth (DoP; DECCW) | 5.1; Appendix 1. |
| Other threatened species (DECCW) | 5.1; Appendix 1. |
| Provide details of survey methods used (DoP; CMA) | 3.1 (flora); 4.3 (fauna) |
| Address impacts on connectivity and habitat corridors (DoP; Council; CMA) | 6.1 |
| Address impacts on riparian and/or instream habitats (DoP; Fisheries) | 6.1 |
| Address impacts of blade-strike on birds and movement patterns | 6.5 |
| Management of impacts on flora and fauna during construction (DoP) | 7 |

| **Issue (Authority ID)** | **Section(s) of this report** |
|---|---|
| Identify measures to avoid, mitigate or offset impacts consistent with the 'maintain or improve' principle (DoP; DECCW; Fisheries; Council; CMA) | 7 |
| Use of relevant guidelines as listed in the DGRs (DoP; DECCW) | 6 |
| Impact on native vegetation (DECCW) | 6.1 |
| Spread of weeds (Council) | 6.7 |
| Impact on over-cleared vegetation communities (CMA) | 6.1 |