

Flyers Creek Wind Farm Pty Ltd

Flyers Creek

WIND FARM

Environmental Assessment

APPENDIX D Flora and Fauna



FLORA AND FAUNA ASSESSMENT

**FLYERS CREEK WIND FARM
SHIRE OF BLAYNEY
CENTRAL TABLELANDS
NEW SOUTH WALES**



prepared by

KEVIN MILLS & ASSOCIATES
ECOLOGICAL AND ENVIRONMENTAL CONSULTANTS
114 NORTH CURRAMORE ROAD
JAMBEROO NSW 2533
ABN 346 816 238 93

for

AURECON AUSTRALIA PTY LIMITED
P.O. Box 538
NEUTRAL BAY NSW 2089

April 2011

08/40

Document Reference

Kevin Mills & Associates (2011). Flora and Fauna Assessment, Flyers Creek Wind Farm, Shire of Blayney, Central Tablelands, New South Wales. Prepared for Aurecon Australia Pty Limited, Sydney, April.

Kevin Mills & Associates

Ecological and Environmental Consultants
114 North Curramore Road
Jamberoo NSW 2533
ABN 346 816 238 93

Ph: (02) 4236 0620 or 0419 248094

Email: k.mills@bigpond.net.au

Cover Photograph: Typical landscape of the Flyers Creek Wind Farm site; most of these trees are Yellow Box *Eucalyptus melliodora*.

COPYRIGHT

© Kevin Mills & Associates 2011

All intellectual property and copyright reserved.

Apart from any fair dealing for the purpose of private study, research, criticism or review, as permitted under the *Copyright Act, 1968*, no part of this report may be reproduced, transmitted, stored in a retrieval system or updated in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without written permission. Enquiries should be addressed to Kevin Mills & Associates.

This report was prepared for Aurecon Australia Pty Limited in accordance with the study brief developed between that company and Kevin Mills & Associates. The report should be used only by the previously named, and only for the stated purpose and not for any other purpose.

Contents

1. Introduction	1
2. The Study Area	2
2.1 Location	2
2.2 Topography, Geology and Soil	2
2.3 Past and Present Land Use	5
3. Survey Methods	5
3.1 Guidelines for Threatened Species Surveys and Assessments	5
3.2 Flora Survey Method	5
3.3 Fauna Survey Method	6
4. Flora	7
4.1 Vegetation Patterns	7
4.2 Plant Communities	8
4.3 Plant Species Recorded	8
4.4 Threatened Plant Species	9
5. Fauna	9
5.1 Description of Fauna Habitat	9
5.2 Fauna Species recorded in the Study Area	10
6. Threatened Species, Populations and Communities	11
6.1 Classification and Assessment	11
6.2 Presence of Threatened Species, etc.	12
6.3 Migratory Species	17
7. Impact on Flora and Fauna	17
7.1 General Impact	17
7.2 Assessment under Part 3A	17
7.3 Assessment under the EPBC Act	22
8. Conclusion and Recommendations	25
9. References	28
Appendices	
1. Vegetation/Habitat Survey Sheets	A2
2. Plant Species List for the Study Area	A11
3. Animal Species List for the Study Area	A15
4. Bird Survey Sheets	A22
5. Tree Hollow Survey Sheets	A32
Tables	
1. Noxious weeds recorded in the study area	8
2. Summary of tree hollow survey data	9
3. Summary of bird survey data	10
4. List of threatened species for the locality	14
Figures	
1. The Study Area	3
2. Potential line route for grid connection	4
3. Extent of Woodland in the Study Area	18

1. INTRODUCTION

Kevin Mills & Associates Pty Limited was commissioned by Aurecon Australia Pty Limited on behalf of Infigen Energy, who are applying to the Department of Planning under Part 3A of the *Environment Planning & Assessment Act 1979* (NSW) for the development of a wind farm south of Orange on the Central Tablelands of New South Wales. The purpose of this report is to assess the potential impact of the wind farm on flora and fauna. Aurecon Australia is overseeing the preparation of the Environmental Assessment (EA) for the project.

The study and this report have been guided by the Director-General's Requirements contained in the letter from the Department of Planning and dated 19 January 2009. The relevant flora and fauna requirements are set out below:

“Flora and Fauna - the EA must:

- include an assessment of all project components (including the transmission easement through Canobolas State Forest) on flora and fauna and their habitat consistent with the *Draft Guidelines for Threatened Species Assessment* (DEC, 2005), including details on the existing site conditions and quantity and likelihood of disturbance;
- The EA must specifically consider impacts to threatened species and communities listed under both State and Commonwealth legislation that have been recorded on the site and surrounding land, impacts to riparian and/or instream habitat in the case of disturbance of waterways, and to biodiversity corridors. In addition, impact of the project on birds and bats from blade strikes, low air pressure zones at the blade tips, and alteration to movement patterns resulting from the turbines and transmission lines must be assessed, including demonstration of how the project has been sited to avoid and/or minimise such impacts;
- details of how flora and fauna impacts would be managed during construction and operation including adaptive management and maintenance protocols; and
- measures to avoid, mitigate or offset impacts consistent with ‘improve or maintain’ principles. Sufficient details must be provided to demonstrate the availability of viable and achievable options to offset the impacts of the project.”

The relevant recommendations from the Department of Environment and Climate Change (DECC) and contained in a letter to the Department of Planning and dated 8 January 2009 were also considered during the flora and fauna study; these are reproduced below.

“1. Potential Impacts on the Project on Biodiversity

(a) Threatened Species

- (i) In relation to identified Threatened Species, the EA must follow the guidance provided in the document “Threatened Species Survey and Assessment: Guidelines for Developments and Activities – Working Draft” (2004).
- (ii) The EA must include a quantitative risk assessment in relation to the risk of blade strike (or other blade related injuries/fatalities) to avifauna, particularly focusing on risks to Threatened Species.
- (iii) A field survey should be conducted and documented in accordance with the guidelines.
- (iv) Likely impacts on threatened species and their habitat need to be assessed, evaluated and reported on. The EA should specifically report on the considerations listed in Step 3 on the draft guidelines.
- (v) The EA must describe the actions that will be taken to avoid impacts, or to mitigate unavoidable impacts of the project on threatened species and their habitat. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.
- (vi) Step 4 of the draft guidelines requires that where measures to avoid or mitigate are not possible, offset strategies need to be considered.
- (vii) The EA must clearly state whether it meets each of the key thresholds set out in Step 5 of the draft guidelines.

(b) Native Vegetation

The EA needs to address the potential impact on native vegetation; specifically:

- (i) The hectares of native vegetation that will have to be cleared to accommodate the proposal.
- (ii) The floristics of the botanical communities of native vegetation that will need to be cleared.

- (iii) The extent of native vegetation on the site which may be remnant vegetation, protection re-growth or non-protected re-growth as defined by the Native Vegetation Act 2003.
- (iv) The requirement to develop a suitable offset(s) to improve or maintain environmental outcomes for the lawful clearing of native vegetation, in relation to four environmental values: water quality, soils, salinity and biodiversity (including threatened species).
- (v) The general requirements of the Native Vegetation Act 2003, especially in relation to Vulnerable Land.

(c) Biodiversity in general

- (i) In situations where the avoidance of impacts of the project on Threatened species, Flora, Fauna, Endangered Ecological Communities and their associated habits and Native Vegetation is not possible or practical, a description of mitigation measures proposed is required (for example, the strategic siting of infrastructure to avoid impacting on biodiversity). This should include an assessment of the effectiveness and reliability of the proposed mitigation measures.
- (ii) Any residual impacts after the implementation of proposed mitigation measures will require assessment using the "BioBanking Assessment Methodology" (2008). The Proponent should note that DECC may require Biodiversity Credits to be obtained to offset any residual biodiversity impacts."

The main information contained in this report is:

- i. a description of the plant communities, remnant vegetation and fauna habitats on the wind farm site; and potential transmission line route for grid connection;
- ii. lists of the flora and fauna species observed during this study together with relevant previous information;
- iii. an assessment of the potential impact on flora and fauna, including species, populations and ecological communities listed under the New South Wales *Threatened Species Conservation Act 1995* (TSC Act) and New South Wales *Fisheries Management Act 1994* (FM Act), and matters of national environmental significance listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); and
- vi. recommendations to avoid and mitigate potential impacts.

Field surveys in the study area were undertaken by Kevin Mills & Associates in mid-November 2008, late-February 2009 and early October 2010.

2. THE STUDY AREA

2.1 Location

The study area is located on the central tablelands of New South Wales. The wind farm site is located between Forest Reefs in the north, Carcoar in the south-east and Flyers Creek in the west. A proposed transmission line would traverse the Cadia Mine site to the northwest of the wind farm site. The study area is delineated in **Figure 1**, which shows the general layout of the proposed wind farm and the areas particularly targeted during this study.

The primary study area, where the wind farm would be located, extends for about 13 kilometres north to south and about eight kilometres east to west. Infrastructure associated with the wind farm would primarily be located on the ridges, as indicated on **Figure 1**. The study area also includes a substation site and a transmission line route extending from the wind farm to the west and northwest shown in **Figure 2**.

2.2 Topography, Geology and Soil

The study area is located on undulating to moderately steep ridge country at an altitude of approximately 800 – 950 metres. Drainage is to Flyers Creek in the west and the Belubula River in the south. The underlying geology in the north is Tertiary basalt, while in the south the geology is mainly a complex of Ordovician sedimentary rocks. The soils, reflecting the geology, are mostly deep, clayey soils, rocky in some places, with alluvial soils along the valley floors. The basalt country in particular has been extensively cleared for its high value for farming.

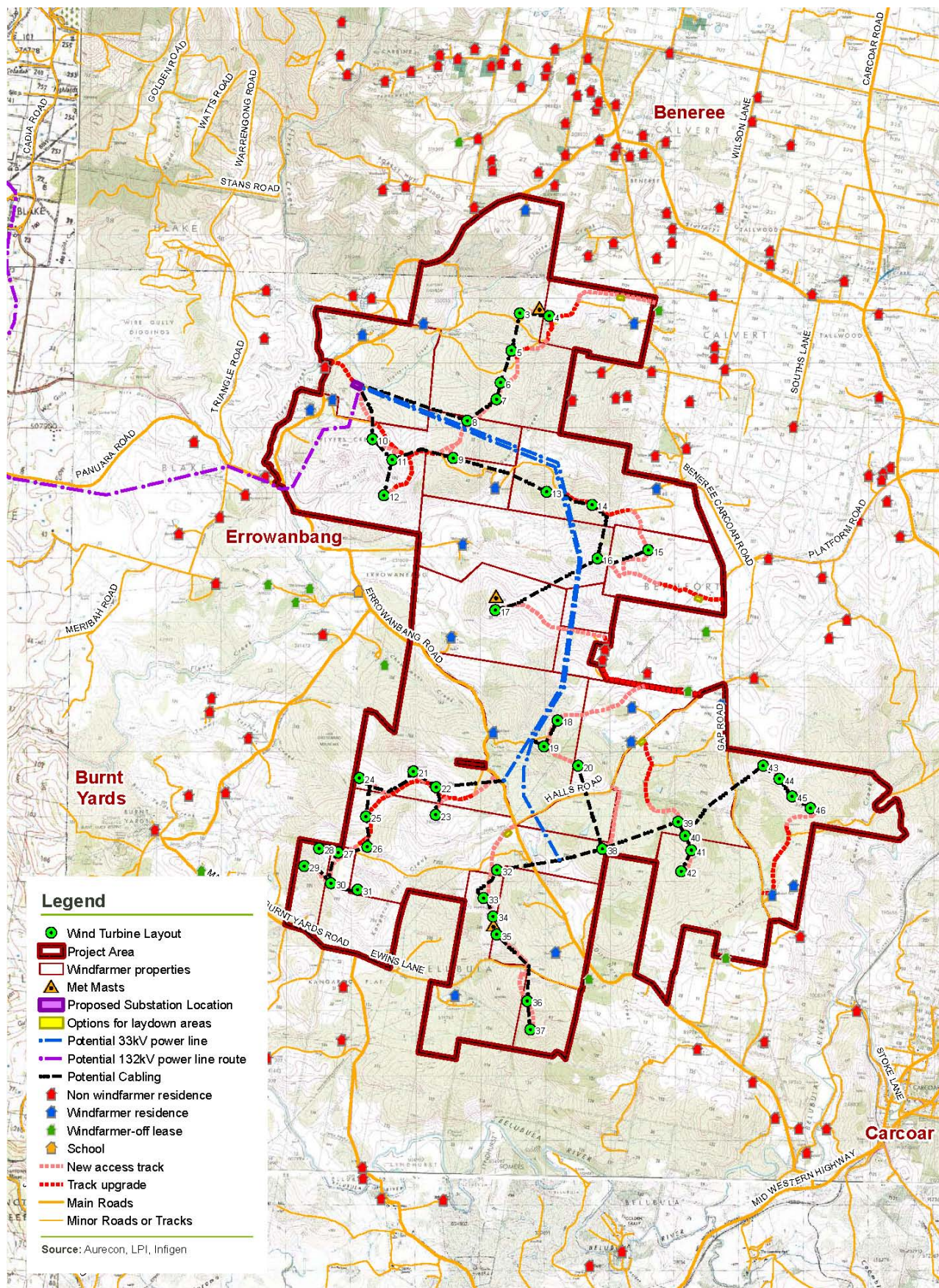


Figure 1. The Study Area

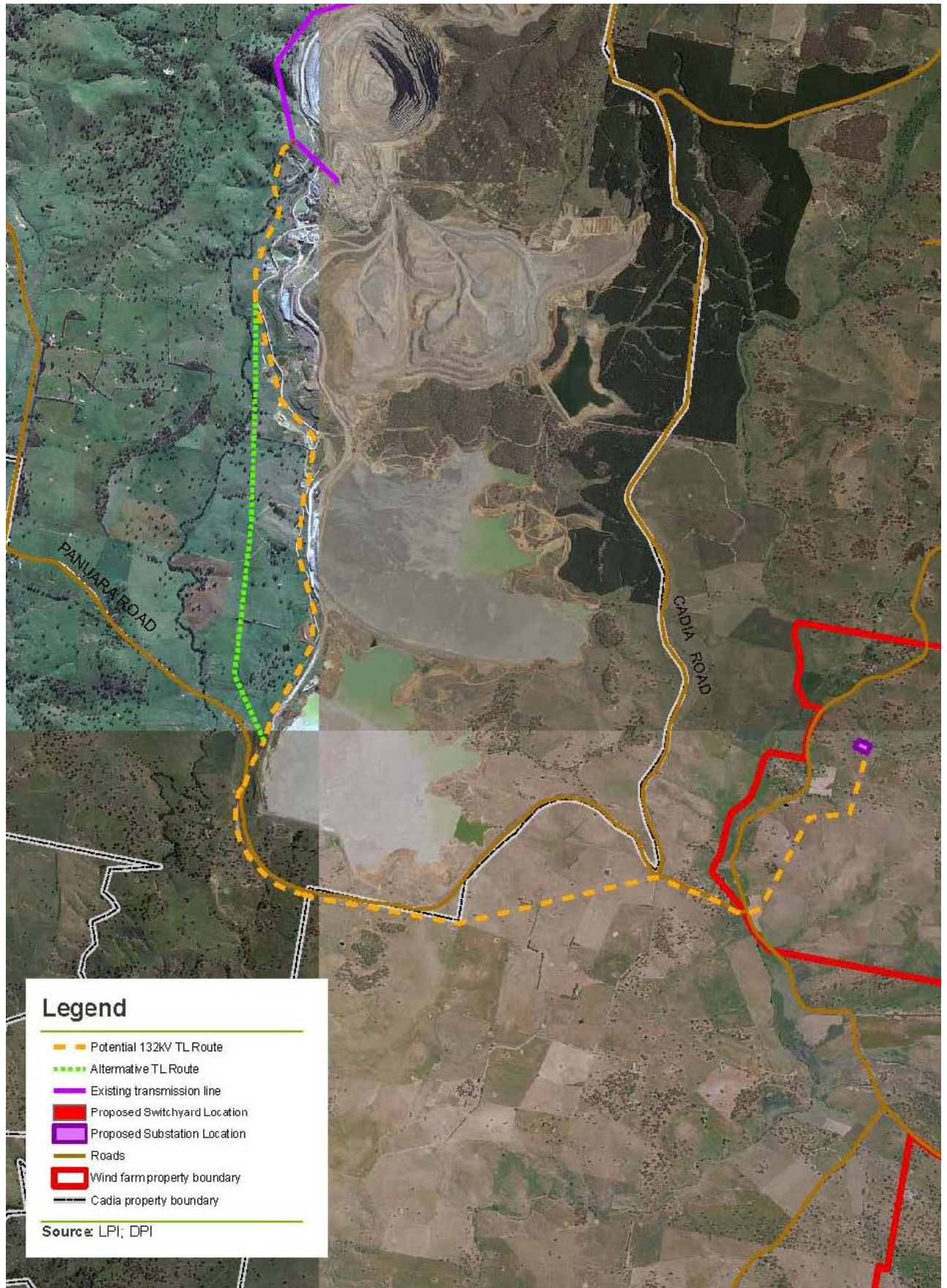


Figure 2. Potential line route for grid connection

2.3 Past and Present Land Use

The land within the study area has been extensively used for stock grazing for many years. Most areas are completely cleared of native vegetation cover, although stands of mature trees are typical of some places. There is very little natural forest or woodland vegetation remaining. Most paddocks have been pasture improved, and some cropping occurs on the more level valley floors. Some patches of woodland occur here and there, mainly in the far southeast part of the area.

3. SURVEY METHODS

3.1 Guidelines for Threatened Species Surveys and Assessment

In 2004, the former Department of Environment and Conservation (now the Department of Environment, Climate Change and Water) published guidelines for threatened species surveys and assessments. Published as a working draft, the guidelines are known as the Threatened Species Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (DEC 2004). Chapter 5, Field Surveys, provides guidance on field survey techniques for detecting threatened species and the level of effort required.

The Guidelines promote “a consistent and systematic approach to the survey and assessment of threatened biodiversity” (p.2-11), but concede that they are not always appropriate or necessary. For example, the document states “Not all the survey methods . . . will be appropriate or necessary in all situations.” (Guidelines, p.8-72). The guidelines also states: “Ideally, surveys would be undertaken during optimal climatic and seasonal conditions and would also consider issues such as migratory species movements, availability of shelter and food resources, and the statistical issues associated with minimising sampling error. In many cases this will not be possible.” (Guidelines, p.8-72)

3.2 Flora Survey Method

Date of Survey: The flora surveys were undertaken in the study area in November 2008, February 2009 and October 2010.

Objectives: The objectives were to classify and describe the vegetation, to record as many as possible of the plant species present, to search for threatened plant species and to assess the potential for threatened plant species and communities to occur in the study area.

Vegetation Classification and Mapping: The vegetation in the study area was classified on the basis of its structure and the name(s) of the dominant plant species in the area, often based upon the tallest stratum (e.g. trees,) using the structural classification system devised by Walker and Hopkins (1990). The vegetation classes within the system include closed forest (rainforest), open forest, woodland, open woodland, isolated trees, shrubland, heathland, grassland, sedgeland and fernland, etc. If well-accepted plant community names were available, these were used to label the communities; e.g. listed endangered ecological communities.

The vegetation was mapped by marking the boundaries of the various vegetation patches directly onto an aerial photograph of the study area. The boundaries were ground-truthed and are reasonably accurate. Three vegetation categories were identified and mapped, namely:

- remnant woodland;
- widely-spaced trees;
- predominantly treeless paddocks.

Survey Design and Technique: In keeping with the requirements of the *Threatened Species Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (DEC 2004), the survey technique combined multiple traverses of the study area with vegetation sampling. The random meander method was also used. The traverses were undertaken on foot and covered the full topographic variation of the study area, the full range of vegetation communities present and areas of potential habitat for threatened plant species.

Vegetation sampling was undertaken as per the Guidelines for survey plots (plant quadrats) to sample stands of woodland in the study area. A vegetation sampling quadrat measuring 20 metres by 20 metres (400m²) was established where the vegetation was considered to be fairly typical or representative of the

woodland patch. A survey sheet was completed to record the following data: plot identification number, date of survey, plot size, plot location (name of property and GPS reading), land tenure, landform, geology and soil type, slope (flat, gentle, moderate, steep), aspect, altitude, the species present in each stratum and an abundance rating for each species. The surveys of the woodland remnants also include a standardised habitat assessment, also recorded on the above survey sheet. **Appendix 1** provides copies of the completed survey sheets.

In the study area generally, the characteristic plant species were recorded, and notes were made on the structure and condition of the vegetation. All plant species observed were recorded. The survey was thorough and undertaken at an appropriate time of the year, so most of the species present would have been detected; however, additional species can almost always be found during longer surveys and in different seasons.

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).

The following definitions are used in this report, these are generally widely accepted in the botanical literature.

- *Forest*: a community of relatively closely spaced trees (projective foliage cover >30%) growing taller than 10 metres.
- *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.
- *Sown Pasture*: where the dominant plants are sown exotic species (>75% cover), usually fertilised land used for grazing (e.g. ryegrass and clover).
- *Cropland*: a species that is sown, usually following ploughing, for commercial harvest (e.g. wheat) or stock feed.

3.3 Fauna Survey Method

Date of Survey: General fauna surveys were undertaken in November 2008, February 2009 and October 2010, at the same time as the flora surveys. These spring and summer times are ideal for surveying fauna. The weather conditions at the time of the surveys were good, with warm temperatures and little wind. Prior to the October 2010 surveys, the region had experienced good rains and the landscape was green with a fresh cover of herbaceous vegetation.

Objectives: The objectives were to describe the fauna habitat, to detect as many as possible of the fauna species present and to survey for and assess the potential for threatened fauna species to occur in the study area. Note that others are undertaking bat surveys on the proposed wind farm site.

Survey Design and Technique: The *Threatened Species Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (DEC 2004) were taken into account when determining what fauna survey techniques and survey effort were appropriate for this study. As mentioned earlier, the Guidelines state that "not all the survey methods detailed [in the Guidelines are] appropriate or necessary in all situations" (*Guidelines*, p.8-72).

All fauna species observed, heard or detected by other means (e.g. signs of presence) during the surveys were identified and recorded. Species were identified by direct observation and call-recognition, and a ground search was conducted for animal scats, tracks, and diggings. The survey results indicate which species were observed during the survey, but should not be regarded as a complete inventory of the species that would occur in the study area; this could be obtained only by a long study spanning all seasons. For this reason, the survey results were supplemented by data from previous surveys nearby and the NSW Wildlife Atlas.

Bird surveys on proposed wind farm sites are particularly important, so that special attention was given to identifying and recording this fauna group. The considerations and procedures set out in the documents titled *Wind Farm and Birds. Interim Standard for Risk Assessment* (AWEA 2005) and *EPBC Policy Statement 2.3. Wind Farm Industry* (DEWHA 2008) were especially noted.

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**.

In this study, the primary aim was to survey for threatened birds as the character of the country within the study area precluded the presence of all other threatened animals known or likely to occur in the locality. The Superb Parrot was especially targeted as were the threatened passerine woodland birds.

A tree hollow survey was undertaken along the ridges where the turbines would be located. The survey involved walking a transect recording all trees with hollows, their species name, dch (measurement of tree size – trunk diameter at chest height) and GPS location. Hollows were divided into trunk and branch hollows and into size classes, i.e. <10 cm, 10-20 cm, and >20 cm.

Nomenclature: The fauna species names in this report are based on the Australian Museum's *The Mammals of Australia* (Strahan 1995), *Australian Bats* (Churchill 1998), *The Taxonomy and Species of Birds of Australia and its Territories* (Christidis & Boles 2008) and *Reptiles and Amphibians of Australia* (Cogger 1992).

4. FLORA

4.1 Vegetation Patterns

The study area is covered in good quality soils that once supported forest to woodland dominated in most places by Yellow Box *Eucalyptus melliodora* and Blakely's Red Gum *Eucalyptus blakelyi*. These forests and woodlands are part of the very extensive community complex known as White Box – Yellow Box – Blakely's Red Gum Woodland (Box – Gum Woodland), that extended along the central tablelands and western slopes of New South Wales. The other key tree species in the area are Bundy *Eucalyptus goniocalyx*, Broad-leaved Peppermint *Eucalyptus dives* and Red Stringybark *Eucalyptus macrorhyncha*. White Box *Eucalyptus albens* is rare on the wind farm site, but grows in the vicinity of the Cadia Mine, not far to the west; for example in the Panuara Road area. These forests and woodlands have been extensively cleared because of the high quality agricultural soils in which they grow. The study area today supports scattered paddock trees and patches of trees, with much of the area being completely treeless. Many public roadsides support stands of trees, often only old trees. There is very little native ground cover in any areas and native shrubs are quite rare. There is very little native understorey vegetation.

4.2 Plant Communities

Most of the remnant trees, patches of trees and occasional patch of native grassland in the area are part of the one plant community, the Yellow Box – Blakely's Red Gum Woodland. As noted above, this is part of a community complex found extensively across central western New South Wales. Large, old trees are all that remain in many places; these paddock trees invariably have an exotic grassland understorey, mostly of improved pasture. Most paddocks have been extensively pasture improved, having been fertilised and sown with exotic species for many years. Common pasture species include the grasses, *Phalaris*, **Phalaris* sp., Ryegrass **Lolium* sp., Barley Grass **Hordeum* sp. and Brome Grasses **Bromus* spp.; all are common throughout the area.

The most common trees are Yellow Box *Eucalyptus melliodora*, Bundy *Eucalyptus goniacalyx* and Blakely's Red Gum *Eucalyptus blakelyi*. Broad-leaved Peppermint *Eucalyptus dives* is scattered across the southern part of the area on soils derived from old sedimentary rocks, where also Red Stringybark *Eucalyptus macrorhyncha* forms occasional stands. On low-lying flats in the south, thickets of Blakely's Red Gum *Eucalyptus blakelyi* grow in patches here and there; these likely originate from a heavy seeding and regeneration of seedlings approximately 20 years ago. In the west, such as on the Cadia Mine site, White Box *Eucalyptus albens* is quite common, while Snow Gum *Eucalyptus pauciflora* and Candlebark *Eucalyptus rubida* grow in a few places. Along the creek at Cadia Mine, River Oak *Casuarina cunninghamiana* is common. Willows *Salix* spp. are common along many creeks and on valley flats.

As noted above, there is little native grassland in the area; small patches occur mostly on rocky sites and road sides. The grassland contains a low diversity of native species, invariably being dominated by Corkscrew *Austrostipa scabra* or Weeping Grass *Microlaena stipoides*. Other typical and relatively common native species include Wallaby Grasses *Austrodanthonia* spp., Swamp Dock *Rumex brownii* and Oxalis *Oxalis perennans*.

A total of nine representative vegetation patches were selected for survey; these were surveyed for vegetation and habitat attributes. The resultant survey sheets are provided in **Appendix 1**. The poor quality of the native grassland is indicated by the results of the vegetation survey plots shown in **Appendix 1**. The understorey in most places is exotic grassland, dominated by pasture species and typical pasture weeds. Some native pasture verging on native grassland occurs in a few small patches across the study area. A vegetation map was prepared and is presented in **Figure 3**. The majority of the study area is improved pasture without trees.

4.3 Plant Species Recorded

A complete list of the plant species recorded is provided in **Appendix 2**. 50 indigenous and 72 exotic (introduced) species were recorded. Most of the native species recorded are grasses and forbs; the number of tree and shrub species is very low, reflecting the intensive nature of the farming and grazing throughout the study area.

Several species declared noxious under the *Noxious Weeds Act 1993* (NSW) in the Upper Macquarie County Council area, including the Shire of Blayney, were observed in the study area; see **Table 1**.

Table 1
Noxious weeds recorded in the study area

Name	Habit	Control Class ¹
<i>Rubus fruticosus</i> sp. agg. Blackberry	Rambling, prickly shrub	4
<i>Onopordium acanthium</i> Scotch Thistle	Prickly herb	4
<i>Nassella trichotoma</i> Serrated Tussock	Tussock grass	4
<i>Hypericum perforatum</i> St John's Wort	Herb	4
<i>Rosa rubiginosa</i> Sweet Briar	Thorny shrub	4

1. Control Class as defined by the *Noxious Weeds Act 1993* (NSW).

4.4 Threatened Plant Species

No threatened plants have been recorded within 20 kilometres of the study area (NSW Wildlife Atlas). No threatened plant species were recorded within the study area in this study. Given the highly disturbed character on the whole area, particularly the ground cover, it seems unlikely that any such species occurs on the wind farm site. Flora studies on the nearby Cadia Mine site over a period of 15 years did not locate any threatened plant species (Western Research Institute 2009).

5. FAUNA

5.1 Description of Fauna Habitat

The fauna habitats in the study area are typical of the rural environment in which the wind farm is located. The landscape is characterised by grazing paddocks with scattered old trees and in the south, off the basalt, there are some patches of woodland. Most of the land supports exotic grassland, including sown pasture, and scattered paddock trees with little tree regeneration. Some patches of native understorey occur but shrubs are virtually non-existent.

Small farm dams are scattered across the area but there are no large wetlands in the area and most watercourses are ephemeral. To the west, about five kilometres away, the Cadia Mine site contains several large artificial settling ponds, while to the east, about 18 kilometres away, is Carcoar Dam.

The most important habitats for fauna are the remnant paddock trees and stands of woodland that provide foraging and breeding sites for birds. Tree hollows are a particularly important resource for many bird species.

Tree hollow surveys

The data from the tree hollow surveys are summarised in **Table 2**. The survey sheets completed for the tree hollow surveys are presented in **Appendix 5**. Living and dead trees were surveyed for hollows. In total, 41 trees on the ridge tops were surveyed and 70 hollows counted. Of these, 36 living trees had at least one hollow, while five dead trees also contained hollows. The average number of hollows per tree was 1.8.

Table 2
Summary of tree hollow survey data

Transect				
Tree species	No. trees	No. hollows	No. hollows/tree	Av. Tree dch¹
Transect 1				
<i>Eucalyptus melliodora</i>	2	9	4.5	89.5 cm
<i>Eucalyptus gonicalyx</i>	1	1	1	53 cm
<i>Eucalyptus blakelyi</i>	2	4	2	105 cm
Dead tree	3	8	2.7	63 cm
All trees	8	22	2.8	79 cm
Transect 2				
<i>Eucalyptus melliodora</i>	4	5	1.3	49 cm
<i>Eucalyptus gonicalyx</i>	2	3	1.5	104 cm
All trees	6	8	1.3	63 cm
Transect 3				
<i>Eucalyptus melliodora</i>	5	5	1	85.6 cm
<i>Eucalyptus gonicalyx</i>	2	2	1	108 cm
All trees	7	7	1	89 cm
Transect 4				
<i>Eucalyptus melliodora</i>	6	8	1.3	95.5 cm
Dead tree	1	1	1	66 cm
All trees	7	9	1.3	91 cm
Transect 5				
No hollows recorded	-	-	-	-

Transect 6

<i>Eucalyptus melliodora</i>	5	14	2.8	78 cm
<i>Eucalyptus goniacalyx</i>	5	8	1.6	72 cm
<i>Eucalyptus albens</i>	2	6	3	93.5 cm
Dead tree	1	1	1	35 cm
All trees	13	29	2.2	74 cm

All Transects

<i>Eucalyptus melliodora</i>	22	36	1.6	82 cm
<i>Eucalyptus goniacalyx</i>	10	14	1.4	78 cm
<i>Eucalyptus blakelyi</i>	2	4	2	105 cm
<i>Eucalyptus albens</i>	2	6	3	93.5 cm
Dead trees	5	10	2	58.4 cm
All live trees	36	60	1.7	83.1 cm

1. dch : trunk diameter at chest height, a measure of tree size.

5.2 Fauna Species recorded in the Study AreaSpecies recorded

The fauna species recorded in the study area have been listed in **Appendix 3**. Also listed in **Appendix 3** are those species recorded in the locality in the NSW Wildlife Atlas and in the study of the Cadia Mine site nearby by Western Research Institute (2009). In total, nine mammals, 86 birds, 6 reptiles and 4 frogs were recorded in the study area during this investigation. A considerably larger number of species have been recorded locally (Western Research Institute 2009); see **Appendix 3**.

Bird Surveys

Targeted bird counts at 23 sites spread throughout the study area recorded 1,292 observations of 57 species over a total observation time of 14.8 hours. The results of these surveys are provided in **Table 3**.

Table 3
Summary of bird survey data

Count No.	Time (mins)	No. species	Height Class (No. of birds)				
			Ground	<10m	10-20m	20-50m	>50m
1	30	13	12	14	12	-	-
2	40	22	34	22	14	2	-
3	30	15	15	18	9	1	-
4	20	8	-	3	17	-	-
5	30	12	26	16	1	2	-
6	20	6	11	1	3	1	-
7	30	15	29	10	8	10	-
8	30	9	5	5	10	3	-
9	55	20	6	9	56	109	2
10	35	16	20	4	32	2	1
11	30	23	29	7	15	34	3
12	55	12	9	-	32	-	2
13	30	12	16	4	18	1	-
14	35	3	-	-	5	4	-
15	30	7	-	9	21	1	-
16	30	10	5	8	7	-	-
17	65	26	77	37	13	4	3
18	45	22	39	9	18	-	2
19	45	22	18	30	24	6	1
20	51	21	43	12	13	7	5
21	50	22	30	19	7	-	1
22	55	12	16	9	5	3	-
23	55	23	20	21	12	1	-
All Sites	886 mins 14.8 hrs	57 -	460 (36%)	267 (21%)	354 (27%)	191 (4.5%)	20 (1.5%)

The results of the bird surveys indicate that of the 1,292 individual bird observations, 85 % were seen below 20 metres in height. This is approximately the height of the tallest trees in the area. Few birds fly higher than 50 metres from the ground, only 1.5 percent of observations. Larger birds of prey are the main birds seen at higher levels.

Avifauna on Wetlands

Large flocks of waterbirds can be an important consideration on wind farm sites, so attention was given to birds on wetlands in the study area. The study area contains numerous small farm dams. There are only a few that are of any substantive size. Two dams on the property *Nullawonga* are somewhat larger. The dam nearest the homestead is particularly attractive to waterbirds. Counts at this dam on 23 and 24 February 2009 recorded the following maximum number of birds:

Australasian Grebe	12
Australian Wood Duck	128
Dusky Moorhen	1
Eurasian Coot	7
Grey Teal	14
Hardhead	2
Hoary-headed Grebe	2
Pacific Black Duck	14
Shoveler	4
Welcome Swallow	7

The nearest large water bodies are the Cadia Mine settling ponds to the west and Carcoar Dam to the east, neither is likely to attract large numbers of waterfowl. The former because these ponds are active settling dams containing contaminated water with no wetland vegetation. The latter because it is a deep water storage dam with minimal valuable wetland habitat.

6. THREATENED SPECIES, POPULATIONS AND COMMUNITIES

6.1 Classification and Assessment

Threatened species, populations and communities in New South Wales are listed on schedules attached to the NSW *Threatened Species Conservation Act 1995* (TSC Act) and NSW *Fisheries Management Act 1994* (FM Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Under the TSC and FM Acts they are classified "endangered", "vulnerable", "critically endangered" or "presumed extinct". Under the EPBC Act, threatened species and communities are classified "extinct", "critically endangered", "endangered", "vulnerable" or "conservation dependent". The EPBC Act also lists "protected migratory species".

The "Threatened Species Assessment Guidelines; the Assessment of Significance", published by the Department of Environment and Climate Change (DECC 2007), state that the applicant/proponent should develop a list of threatened species, populations and ecological communities which may be affected directly or indirectly by the proposed action, development or activity" [and that] "adequate reasons must be provided to show how the list was derived" (p.2, para.6).

In order to develop such a list, the NSW Wildlife Atlas (DECC) was searched for threatened species previously recorded in the local area, i.e. within about 10 kilometres of the study area. Searches were also made of records of those species in other reports and publications. These species have been listed below, in **Table 4**, with the exception of coastal and marine species for which there is obviously no habitat in the study area.

The *Guidelines* state that "a species does not have to be considered as part of the assessment of significance if adequate surveys or studies have been carried out that clearly show that the species does not occur in the study area, or will not use on-site habitats on occasion, or will not be influenced by off-site impacts of the proposal. Otherwise, all species likely to occur in the study area (based on general species distribution information), and known to use that type of habitat, should be considered in the rationale that determines the list of threatened species, populations and ecological communities for the assessment of significance" (DECC 2007; pp.2-3, para.7). The following questions were therefore posed with regard to each threatened species:

Does the species occur in the study area?

Is the species likely to use the on-site habitats on occasion?

Is the species likely to be influenced by off-site impacts of the proposal?

Is the Assessment of Significance required?

6.2 Presence of Threatened Species, etc.

Records of threatened species previously observed in the locality were obtained from several sources, namely the NSW Wildlife Atlas, the study by Western Research Institute (2009) nearby (including previous records) and this study. A few additional species were added to the list for consideration, as these occur widely on the tablelands and may have simply been missed during previous studies.

In order to assess whether each threatened species is likely to occur in or utilise the on-site habitats on occasion, consideration was given to determining the extent to which the study area satisfies the habitat requirements and habitat preferences of the threatened species in question. The frequency of previous records in the NSW Wildlife Atlas and the date of the last reliable record were also taken into account in assessing whether the threatened species are likely to use the on-site habitats. The assessment has been undertaken below, in **Table 4**.

The following threatened species were recorded in the study area during the current investigation in 2008 to 2010. Additional species listed on and in the vicinity of the Cadia Mine site (Western Research Institute 2009) are also listed below.

Superb Parrot

The Superb Parrot was observed several times in the study area, mainly during the breeding season in November 2008; see below.

<u>Location</u> (WGS 84)	<u>Observation</u>	<u>Date</u>
55 0692566 6290092	4 birds	Nov.2008
55 0691486 6290704	3 birds seen several times	Nov.2008
55 0689207 6289194	3 birds	Nov.2008
55 0693630 6384395	1 bird	Nov.2008
55 0692688 6283073	6 birds	Nov.2008
55 0695678 6285166	5 birds	Feb. 2009
55 0690454 6290526	3 birds	07 Oct. 2010
55 0689711 6289588	7 birds	07 Oct. 2010

This parrot is primarily a ground feeder, eating grass seeds and other herbaceous plants. Also eaten are fruit, nectar and insects; flowering or fruiting trees are also visited for foraging. The Orange region is at the north-eastern edge of a core breeding area that extends from Cowra in the north and Yass in the south (Webster & Ahern 1992). One landowner stated that the birds were regularly observed on his land. Although breeding of this species was not confirmed during the surveys, breeding may be expected to occur in the area. The key habitat component is the availability of tree hollows; these are essential for breeding.

Diamond Firetail

The Diamond Firetail was observed twice in February 2009, at the locations set out below.

<u>Location</u> (WGS 84)	<u>Observation</u>	<u>Date</u>
55 0693986 6283555	10 birds	24 Feb. 2009
55 0691768 6290514	2 birds	25 Feb. 2009

This woodland bird is generally a bird of the tablelands and western slopes of NSW, seldom occurring on the coast. The species is mainly a ground-feeder and occurs in pairs (summer) or small flocks. Birds forage widely across open country, particularly in the cooler months. Nests are often in the dense foliage of a shrub or sapling, and also in low trees.

Varied Sittella

The Varied Sittella was observed twice in February 2009, at the locations set out below.

<u>Location</u> (WGS 84)	<u>Observation</u>	<u>Date</u>
55 0694819 6288143	2 birds	23 Feb. 2009
55 0692230 6290043	3 birds	24 Feb. 2009

The Varied Sittella is widespread in Australia, found in most forest and woodland types. Birds usually forage high in a tree and often on dead branches. Birds are expected to be visitors to the woodland patches in the study area.

Little Eagle

This bird of prey was observed flying over the study area in February 2009. The species has also been recorded on the Cadia Mine site.

Additional recorded threatened species, Cadia Mine site and vicinity (Western Research Institute 2009)

Swift Parrot	Little Lorikeet
Brown Treecreeper	Speckled Warbler
White-fronted Chat	Scarlet Robin
Flame Robin	Squirrel Glider

Although some of these species no doubt occur on the wind farm site occasionally, the critical habitat elements required by the species are mostly absent from the area. The Cadia mine site and the surrounding land support extensive areas of forest and woodland, and are quite different to the land on which the wind farm is proposed to be located

Table 4.
List of threatened species for the locality

Species	TSC Act1	EPBC Act1	Habitat Requirements/Preferences, etc.	Potential presence in the study area (Recorded/High / Medium / Low)
<u>Populations</u>				
No endangered populations occur in the locality.				
<u>Critical Habitat</u>				
No critical habitat occurs in the locality.				
<u>Ecological communities</u>				
White Box Yellow Box Blakely's Red Gum Woodland	E	E	Remnants of this community occur extensively across the Central Tablelands and further afield.	Recorded. The trees and woodland stands in the area are mostly part of this community complex.
<u>Threatened Plants</u>				
None recorded within 20 km of the study area.				
<u>Threatened Mammals</u>				
Koala <i>Phascolarctos cinereus</i>	V	-	Koalas occur in eucalypt forest and woodland containing their preferred feed tree species, i.e. <i>Eucalyptus tereticornis</i> , <i>E. microcorys</i> , <i>E. punctata</i> , <i>E. viminalis</i> , <i>E. camaldulensis</i> , <i>E. albens</i> , <i>E. haemastoma</i> , <i>E. signata</i> , <i>E. populnea</i> and <i>E. robusta</i> . Where Koalas occur, one or more of these species is often dominant or prominent. Because so much native vegetation in NSW has been cleared, Koalas now occur in marginal habitat.	Low. Wildlife Atlas record from northwest of Blayney, about eight kilometres east of study area. Potential food trees present.
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	V	V	Quolls live in a wide variety of habitats, e.g. rainforest, eucalypt forest, woodland and coastal heath. Their diet consists of medium sized mammals, birds, small mammals and carrion. They have a large home range, 1287-1452 ha for males and 614-1067 ha for females (Edgar & Belcher 1995). Dens are in hollow logs, tree hollows, caves and crevices. Usually terrestrial.	Low. NSW Wildlife Atlas record east of Carcoar, about 12 km from study area. Suitable habitat probably not present.
Squirrel Glider <i>Petaurus norfolcensis</i>	V	-	Squirrel Gliders have highly specialised habitat requirements. They inhabit open, dry eucalypt forest and woodland, and are generally absent from closed and/or moist forest. In coastal areas, they occur in Blackbutt - Bloodwood forest with a heathy understorey, e.g. of wattles and banksias, Smooth-barked Angophora – Blackbutt woodland and forest, and some wetter forest types along creeks. In southern coastal NSW, they occur in Bangalay, Blackbutt and Spotted Gum. They need tree hollows for use as refuges and nest sites. Banksias and wattles provide important food resources. The species has a home range of 20-30 ha.	Low. Wildlife Atlas record well to the southwest of Orange, also recorded from Cadia area (Western Research Institute 2009). Suitable habitat probably not present.

**Table 4. cont...
List of Threatened Species for the Locality**

Species	TSC Act1	EPBC Act1	Habitat Requirements/Preferences, etc.	Potential presence in the study area (Recorded/High / Medium / Low)
Threatened Birds				
Brown Treecreeper <i>Climacteris picumnus</i>	V	-	The Brown Treecreeper is an inland species that occurs in eucalypt woodland, preferably open woodland, without dense shrubs. They forage on tree trunks and on the ground among fallen and leaf litter. They nest in tree hollows.	Moderate. Recorded nearby to the west, Cadia area (Western Research Institute 2009).
Diamond Firetail <i>Stagonopleura guttata</i>	V	-	The Diamond Firetail occurs throughout south-eastern Australia mostly in inland areas. The species generally inhabits eucalypt woodlands forest and mallee where there is a grassy understorey and also occurs in grassland.	Recorded. Observed in the study area.
Flame Robin <i>Petroica phoenicea</i>	V	-	The robin is moderately common throughout the tablelands. Birds tend to move to lower altitudes in winter when they can be seen in very open country.	Moderate. Recorded in the Cadia area (Western Research Institute 2009).
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	V	-	Gang-gang Cockatoos mainly occur in eucalypt forest, where they feed on eucalypt fruit and wattle seed. They nest in large old trees with hollows. The species is nomadic, with some seasonal movements, as well, as the cockatoos wander over wide areas in response to the seasonal availability of food.	Moderate. Relatively common throughout the Central Tablelands region.
Hooded Robin <i>Melanodryas cucullata</i>	V	-	The Hooded Robin occurs throughout Australia mainly in inland areas. This bird inhabits a wide range of woodlands, shrublands and forest, in particular open woodland with some shrubs and dead timber.	Moderate. A woodland bird that probably occurs in the locality.
Little Eagle <i>Hieraaetus morphnoides</i>	V	-	The Little Eagle is widespread in Australia, inhabiting a very wide range of habitats. Pairs range over a wide area and nest in a tall tree within a stand of trees.	Recorded. Observed during this study, and reported from Cadia area (Western Research Institute 2009).
Little Lorikeet <i>Glossopsitta pusilla</i>	V	-	The Little Lorikeet is widespread in eastern and southern Australia, inhabiting most treed areas. Nests in tree hollows.	Low. Recorded in the Cadia area (Western Research Institute 2009).
Regent Honeyeater <i>Xanthomyza phrygia</i>	E	E	Regent Honeyeaters occur in temperate eucalypt woodland and open forest, in wooded farm-land and in urban areas with mature trees. They prefer areas with large trees, many flowering trees and a tall shrub layer. They are wide ranging and highly nomadic.	Low. Previous observation reported by Cenwest (2005). A rare visitor to the region.
Scarlet Robin <i>Petroica boodang</i>	V	-	The robin is moderately common throughout the tablelands. Birds tend to move to lower altitudes in winter when they can be seen in very open country.	Moderate. Recorded on Cadia site (Western Research Institute 2009).

Table 4. cont...
List of Threatened Species for the Locality

Species	TSC Act1	EPBC Act ¹	Habitat Requirements/Preferences, etc.	Potential presence in the study area (Recorded/High / Medium / Low)
Speckled Warbler <i>Chthonicola sagittata</i>	V	-	Habitat Requirements/Preferences, etc. The Speckled Warbler is found in south-eastern Australia and is mainly an inland bird. This species inhabits woodlands with a grassy understorey, often where there is a sparse shrub cover. Nests are made on the ground.	Moderate. A woodland bird that probably occurs in the locality. Recorded on Cadia site. (Western Research Institute 2009).
Superb Parrot <i>Polytelis swainsonii</i>	V	V	This parrot occurs throughout the western slopes of NSW, onto the edges of the tablelands of NSW, and into central Victoria. The breeding areas are in the central to southern part of its range. The orange area is on the eastern edge of a core breeding area. Birds disperse widely from the breeding areas outside the breeding season (September to January). Hollows in trees are essential for breeding.	Recorded. Observed during this study.
Turquoise Parrot <i>Neophema pulchella</i>	V	-	Turquoise Parrots inhabit "woodlands, open forest and timbered grasslands on mountain slopes, ridges and along watercourses", favouring "the edges of woodland adjoining open grassland, or timbered ridges and tree-lined creeks that traverse farmland" (Forshaw 1981). They forage on the ground for seed, usually in pairs or small groups. After breeding, they disperse from the woodlands into more open country.	Moderate. Previously recorded in the locality Cenwest (2005).
Swift Parrot <i>Lathamus discolor</i>	E	E	The Swift Parrot in a non-breeding, winter visitor to NSW; the species only breeds in Tasmania. Birds are highly mobile and appear in a region irregularly, depending upon the availability of flowering trees.	Low. Recorded in the Cadia area (Western Research Institute 2009).
Varied Sittella <i>Daphoenositta chrysoptera</i>	V	-	The sittella is widespread in Australia, found in most forest and woodland types. Birds forage in the tree tops, often on dead wood. Tiny nests are made in trees.	Recorded. Observed during this study.
White-fronted Chat <i>Epthianura albifrons</i>	V	-	The chat is a ground bird, usually found in and around wetlands, including coastal saltmarsh and inland areas.	Moderate. Recorded in the Cadia area (Western Research Institute 2009).

1. V = vulnerable, E = endangered, - = not listed.
 Species in **bold** were recorded in this study.

6.3 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).

Many listed internationally protected migratory species occur in the locality of the wind farm. Such species include all diurnal birds of prey (e.g. Nankeen Kestrel) and waterfowl (i.e. native ducks), species that are not threatened in Australia and are in some cases very abundant. The important sites for migratory species in Australia are large areas of habitat where these species congregate, such as extensive wetlands. Some of these species occur on the site from time to time, but there is no important habitat on the site for such species and the habitat on the site does not support an ecologically important proportion of a population of such species.

7. IMPACT ON FLORA AND FAUNA

The assessment of the potential impact of the proposed wind farm must be considered having regard to those matters set out in the Director-General's Requirements, as provided in **Section 1**. The relevant matters for flora and fauna are discussed below.

7.1 General Impact

The landscape in which the Flyers Creek Wind Farm is proposed to be located is almost totally cleared of its original woodland vegetation. The great majority of the wind farm and its ancillary infrastructure would be located on the ridgetops of grazing paddocks supporting exotic grassland, much of which is improved pasture with few to no native trees other than scattered trees. The impact on local flora and fauna for the majority of the development will be negligible.

There are some stands of woodland, mainly in the south that can be avoided through detailed layout design. Some trees will inevitably be removed in a few places. The habitat value of paddock trees has been stressed above. The exact loss of trees cannot be quantified at this time as the location of infrastructure, particularly tracks and cable routes, has not been finalised. With careful routing of tracks and cables, and micro-siting of towers, it is possible to minimise the loss of trees; a recommendation dealing with this matter is provided below.

7.2 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 *Guidelines for Threatened Species Assessment* identify the following objectives with 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 Conservation Act 1999* (Commonwealth); these matters are not listed under state legislation, although there is considerable overlap in the species and communities that are listed. An assessment under the Commonwealth Act is provided in the next section of the report.

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 is 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 from the Part 3A *Guidelines* as set out above.

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 area 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 the development application. **Section 3** describes the survey methods employed in the study. The known and potential threatened species in the locality are discussed in **Section 6.2**.

Step 2 – Field Survey and Assessment

Field surveys were undertaken in the study area in mid-November 2008, late-February 2009 and early October 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 **Sections 4 and 5** of this report. The assessment of the survey results, particularly in regard to the presence of threatened species, etc. are provided in **Sections 4 and 5**. All known or potential threatened species and communities are discussed in **Section 6**.

Step 3 – Evaluation of Impact

The impact of the proposed development is assessed under several key headings below; see also **Sections 6 and 7**.

Threatened Plant Species

The surveys of the study area did not find any threatened plant species and none are expected to be occur there. The highly modified land, much of which is pasture improved with little native vegetation, and the exotic grassland cover of most areas, precludes the likelihood of threatened plants occurring in the study area. No such species have been recorded locally.

Threatened Animal Species

Several threatened woodland birds were found in the study area and a few others no doubt occur there from time to time. Woodland is the most important habitat for these species, as well as hollow-bearing trees. The impact on these species is not likely to be significant, as long as woodland is avoided and removal of hollow-bearing trees is minimised. The loss of a few trees containing hollows is not likely to be detrimental to the Superb Parrot, as long as appropriate measures are taken in the design and construction of the wind farm such that tree loss is minimized. Observations on site indicate that this is achievable.

Threatened Communities

Most of the woodland remnants are part of the Yellow Box - Red Gum listed endangered ecological community. These can be avoided through appropriate layout of the project. The quality of the occasional patches of native grassland, that was originally part of the woodland, is low to very low. This grassland exhibits low native plant species diversity and is dominated by one or two grasses. Stands of woodland are quite rare in the area; see **Figure 3**.

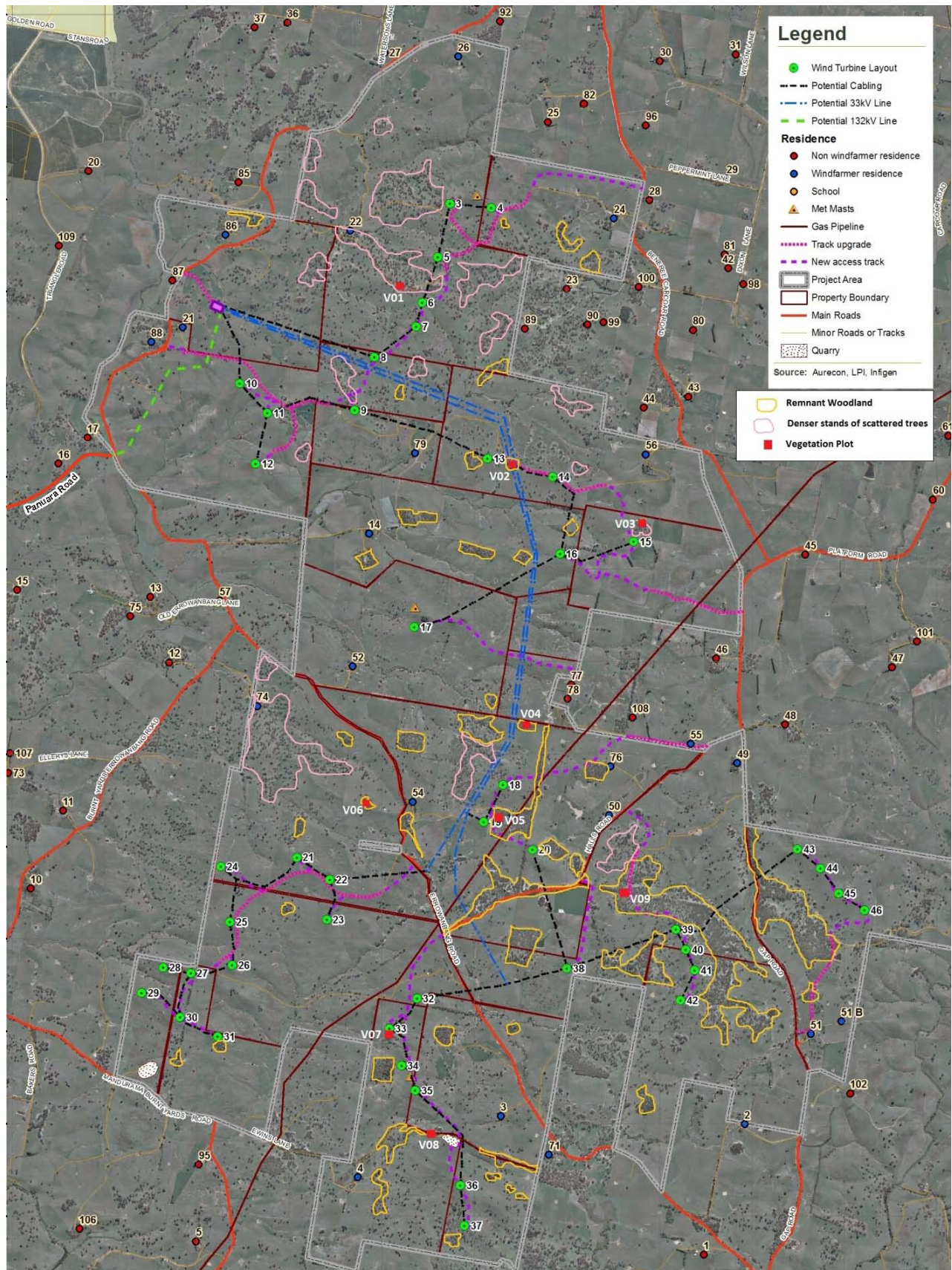


Figure 3. Extent of Woodland in the Study Area

Step 4 – Avoid, mitigate and then offset

As noted elsewhere, careful design of the project can be used to avoid impacting on patches of remnant woodland and stands of hollow-bearing trees. The development can 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 a consequence of the inevitable loss of some trees, a recommendation for offsetting is made below. An assessment of woodland and native grasslands, which may be impacted by construction activities, is described in more detail in Section 7.3. In general, there is almost no native grassland in the area and areas of woodland were found to have an exotic grassland understorey. It is estimated that the greatest loss of native tree vegetation, some of which has a native understorey, is about 1.1 hectares.

Step 5 – Key thresholds

The *Guidelines* require justification of the preferred option based on the following. These issues have been addressed in greater detail earlier in this report.

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 will not diminish biodiversity values in the area. The land affected is mostly highly modified from its original character. No wetlands or watercourses will be affected and no stands of woodland will be modified or removed. A recommendation made later aims to improve biodiversity values in the area.

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 of a threatened species known or likely to occur in the area. At most, some trees will be removed, but no woodland will be removed. The loss of a few hollow-bearing trees is not likely to reduce the long-term viability of a local population of a threatened species. The removal of some trees is not likely to reduce the long-term viability of an endangered community; i.e. Box-Gum Woodland. There are no endangered populations 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 primarily located on the ridgetops of paddocks that have mostly been cleared of their original natural vegetation and habitats. The wind farm is not likely to accelerate the extinction of any species, or ecological community or place any such species or community at risk of extinction. There are no endangered populations in the area impacted by the wind farm development.

whether or not the proposal will adversely affect critical habitat.

There is no declared critical habitat within or in the vicinity of the development areas.

7.3 Assessment under the EPBC Act

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 must be referred to the Commonwealth Minister if the action has, will have, or is likely to have a significant impact on matters of national environmental significance. In addition to setting out "significant impact criteria" for the various matters of national environmental significance, e.g. endangered species, vulnerable species, endangered ecological communities and listed migratory species, the *Guidelines* provide the following important definitions.

"A *significant impact* is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on matters of national environmental significance."

"To be *likely*, it is not necessary for a significant impact to have a greater than 50% chance of happening, it is sufficient if a significant impact on the environment is a real or not remote chance or possibility."

"*Population*, in relation to critically endangered, endangered or vulnerable, threatened species, means:

- a geographically distinct regional population, or collection of local populations; or
- a regional population, or collection of local populations occurring within a particular bioregion."

"An *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal,
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species' range.

"*Habitat critical to the survival of a species or ecological community*" refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community."

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act.

The Superb Parrot is the only nationally listed threatened species known to occur in the study area. The remnants of the Yellow Box woodland in the study area is part of the White Box Yellow Box Blakely's Red Gum Woodland complex, listed as a threatened community. The impact of the proposed wind farm on this species and community is assessed below by applying the significant impact criteria for the vulnerable species and the endangered ecological community. The impact on listed migratory species has also been assessed below, by applying the significant impact criteria for migratory species.

*Significant Impact Criteria for **Vulnerable Species***

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

- lead to a long-term decrease in the size of an important population of a species;
- reduce the area of occupancy of an important population;
- fragment an existing important population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of an important population;
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;
- introduce disease that may cause the species to decline; or
- interfere substantially with the recovery of the species.

Impact of the Proposed Wind Farm on the Superb Parrot

The critical habitat components for the Superb Parrot are tree hollows that are of a size that provide breeding sites. As noted elsewhere, measures can be taken to minimize the loss of hollow-bearing trees. Such trees are common across this landscape, but any loss should be avoided as such trees take a long

time to be replaced. In this area, trees are mostly not replaced when they die or are removed so in the long term tree numbers gradually decline. The loss of a few trees containing hollows is not likely to cause any of the above impacts, as long as appropriate measures are taken in the design and construction of the wind farm such that tree loss is minimized. Observations on site indicate that this is achievable.

It is concluded that the development of the proposed wind farm, considering all of its components, is not likely to “adversely affect habitat critical to the survival of a species” (i.e. tree hollows), and therefore it will not have a significant impact on the Superb Parrot.

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 Proposed Wind Farm on White Box Yellow Box Blakely's Red Gum Woodland

The assessment of the listed community involved field observation and sampling of the vegetation at various woodland sites. Attention was particularly given to the investigation of sites supporting woodland and native grassland. Each area was assessed according to the procedures set out in the DEH (2007) document, to determine if the vegetation met the criteria for the listed woodland and derived grassland community.

The above assessment found that almost no areas met the minimum criteria for the listed White Box - Yellow Box - Blakely's Red Gum Woodland and Derived Grassland community. There is almost no native grassland in the whole area and those areas of woodland were found to have an exotic grassland understorey. The woodland and the trees are of conservation value, but few sites meet the criteria for the listed community. As noted above, stands of woodland can be readily avoided by the proposed wind farm.

It is concluded that the proposed wind farm will not have any of the above impacts upon the White Box - Yellow Box - Blakely's Red Gum Woodland and Derived Grassland listed community.

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 Roadworks on Listed Migratory Species

The proposed wind farm is not likely to have a significant impact on listed migratory species. There is no "important habitat" in the area for such species and the habitat in the vicinity of the wind farm is not likely to support an ecologically important proportion of a population of such species. This conclusion is reached because listed migratory species are only present in small numbers and do not congregate in large numbers.

Conclusion, EPBC Act

In our opinion, the proposed wind farm is not likely to have a significant impact on matters of national environmental significance listed under the *Environment Protection and Biodiversity Conservation Act*. Referral to the Commonwealth Minister for the Environment for assessment and approval is therefore not warranted.

8 CONCLUSION AND RECOMMENDATIONS

Summary of Findings

This report provides a description of the flora and fauna occurring on the proposed Flyers Creek Wind Farm where it is proposed to construct wind turbines and associated access tracks and cabling routes (overhead and buried) and an electrical substation. 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.

The study determined that the wind farm proposal is not likely to have a significant impact upon listed threatened species, populations or communities. The area does support several threatened woodland birds and remnants of an endangered ecological community. The key habitats for the species are woodland and trees with hollows. The wind farm can be constructed without removing stands of woodland and tree removal can be minimised by careful layout design.

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. Some of the woodland in the area is likely to be part of the listed White Box – Yellow Box – Blakely's Red Gum and Derived Grasslands community.

Woodland that meets the criteria established by the Commonwealth for that community 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.

Recommendations for Avoiding Impact and for Mitigation

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

- i) The principal way in which the impact of the wind farm can be minimised is by micro-siting the facilities to avoid removing woodland and trees. It is recommended that an ecologist be involved in determining the routing of access tracks and cable routes where tree removal may be involved. It is further recommended that where towers may involve tree removal that an ecologist also be involved in site selection to retain valuable habitat trees.
- ii) It is recommended that priority be given to retaining hollow-bearing trees because of their high habitat value and inability to replace them in the short term.
- iii) It is recommended that, where feasible, trees to be removed are cut down outside the breeding season of most fauna species. It is also recommended that a register of all tree removal be maintained, including details of tree locations, type, size and numbers. This information is to be reviewed by an ecologist for assessing the adequacy of any offset relating to tree clearing.
- iv) Several small creeks would be crossed by access tracks and cable routes. It is recommended that particular care be taken at these locations to avoid erosion and the movement of soil into watercourses.
- v) 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.
- vi) As an offset for removing trees (the maximum area is estimated at no more than 1.1 hectares), it is recommended that a suitable stand or stands of woodland be fenced from grazing and allowed to regenerate. The location of the woodland stand(s) should be determined in consultation with an ecologist and the extent of any clearing should be related to the extent of the offset area adopted.
- vii) Weed control on the properties is not the responsibility of the operator or contractors associated with the wind farm. However, measures shall be implemented to ensure that the construction phase activities of the proposed wind farm, does not exacerbate any invasive weeds by spreading to new locations 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.
- viii) The construction phase should be monitored by a qualified environmental auditor in accordance with a Construction Environmental Management Plan. 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.
- ix) Large rock outcrops should be avoided, because they provide valuable habitat for reptiles and other native animals; in a largely 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.
- x) Many kilometres of buried cable will be installed throughout the wind farm site to link turbines to the wind farm substation. 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 satisfactorily revegetated.
 - The property owners and/or relevant government authority should be contacted to identify a suitable cover crop for sites requiring seeding to accelerate revegetation.

- xi) Steps can be taken to minimise the potential to impact on birds of prey, i.e. minimise the probability of 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 on site access tracks 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 navigation as required by government authorities, to minimise attracting 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.
- xii) Prior to the beginning of the construction phase of the project, a field survey for the Superb Parrot should be undertaken by a qualified biologist. The following methods should be employed in this survey.
- The survey must be carried out in the breeding season of the parrot (i.e. September to December).
 - Local land owners shall be interviewed to gain information about where the parrots have been seen, particularly in the current season.
 - General observations in the areas where the parrots were seen on previous visits should be carried out to identify any areas where the parrots are present in that season.
 - The targeted surveys will be carried out along those ridges and other places where trees may be removed by the wind farm infrastructure.
 - Where Superb Parrots are observed in the target areas, they will be intensively studied to determine if they are nesting in the trees that may be removed. This will include watching parrot activity to determine if nesting is occurring (e.g. the sex of birds in flocks and attempting to follow parrots to nest trees).
 - If nest trees are located in the target area, these trees will be documented, marked and discussions with the DECCW undertaken as to the mitigation measures that should be undertaken.
 - A report will be furnished to the DoP for forwarding to the DECCW, outlining the studies undertaken and the results of those studies, including any consultation with DECCW during the study period.
- xiii) Monitoring the impact of blade-strike on birds and bats should be undertaken following completion of the wind farm. The monitoring methods to be utilised should be discussed with the DECCW before they are commenced.
- xiv) No large dams should be constructed within one kilometre of turbines.
- xv) If trees and other plants are planted around buildings and other facilities, then ideally these should be locally indigenous species.
- xvi) 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.
-

9. REFERENCES

- AWEA (2005). Wind Farms and Birds: Interim Standards for Risk Assessment, Australian Wind Energy Association Report, July.
- Baines, J. (1981). *Australian Plant Genera*. The Society for Growing Australian Plants, Surrey Beatty & Sons Pty Ltd, NSW, 406p.
- Cenwest (2005). Cadia East Study Area. Terrestrial Vertebrate Fauna Assessment, February.
- Christidis, L. & Boles, W. E (2008). *Systematics and Taxonomy of Australian Birds*. CSIRO Publishing, Melbourne.
- Churchill, S. (1998). *Australian Bats*. Reed New Holland, Sydney, 230p.
- Cogger, H. (1992). *Reptiles and Amphibians of Australia*. Reed, Sydney, revised ed., 775p.
- Commonwealth of Australia (1999). *Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth Government, Canberra.
- DEWHA (2008). EPBC Act Policy Statement 2.3. Wind Farm Industry. Depart of the Environment, Water, Heritage and the Arts.
- Edgar, R. and Belcher, C. (1995). Spotted-tailed Quoll. In *The Mammals of Australia*. R. Strahan (ed.). The Australian Museum Trust and Reed Books, Sydney, pp.67-68.
- Forshaw, J. M. (1981). *Australian Parrots*. Lansdowne Editions, Melbourne, 312p. Second edition.
- Harden, G. (ed.) (1992-2002). *Flora of New South Wales. Volumes 1 - 4*. Royal Botanic Gardens/University of NSW Press, Sydney. incl. revised editions.
- NSW Department of Environment and Climate Change (DECC). NSW Wildlife Atlas. Computer database of species records, various contributors, periodically updated.
- DEC (2004). *Threatened Species Survey and Assessment: Guidelines for developments and activities* (working draft), New South Wales Department of Environment and Conservation, Hurstville, NSW.
- NSW Department of Environment and Climate Change (DECC) (2007). *Threatened Species Assessment Guidelines; the Assessment of Significance*. DECC, Sydney South, August, 12p.
- New South Wales (1979). *Environmental Planning & Assessment Act 1979*. NSW Government, Sydney.
- New South Wales (1993). *Noxious Weeds Act 1993*. Government Printer, Sydney.
- New South Wales (1994). *Fisheries Management Act 1994*. NSW Government, Sydney.
- New South Wales (1995). *Threatened Species Conservation Act 1995*. NSW Government, Sydney.
- New South Wales (2003). *Native Vegetation Act 2003*. NSW Government, Sydney.
- Richardson, F. J., Richardson, R. G. & Shepherd, R. C. H. (2006). *Weeds of the South-east*. The authors, 438p.
- Strahan, R. (1995). *The Mammals of Australia*. Australian Museum/Reed Books, Sydney, 756p.
- Walker, J. & Hopkins, M. (1990). Vegetation. In *Australian Soil and Land Survey, Field Handbook*, McDonald, R., Isbell, R., Speight, J., Walker, J. & Hopkins, M. (eds). Inkata Press, Melbourne, 2nd ed., pp.58-86. First Published 1984.
- Webster, R. & Ahern, L. (1992). Management for Conservation of the Superb Parrot (*Polytelis swainsonii*) in New South Wales and Victoria. November.
- Western Research Institute & Resource Strategies (2009). Cadia East Project. Appendix A. Vertebrate Fauna Assessment. For Cadia Holdings Pty Limited, Orange, April.

* * * * *

Appendices

1. Vegetation/Habitat Survey Sheets	A2
2. Plant Species List for the Study Area.....	A11
3. Animal Species List for the Study Area.....	A15
4. Bird Survey Sheets	A22
5. Tree Hollow Survey Sheets.....	A32

Appendix 1

Vegetation/Habitat Survey Sheets

Vegetation/Habitat Survey Form		Kevin Mills & Associates	
Site Name: Flyers Creek		Plot No. V01 Plot Size.: 20m x 20m (400m ²)	
Location: Masters Property "Wallaby"		Photo: yes	
Date: 11.11.08		Community: Yellow Box Woodland	
GPS (plot centre): 55 0692203 6290080 (WGS 84)		Soil: Brown, clayey and rocky.	
Land Tenure: Freehold		Geology: Mafic volcaniclastics, volcanic conglomerate, siltstone	
Altitude: 870 metres		Aspect: North	
Slope: Gentle		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	
<i>Austrodanthonia racemosa</i>	1	<i>Acetosella vulgaris</i>	1
<i>Austrostipa scabra</i>	5	<i>Arctotheca calendula</i>	1
<i>Bothriochloa macra</i>	1	<i>Bromus diandrus</i>	1
<i>Crassula sieberiana</i>	1	<i>Carthamus lanatus</i>	5
<i>Einadia nutans</i>	1	<i>Erodium cicutarium</i>	1
<i>Hydrocotyle laxiflora</i>	1	<i>Hordeum</i> sp.	2
<i>Oxalis perennans</i>	1	<i>Hypochaeris radicata</i>	1
<i>Rumex brownii</i>	1	<i>Lolium</i> sp.	2
Exotics		<i>Picris hieracioides</i>	1
<i>Trifolium glomeratum</i>	1	<i>Poa bulbosa</i>	1
<i>Trifolium subterraneum</i>	1	<i>Bromus hordeaceus</i>	2
<i>Vulpia muralis</i>	1		1
Dead Trees: Yes			
Mistletoes: No			
Tree species: <i>Eucalyptus melliodora</i> , <i>Eucalyptus goniacalyx</i>			
Shrub cover: No			
Groundcover: Exotic grassland/native pasture.			
Tree hollows: Uncommon			
Rock outcrops: Minor			
Watercourse/Dams: No			
Termite mounds: No			
Ground debris: Uncommon			
Special features/notes: Large old <i>E Eucalyptus melliodora</i> stand.			



Vegetation/Habitat Survey Form		Kevin Mills & Associates	
Site Name: Flyers Creek - Hillview		Plot No. V06 Plot Size.: 20m x 20m (400m ²)	
Location: Hillview		Photo: yes	
Date: 11.11.08		Community: Exotic grassland	
GPS (centre): 55 0691878 6284439 (WGS 84)		Soil: Dark brown, clayey, rocky	
Land Tenure: Freehold		Geology: Mafic volcaniclastics, volcanic conglomerate, siltstone	
Altitude: 850 metres		Aspect: North	
Slope: Gentle		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	
<i>Einadia nutans</i>	1	<i>Bromus diandrus</i>	1
<i>Geranium solanderi</i>	1	<i>Carthamus lanatus</i>	1
<i>Lomandra filiformis</i>	1	<i>Cirsium vulgare</i>	1
<i>Oxalis perennans</i>	1	<i>Dactylis glomerata</i>	1
<i>Rumex brownii</i>	1	<i>Echium plantagineum</i>	1
<i>Urtica incisa</i>	1	<i>Hirschfeldia incana</i>	2
		<i>Hordeum sp.</i>	5
		<i>Lolium sp.</i>	3
		<i>Phalaris aquatica</i>	3
		<i>Picris hieracioides</i>	1
		<i>Polygonum aviculare</i>	1
		<i>Silybum marianum</i>	1
		<i>Trifolium glomeratum</i>	1
Dead Trees: Several			
Mistletoes: No			
Tree species: <i>Eucalyptus melliodora</i> , <i>Eucalyptus goniocalyx</i>			
Shrub cover: No			
Groundcover: Exotic grassland.			
Tree hollows: Occasional			
Rock outcrops: Minor			
Watercourse/Dams: No			
Termite mounds: No			
Ground debris: Occasional fallen trees and branches			
Special features/notes: None.			



Vegetation/Habitat Survey Form		Kevin Mills & Associates	
Site Name: Flyers Creek		Plot No. V08 Plot Size.: 20m x 20m (400m ²)	
Location: Hope Hill, North of Optus tower		Photo: yes	
Date: 11.11.08		Community: Exotic grassland	
GPS (centre): 55 0692586 6280885 (WGS 84)		Soil: Dark brown, clayey	
Land Tenure: Freehold		Geology: Siltstone, sandstone, mudstone, chert, marble calcareous mudstone	
Altitude: 850 metres		Aspect: North	
Slope: Gentle		Topography: Upper slope	
Species Cover: 1:<5% (uncommon); 2:<5% (common), 3:5-25%; 4:25-50%; 5:50-75%; 6:75-100%.			
Natives		Exotics	
<i>Acaena ovina</i>	1	<i>Arctotheca calendula</i>	1
<i>Austrodanthonia racemosa</i>	2	<i>Bromus diandrus</i>	1
<i>Cotula australis</i>	1	<i>Bromus hordeaceus</i>	1
<i>Cyrosurus echinatus</i>	1	<i>Bromus rubens</i>	1
<i>Einadia nutans</i>	1	<i>Carduus tenuiflorus</i>	1
<i>Hydrocotyle laxiflora</i>	1	<i>Cerastium fontanum</i>	1
<i>Juncus subsecundus</i>	2	<i>Erodium cicutarium</i>	1
<i>Lomandra filiformis</i>	1	<i>Hordeum</i> sp.	1
<i>Microlaena stipoides</i>	1	<i>Hypochaeris radicata</i>	1
<i>Oxalis perennans</i>	1	<i>Lactuca serriola</i>	1
<i>Plantago varia</i>	1	<i>Lolium</i> sp.	6
<i>Poa sieberiana</i>	1	<i>Medicago polymorpha</i>	1
<i>Rumex brownii</i>	2	<i>Nassella trichotoma</i>	1
<i>Solenogyne dominii</i>	1	<i>Petrorhagia nanteuillii</i>	1
<i>Wahlenbergia luteola</i>	1	<i>Polygonum aviculare</i>	1
Exotics		<i>Trifolium augustifolium</i>	1
<i>Trifolium subterraneum</i>	1	<i>Trifolium campestre</i>	1
		<i>Trifolium glomeratum</i>	1
Dead Trees: Several			
Mistletoes: None			
Tree species: <i>Eucalyptus melliodora</i> , <i>Eucalyptus goniocalyx</i> , <i>Eucalyptus blakelyi</i>			
Shrub cover: No			
Groundcover: Exotic grassland			
Tree hollows: Common			
Rock outcrops: No			
Watercourse/Dams: No			
Termite mounds: No			
Ground debris: Common fallen branches			
Special features/notes: Large old trees with many hollows.			



Vegetation/Habitat Survey Form		Kevin Mills & Associates	
Site Name: Flyers Creek		Plot No. V07 Plot Size.: 20m x 20 m (400m ²)	
Location: Hope Hill Ridge, north end.		Photo: yes	
Date: 11.11.08		Community: Exotic grassland.	
GPS (centre): 55 0692103 6282024 (WGS 84)		Soil: Dark brown, rocky, clayey.	
Land Tenure: Freehold		Geology: Mafic volcaniclastics, sandstone, conglomerate	
Altitude: 900 metres		Aspect: North	
Slope: Moderate		Topography: Upper slope.	
Species Cover: 1:<5% (uncommon); 2:<5% (common), 3:5-25%; 4:25-50%; 5:50-75%; 6:75-100%.			
Natives		Exotics	
<i>Austrostipa scabra</i>	1	<i>Amsinckia calycina</i>	1
<i>Geranium solanderi</i>	1	<i>Arctotheca calendula</i>	3
<i>Urtica incisa</i>	1	<i>Bromus diandrus</i>	1
		<i>Carduus tenuiflorus</i>	1
		<i>Cerastium fontanum</i>	1
		<i>Erodium cicutarium</i>	1
		<i>Hordeum</i> sp.	6
		<i>Lolium</i> sp.	2
		<i>Malva parviflora</i>	1
		<i>Polygonum aviculare</i>	1
		<i>Silybum marianum</i>	2
		<i>Trifolium glomeratum</i>	1
		<i>Trifolium subterraneum</i>	1
Dead Trees: Common			
Mistletoes: No			
Tree species: <i>Eucalyptus melliodora</i> , <i>Eucalyptus gonicalyx</i>			
Shrub cover: Nil			
Groundcover: Exotic grassland			
Tree hollows: Common			
Rock outcrops: Abundant			
Watercourse/Dams: Nil			
Termite mounds: Nil			
Ground debris: Abundant; fallen tree trunks and branches.			
Special features/notes: Prolific flowering of Yellow Box.			



Vegetation/Habitat Survey Form		Kevin Mills & Associates	
Site Name: Flyers Creek		Plot No. V05 Plot Size.: 20m x 20m (400m ²)	
Location: Hillcrest		Photo: yes	
Date: 11.11.08		Community: Exotic grassland – native pasture.	
GPS (centre): 55 0693209 6284185 (WGS 84)		Soil: Light brown, clayey.	
Land Tenure: Freehold		Geology: Clinopyroxene basalt, agglomeratic in places, basaltic subvolcanic intrusives	
Altitude: 900 metres		Aspect: North	
Slope: Gentle		Topography: Crest of ridge.	
Species Cover: (1:<5% (uncommon); 2:<5% (common), 3:5-25%; 4:25-50%; 5:50-75%; 6:75-100%)			
Natives		Exotics	
<i>Austrodanthonia carphoides</i>	2	<i>Acetosella vulgaris</i>	2
<i>Austrodanthonia racemosa</i>	1	<i>Arctotheca calendula</i>	1
<i>Austrostipa scabra</i>	5	<i>Bromus hordeaceus</i>	1
<i>Crassula sieberiana</i>	1	<i>Erodium cicutarium</i>	1
<i>Microlaena stipoides</i>	2	<i>Hypochaeris radicata</i>	1
<i>Oxalis perennans</i>	1	<i>Lolium</i> sp.	2
<i>Rumex brownii</i>	1	<i>Pentaschistis airoides</i>	1
<i>Solenogyne dominii</i>	1	<i>Petrorhagia nanteuillii</i>	1
		<i>Picris hieracioides</i>	1
		<i>Poa bulbosa</i>	3
		<i>Trifolium subterraneum</i>	1
		<i>Vulpia</i> sp.	1
Dead Trees: Abundant			
Mistletoes: Nil			
Tree species: <i>E. blakelyi</i> , <i>E. goniocalyx</i> , <i>E. melliodora</i> , <i>E. macroryncha</i> .			
Shrub cover: Nil			
Groundcover: Mostly an exotic grassland; see above.			
Tree hollows: Common.			
Rock outcrops: Common			
Watercourse/Dams: Nil			
Termite mounds: Nil			
Ground debris: Abundant			
Special features/notes:			



Vegetation/Habitat Survey Form		Kevin Mills & Associates	
Site Name: Flyers Creek		Plot No. V04 Plot Size.: 20m x 20m (400m ²)	
Location: "Nullawonga"		Photo: yes	
Date: 11.11.08		Community: Exotic grassland	
GPS (centre): 55 0693557 6285339 (WGS 84)		Soil: Dark brown, clayey.	
Land Tenure: Freehold		Geology: Clinopyroxene basalt, agglomeratic in places, basaltic subvolcanic intrusives	
Altitude: 910 metres		Aspect: West	
Slope: Level		Topography: Broad ridge crest.	
Species Cover: (1:<5% (uncommon); 2:<5% (common), 3:5-25%; 4:25-50%; 5:50-75%; 6:75-100%)			
Natives		Exotics	
<i>Rumex brownii</i>	1	<i>Arctotheca calendula</i>	2
<i>Oxalis perennans</i>	1	<i>Bromus diandrus</i>	1
		<i>Echium plantagineum</i>	2
		<i>Hordeum</i> sp.	5
		<i>Lolium</i> sp.	5
		<i>Polygonum aviculare</i>	1
		<i>Trifolium subterraneum</i>	1

Dead Trees: Common
Mistletoes: Nil
Tree species: <i>Eucalyptus melliodora</i> , <i>Eucalyptus goniacalyx</i>
Shrub cover: Nil
Groundcover: Exotic grassland
Tree hollows: Common
Rock outcrops: Nil
Watercourse/Dams: Nil
Termite mounds: Nil
Ground debris: Abundant
Special features/notes:



Grassland Survey Form		Kevin Mills & Associates	
Site Name: Flyers Creek		Plot No. V02 Plot Size.: 20m x 20m (400m ²)	
Location: "Cooramilla"		Photo: yes	
Date: 11.11.08		Community: Exotic grassland	
GPS (centre): 55 0693407 6288163 (WGS 84)		Soil: Reddish brown, clayey, rocky.	
Land Tenure: Freehold		Geology: Latite	
Altitude: 840 metres		Aspect: North	
Slope: Gentle		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	
<i>Austrodanthonia racemosa</i>	2	<i>Acetosella vulgaris</i>	1
<i>Austrostipa scabra</i>	6	<i>Amsinckia calycina</i>	1
<i>Cotula australis</i>	1	<i>Arctotheca calendula</i>	1
<i>Crassula sieberiana</i>	1	<i>Bromus hordeaceus</i>	1
<i>Einadia nutans</i>	1	<i>Carthamus lanatus</i>	1
<i>Oxalis perennans</i>	1	<i>Erodium cicutarium</i>	1
<i>Rumex brownii</i>	1	<i>Hypochaeris radicata</i>	1
<i>Solenogyne dominii</i>	1	<i>Lolium</i> sp.	2
<i>Wurmbea dioica</i>	1	<i>Poa bulbosa</i>	2
		<i>Trifolium augustifolium</i>	1
		<i>Trifolium glomeratum</i>	1
Dead Trees: Common			
Mistletoes: Nil			
Tree species: <i>Eucalyptus melliodora</i> , <i>Eucalyptus bridgesiana</i>			
Shrub cover: Nil			
Groundcover: Exotic grassland in patches of natives			
Tree hollows: Uncommon			
Rock outcrops: Common			
Watercourse/Dams: Nil			
Termite mounds: One, small.			
Ground debris: Uncommon.			
Special features/notes:			



Grassland Survey Form		Kevin Mills & Associates	
Site Name: Flyers Creek		Plot No. V03 Plot Size.: 20m x 20m (400m ²)	
Location: "Cooramilla"		Photo: yes	
Date: 11.11.08		Community: Exotic grassland.	
GPS (centre of plot): 55 0694802 6287476		Soil: Brown, clayey.	
Land Tenure: Freehold		Geology: Latite	
Altitude: 920 metres		Aspect: East	
Slope: Gentle		Topography: Upper slope.	
Species Cover: (1:<5% (uncommon); 2:<5% (common); 3:5-25%; 4:25-50%; 5:50-75%; 6:75-100%)			
Natives		Exotics	
<i>Urtica incisa</i>	1	<i>Acetosella vulgaris</i>	1
		<i>Arctotheca calendula</i>	1
		<i>Bromus hordeaceus</i>	3
		<i>Carduus tenuiflorus</i>	2
		<i>Cerastium fontanum</i>	1
		<i>Erodium cicutarium</i>	1
		<i>Hordeum</i> sp.	4
		<i>Lolium</i> sp.	6
		<i>Poa annua</i>	1
		<i>Polygonum aviculare</i>	1
		<i>Silybum marianum</i>	3
		<i>Trifolium glomeratum</i>	1
		<i>Trifolium repens</i>	1
		<i>Trifolium subterraneum</i>	3
Dead Trees: Common			
Mistletoes: No			
Tree species: <i>Eucalyptus melliodora</i> , <i>Eucalyptus gonicalyx</i>			
Shrub cover: Nil			
Groundcover: Exotic			
Tree hollows: Common			
Rock outcrops: Rare			
Watercourse/Dams: No			
Termite mounds: No			
Ground debris: Common			
Special features/notes:			



Grassland Survey Form		Kevin Mills & Associates	
Site Name: Flyers Creek		Plot No. V09 Plot Size.: 20m x 20m (400m ²)	
Location: Lowe Property		Photo: yes	
Date: 08.10.10		Community: Stringybark Woodland	
GPS (centre of plot): 55 0694670 6283528		Soil: Clayey.	
Land Tenure: Freehold		Geology: Mafic volcaniclastics, volcanic conglomerate, siltstone	
Altitude: 880 metres		Aspect: Northwest.	
Slope: Almost level.		Topography: Upper slope.	
Species Cover: (1:<5% (uncommon); 2:<5% (common), 3:5-25%; 4:25-50%; 5:50-75%; 6:75-100%)			
Natives		Exotics	
<i>Austrodanthia</i> sp.	2	<i>Acetosella vulgaris</i>	1
<i>Cotula australis</i>	1	<i>Arctotheca calendula</i>	1
<i>Crassula siberiana</i>	1	<i>Cerastium glomeratum</i>	1
<i>Wurmbea dioica</i>	1	<i>Hypochaeris radicata</i>	1
<i>Geranium</i> sp.	1	<i>Lolium</i> sp.	2
<i>Hydrocotyle laxiflora</i>	3	<i>Poa bulbosa</i>	2
<i>Microlaena stipoides</i>	4	<i>Soliva sessilis</i>	1
<i>Oxalis</i> sp.	1	<i>Stellaria media</i>	1
<i>Rumex brownii</i>	1	<i>Trifolium subterranean</i>	1
<i>Solenogyne dominii</i>	1	Grass spp. ?	2
Dead Trees: Moderately common			
Mistletoes: Uncommon (flowering)			
Tree species: <i>Eucalyptus macrorhyncha</i> , <i>E. blakelyi</i> , <i>E. gonicalyx</i>			
Shrub cover: nil			
Groundcover: 100%, native pasture			
Tree hollows: Occasional			
Rock outcrops: nil			
Watercourse/Dams: nil			
Termite mounds: nil			
Ground debris: Common			
Special features/notes:			



Appendix 2

Plant Species List for the Study Area

PTERIDOPHYTA (Ferns)

Dennstaedtiaceae

Pteridium esculentum

Bracken

GYMNOSPERMAE (Conifers)

Pinaceae

**Pinus radiata*

Radiata Pine

ANGIOSPERMAE (Flowering Plants)

Apiaceae

Hydrocotyle laxiflora

Stinking Pennywort

Asphodelaceae

Bulbine bulbosa

Bulbine Lily

Asteraceae

Cassinia aculeata

Common Cassinia

Cotula australis

Common Cotula

Senecio quadridentatus

Cotton Fireweed

Solenogyne dominii

Smooth Solenogyne

Vittadinia cuneata

Fuzzweed

**Arctotheca calendula*

Capeweed

**Carduus tenuiflorus*

Winged Slender Thistle

**Carthamus lanatus*

Saffron Thistle

**Chondrilla juncea*

Skeleton Weed

**Cichorium intybus*

Chicory

**Cirsium vulgare*

Spear Thistle

**Hypochaeris radicata*

Flatweed

**Lactuca serriola*

Prickly Lettuce

**Onopordium acanthium*

Scotch Thistle

**Picris hieracioides*

Hawkweed Picris

**Silybum marianum*

Variegated Thistle

**Soliva sessilis*

Bindii

**Sonchus asper* subsp. *glaucescens*

Prickly Sowthistle

Boraginaceae

**Amsinckia calycina*

Hairy Fiddleneck

**Echium plantagineum*

Paterson's Curse

**Echium vulgare*

Viper's Bugliss

Brassicaceae

**Capsella bursa-pastoris*

Shepherd's Purse

**Hirschfeldia incana*

Hairy Brassica

Campanulaceae

Wahlenbergia luteola

Yellowish Bluebell

Caryophyllaceae

**Cerastium fontanum*

Mouse-ear Chickweed

**Cerastium glomeratum*

Mouse-ear Chickweed

**Petrorhagia nanteuillii*

Proliferous Pink

**Stellaria media*

Chickweed

Casuarinaceae <i>Casuarina cunninghamiana</i>	River Oak
Chenopodiaceae <i>Chenopodium pumilio</i> <i>Einadia nutans</i>	Clammy Goosefoot Nodding Saltbush
Cucurbitaceae * <i>Cucumis myriocarpus</i>	Paddy Melon
Colchicaceae <i>Wurmbea dioica</i>	Early Nancy
Convolvulaceae <i>Convolvulus erubescens</i> <i>Dichondra repens</i>	Australian Bindweed Kidney Weed
Crassulaceae <i>Crassula sieberiana</i>	Stonecrop
Cyperaceae <i>Carex appressa</i>	Tall Sedge
Euphorbiaceae * <i>Euphorbia lathyris</i>	Caper Spurge
Fabaceae Faboideae (subfamily) <i>Hardenbergia violacea</i> * <i>Genista monspessulana</i> * <i>Medicago polymorpha</i> * <i>Trifolium arvense</i> * <i>Trifolium augustifolium</i> * <i>Trifolium campestre</i> * <i>Trifolium cernuum</i> * <i>Trifolium glomeratum</i> * <i>Trifolium repens</i> * <i>Trifolium subterraneum</i> * <i>Vicia sativa</i> Mimosoideae (subfamily) <i>Acacia dealbata</i> <i>Acacia implexa</i>	Native Sarsaparilla Montpellier Broom Burr Medic Haresfoot Clover Narrow-leaf Clover Hop Clover Drooping-flowered Clover Clustered Clover White Clover Subterranean Clover Common Vetch Silver Wattle Hickory Wattle
Fumariaceae * <i>Fumaria muralis</i>	Wall Fumitory
Geraniaceae <i>Geranium solanderi</i> * <i>Erodium cicutarium</i>	Native Geranium Common Stork's-bill
Hypericaceae * <i>Hypericum perforatum</i>	St John's Wort
Iridaceae * <i>Romulea rosea</i>	Onion Grass
Juncaceae <i>Juncus subsecundus</i>	Rush

Lamiaceae

Mentha satureioides
**Marrubium vulgare*

Creeping Mint
 Horehound

Lomandraceae

Lomandra filiformis

Wattle Mat-rush

Malvaceae

**Malva parviflora*
**Malva neglecta*
**Sida rhombifolia*

Small-flowered Mallow
 Dwarf Mallow
 Paddy's Lucerne

Myrtaceae

Eucalyptus albens
Eucalyptus blakelyi
Eucalyptus dives
Eucalyptus goniacalyx
Eucalyptus macrorhyncha
Eucalyptus melliodora
Eucalyptus pauciflora
Eucalyptus radiata
Eucalyptus rubida

White Box
 Blakely's Red Gum
 Broad-leaved Peppermint
 Bundy
 Red Stringybark
 Yellow Box
 Snow Gum
 Narrow-leaved Peppermint
 Candlebark

Oxalidaceae

Oxalis perennans

Grassland Wood Sorrel

Plantaginaceae

Plantago varia
**Plantago lanceolata*

Variable Plantain
 Ribbed Plantain

Poaceae

Austrodanthonia caespitosa
Austrodanthonia carphoides
Austrodanthonia sp.
Austrostipa scabra
Bothriochloa macra
Cynodon dactylon
Cynosurus echinatus
Elymus scaber
Microlaena stipoides
Poa sieberiana
**Anthoxanthum odoratum*
**Avena* sp.
**Briza maxima*
**Briza minor*
**Bromus cartharticus*
**Bromus diandrus*
**Bromus hordaceus*
**Bromus rubens*
**Dactylis glomerata*
**Holcus lanatus*
**Hordeum* sp.
**Lolium* sp.
**Nassella trichotoma*
**Pentaschistis airoides*
**Phalaris aquatica*
**Phyllostachys aurea*
**Poa annua*
**Poa bulbosa*
**Triticum aestivum*
**Vulpia* spp.

Wallaby Grass
 Short Wallaby Grass
 Wallaby Grass
 Corkscrew
 Red-leg Grass
 Couch Grass
 Rough Dog's Tail
 Wheatgrass
 Weeping Grass
 Poa Tussock
 Sweet Vernal Grass
 Oats
 Large Quaking Grass
 Lesser Quaking Grass
 Prairie Grass
 Great Brome
 Soft Brome
 Red Brome
 Cocksfoot
 Yorkshire Fog
 Barley Grasses
 Ryegrass
 Serrated Tussock
 False Hairgrass
 Phalaris
 Golden Bamboo
 Winter Grass
 Bulbous Bluegrass
 Wheat
 Fescues

Polygonaceae*Polygonum aviculare**Rumex brownii***Acetosella vulgaris***Rumex crispus*

Wireweed

Swamp Dock

Sheep Sorrel

Curled Dock

Rosaceae*Acaena ovina***Rosa rubiginosa***Rubus fruticosus* sp. agg.

Sheep's Burr

Sweet Briar

Blackberry

Rubiaceae*Asperula conferta***Sherardia arvensis*

Common Woodruff

Field Madder

Salicaceae**Populus nigra***Salix babylonica***Salix* sp.

Lombardy Poplar

Weeping Willow

Willow

Sterculiaceae*Brachychiton populneus*

Kurrajong

Typhaceae*Typha orientalis*

Cumbungi

Urticaceae*Urtica incisa***Urtica urens*

Stinging Nettle

Small Nettle

Appendix 3**Animal Species List for the Study Area**

- a. Source of record.
1. Recorded in the NSW Wildlife Atlas within 5 km of the project area.
 2. Recorded previously in the near vicinity in the study by Cenwest (2005).
 3. Recorded in the project area in 2008/09/10.
- b. Introduced bird species are indicated by an asterisk (*).
- c. Cadia mine site and nearby (Western Research Institute & Resource Strategies 2009).
- d. Reported by land owners in the area.

FAMILY		Wildlife Atlas	Cadia area^c	This Study 2008/09/10
Species				
MAMMALS				
ORNITHORHYNCHIDAE				
Platypus	<i>Ornithorhynchus anatinus</i>	1	2	
TACHYGLOSSIDAE				
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>	1	2	
DASYURIDAE				
Brown Antechinus	<i>Antechinus stuartii</i>		2	
Yellow-footed Antechinus	<i>Antechinus flavipes</i>		2	
Common Dunnart	<i>Sminthopsis murina</i>		2	
VOMBATIDAE				
Common Wombat	<i>Vombatus ursinus</i>	1	2	
PETAURIDAE				
Sugar Glider	<i>Petaurus breviceps</i>		2	
Squirrel Glider	<i>Petaurus norfolcensis</i>		2	
PSEUDOCHEIRIDAE				
Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>		2	
PHALANGERIDAE				
Common Brushtail Possum	<i>Trichosurus vulpecula</i>	1	2	
MACROPODIDAE				
Eastern Grey Kangaroo	<i>Macropus giganteus</i>	1	2	3
Common Wallaroo	<i>Macropus robustus</i>		2	3
Swamp Wallaby	<i>Wallabia bicolor</i>	1	2	3
EMBALLONURIDAE				
Yellow-bellied Sheath-tail Bat	<i>Saccolaimus flaviventris</i>		2	
MOLOSSIDAE				
Southern Freetail Bat	<i>Mormopterus planiceps</i>		2	
Inland Freetail Bat	<i>Mormopterus species</i>		2	
White-striped Freetail Bat	<i>Nyctinomus australis</i>		2	
VESPERTILIONIDAE				
Large Bentwing Bat	<i>Miniopterus schreibersii</i>		2	
Lesser Longeared Bat	<i>Nyctophilus geoffroyi</i>		2	
Gould's Longeared Bat	<i>Nyctophilus gouldi</i>		2	
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>		2	
Chocolate Wattled Bat	<i>Chalinolobus morio</i>		2	
Eastern Cave Eptesicus	<i>Eptesicus pumilius</i>		2	
Little Broadnosed Bat	<i>Scotorepens greyii</i>		2	

Eastern Broadnosed Bat	<i>Scotorepens orion</i>	2		
Large Forest Bat	<i>Vespadelus darlingtoni</i>	2		
Southern Forest Bat	<i>Vespadelus regulus</i>	2		
Little Forest Bat	<i>Vespadelus vulturnus</i>	2		
MURIDAE				
Water-rat	<i>Hydromys chrysogaster</i>	1	2	
House Mouse*	<i>Mus musculus</i>		2	
Black Rat*	<i>Ratus rattus</i>		2	
CANIDAE				
Fox*	<i>Vulpes vulpes</i>	1	2	3
FELIDAE				
Cat*	<i>Felis catus</i>		2	3
LEPORIDAE				
Rabbit*	<i>Oryctolagus cuniculus</i>	1	2	3
Brown Hare*	<i>Lepus capensis</i>		2	3
BOVIDAE				
Domestic Cattle*	<i>Bos taurus</i>		2	3
Domestic Sheep*	<i>Ovis aries</i>			3
Goat*	<i>Capra hircus</i>	1		
CERVIDAE				
Unidentified Deer*	<i>Cervus</i> sp.	1		
FAMILY				
Species		Wildlife Atlas	Cadia area ^c	This Study 2008/09/10
BIRDS				
PHASIANIDAE				
Stubble Quail	<i>Coturnix pectoralis</i>			3
Brown Quail	<i>Coturnix ypsilophora</i>		2	
ANATIDAE				
Black Swan	<i>Cygnus atratus</i>		2	3
Australian Wood Duck	<i>Chenonetta jubata</i>	1	2	3
Pacific Black Duck	<i>Anas superciliosa</i>		2	3
Grey Teal	<i>Anas gracilis</i>		2	3
Musk Duck	<i>Biziura lobata</i>		2	
Hardhead	<i>Aythya australis</i>			3
Pink-eared Duck	<i>Malacorhynchus membranaceus</i>		2	3
Australian Shoveler	<i>Anas rhynchotis</i>		2	3
Mallard*	<i>Anas platyrhynchos</i>		2	
PODICIPEDIDAE				
Australasian Grebe	<i>Tachybaptus novaehollandiae</i>		2	3
Hoary-headed Grebe	<i>Polioccephalus polioccephalus</i>		2	3
PHALACROCORACIDAE				
Little Pied Cormorant	<i>Microcarbo melanoleucos</i>		2	3
Great Cormorant	<i>Phalacrocorax carbo</i>		2	3
ARDEIDAE				
White-faced Heron	<i>Egretta novaehollandiae</i>	1	2	3
White-necked Heron	<i>Ardea pacifica</i>			3

THRESKIORNITHIDAE

Australian White Ibis	<i>Threskiornis molucca</i>		3
Straw-necked Ibis	<i>Threskiornis spinicollis</i>		3

FAMILY

Species	Wildlife Atlas	Cadia area ^c	This Study 2008/09/10
---------	----------------	-------------------------	-----------------------

ACCIPITRIDAE

Black-shouldered Kite	<i>Elanus axillaris</i>	2	3
Black Kite	<i>Milvus migrans</i>		3
Brown Goshawk	<i>Accipiter fasciatus</i>	2	3
Wedge-tailed Eagle	<i>Aquila audax</i>	2	3
Little Eagle	<i>Hieraaetus morphnoides</i>	2	3

FALCONIDAE

Brown Falcon	<i>Falco berigora</i>	2	3
Australian Hobby	<i>Falco longipennis</i>	2	
Peregrine Falcon	<i>Falco peregrinus</i>	1	2
Nankeen Kestrel	<i>Falco cenchroides</i>	2	3

RALLIDAE

Dusky Moorhen	<i>Gallinula tenebrosa</i>	2	3
Eurasian Coot	<i>Fulica atra</i>	2	3

CHARADRIIDAE

Double-banded Plover	<i>Charadrius bicinctus</i>	2	
Black-fronted Dotterel	<i>Elseyaornis melanops</i>	2	
Masked Lapwing	<i>Vanellus miles</i>	2	3

LARIDAE

Silver Gull	<i>Larus novaehollandiae</i>	2	3
-------------	------------------------------	---	---

COLUMBIDAE

Common Bronzewing	<i>Phaps chalcoptera</i>	2	
Crested Pigeon	<i>Ocyphaps lophotes</i>	2	3
Peaceful Dove	<i>Geopelia striata</i>	2	
Bar-shouldered Dove	<i>Geopelia humeralis</i>	2	

CACATUIDAE

Yellow-tailed Black-Cockatoo	<i>Calyptorhynchus funereus</i>	2	
Galah	<i>Eolophus roseicapillus</i>	1	2
Long-billed Corella*	<i>Cacatua tenuirostris</i>		3
Little Corella	<i>Cacatua sanguinea</i>	2	
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	1	2

PSITTACIDAE

Cockatiel	<i>Nymphicus hollandicus</i>	2	
Little Lorikeet	<i>Glossopsitta pusilla</i>	2	
Crimson Rosella	<i>Platycercus elegans</i>	1	2
Eastern Rosella	<i>Platycercus eximius</i>	1	2
Red-rumped Parrot	<i>Psephotus haematonotus</i>	2	3
Superb Parrot	<i>Polytelis swainsonii</i>	2	3

CUCULIDAE

Pallid Cuckoo	<i>Cacomantis pallidus</i>	2	3
Brush Cuckoo	<i>Cacomantis variolosus</i>	2	
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	2	
Black-eared Cuckoo	<i>Chalcites osculans</i>	2	
Horsfield's Bronze-Cuckoo	<i>Chalcites basalus</i>	2	
Shining Bronze-Cuckoo	<i>Chalcites lucidus</i>	2	

STRIGIDAE				
Southern Boobook	<i>Ninox novaeseelandiae</i>		2	
TYTONIDAE				
Barn Owl	<i>Tyto alba</i>		2	
PODARGIDAE				
Tawny Frogmouth	<i>Podargus strigoides</i>		2	
AEGOTHELIDAE				
Australian Owlet-nightjar	<i>Aegotheles cristatus</i>		2	
APODIDAE				
White-throated Needletail	<i>Hirundapus caudacutus</i>		2	
HALCYONIDAE				
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	1	2	3
Sacred Kingfisher	<i>Todiramphus sanctus</i>		2	3
MEROPIIDAE				
Rainbow Bee-eater	<i>Merops ornatus</i>		2	3
CORACIIDAE				
Dollarbird	<i>Eurystomus orientalis</i>		2	3
CLIMACTERIDAE				
White-throated Treecreeper	<i>Cormobates leucophaea</i>		2	3
Red-browed Treecreeper	<i>Climacteris erythrops</i>		2	
Brown Treecreeper	<i>Climacteris picumnus</i>		2	
MALURIDAE				
Superb Fairy-wren	<i>Malurus cyaneus</i>	1	2	3
Variegated Fairy-wren	<i>Malurus lamberti</i>		2	
PARDALOTIDAE				
Spotted Pardalote	<i>Pardalotus punctatus</i>		2	3
Striated Pardalote	<i>Pardalotus striatus</i>	1	2	3
Speckled Warbler	<i>Chthonicola sagittata</i>		2	
White-browed Scrubwren	<i>Sericornis frontalis</i>	1	2	3
Weebill	<i>Smicrornis brevirostris</i>		2	
White-throated Gerygone	<i>Gerygone olivacea</i>		2	3
Western Gerygone	<i>Gerygone fusca</i>		2	
Brown Thornbill	<i>Acanthiza pusilla</i>		2	
Buff-rumped Thornbill	<i>Acanthiza reguloides</i>		2	3
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	1	2	3
Yellow Thornbill	<i>Acanthiza nana</i>		2	3
Striated Thornbill	<i>Acanthiza lineata</i>	1	2	3
Southern Whiteface	<i>Aphelocephala leucopsis</i>		2	
MELIPHAGIDAE				
Red Wattlebird	<i>Anthochaera carunculata</i>		2	3
Noisy Friarbird	<i>Philemon corniculatus</i>	1	2	3
Little Friarbird	<i>Philemon citreogularis</i>		2	
Singing Honeyeater	<i>Lichenostomus virescens</i>		2	
Noisy Miner	<i>Manorina melanocephala</i>		2	3
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>		2	3
White-eared Honeyeater	<i>Lichenostomus leucotis</i>		2	
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>	1	2	3
Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>		2	3

White-throated Honeyeater	<i>Melithreptus albogularis</i>	2	3	
White-naped Honeyeater	<i>Melithreptus lunatus</i>	2		
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>	2		
Scarlet Honeyeater	<i>Myzomela sanguinolenta</i>	2		
White-fronted Chat	<i>Epthianura albifrons</i>	2		
FAMILY		Wildlife	Cadia	This Study
Species		Atlas	area ^c	2008/09
PETROICIDAE				
Jacky Winter	<i>Microeca fascians</i>		2	3
Scarlet Robin	<i>Petroica boodang</i>		2	
Red-capped Robin	<i>Petroica goodenovii</i>		2	
Flame Robin	<i>Petroica phoenicea</i>		2	
Eastern Yellow Robin	<i>Eopsaltria australis</i>		2	
NEOSITTIDAE				
Varied Sittella	<i>Daphoenositta chrysoptera</i>		2	3
PACHYCEPHALIDAE				
Crested Shrike-tit	<i>Falcunculus frontatus</i>		2	
Golden Whistler	<i>Pachycephala pectoralis</i>		2	
Rufous Whistler	<i>Pachycephala rufiventris</i>		2	3
Grey Shrike-thrush	<i>Colluricincla harmonica</i>		2	
DICRURIDAE				
Leaden Flycatcher	<i>Myiagra rubecula</i>		2	
Satin Flycatcher	<i>Myiagra cyanoleuca</i>		2	3
Restless Flycatcher	<i>Myiagra inquieta</i>		2	
Magpie-lark	<i>Grallina cyanoleuca</i>	1	2	3
Grey Fantail	<i>Rhipidura albiscapa</i>		2	3
Willie Wagtail	<i>Rhipidura leucophrys</i>	1	2	3
CAMPEPHAGIDAE				
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>		2	3
White-winged Triller	<i>Lalage sueurii</i>		2	3
ORIOIDAE				
Olive-backed Oriole	<i>Oriolus sagittatus</i>		2	
ARTAMIDAE				
Dusky Woodswallow	<i>Artamus cyanopterus</i>		2	3
White-browed Woodswallow	<i>Artamus superciliosus</i>			3
Grey Butcherbird	<i>Cracticus torquatus</i>			3
Pied Butcherbird	<i>Cracticus nigrogularis</i>		2	3
Australian Magpie	<i>Cracticus tibicen</i>	1	2	3
Pied Currawong	<i>Strepera graculina</i>	1	2	3
Grey Currawong	<i>Strepera versicolor</i>		2	
CORVIDAE				
Australian Raven	<i>Corvus coronoides</i>	1	2	3
Little Raven	<i>Corvus mellori</i>		2	
CORCORACIDAE				
White-winged Chough	<i>Corcorax melanorhamphos</i>		2	3
MOTACILLIDAE				
Australasian Pipit	<i>Anthus novaeseelandiae</i>		2	3

PASSERIDAE

House Sparrow*	<i>Passer domesticus</i>		2	3
Red-browed Finch	<i>Neochmia temporalis</i>	1	2	3
Diamond Firetail	<i>Stagonopleura guttata</i>	1	2	3

FRINGILLIDAE

European Greenfinch*	<i>Carduelis chloris</i>		2	
European Goldfinch*	<i>Carduelis carduelis</i>		2	3

FAMILY

Species

Wildlife
AtlasCadia
area^cThis Study
2008/09**DICAEDAE**

Mistletoebird	<i>Dicaeum hirundinaceum</i>		2	3
---------------	------------------------------	--	---	---

HIRUNDINIDAE

White-backed Swallow	<i>Cheramoeca leucosternus</i>		2	
Welcome Swallow	<i>Hirundo neoxena</i>	1	2	3
Tree Martin	<i>Petrochelidon nigricans</i>		2	3
Fairy Martin	<i>Petrochelidon ariel</i>		2	3

SYLVIIDAE

Clamorous Reed-Warbler	<i>Acrocephalus stentoreus</i>		2	3
Rufous Songlark	<i>Cincloramphus mathewsi</i>		2	

ZOSTEROPIDAE

Silvereye	<i>Zosterops lateralis</i>		2	
-----------	----------------------------	--	---	--

MUSCICAPIDAE

Common Blackbird*	<i>Turdus merula</i>	1	2	3
-------------------	----------------------	---	---	---

STURNIDAE

Common Starling*	<i>Sturnus vulgaris</i>	1	2	3
Common Myna*	<i>Acridotheres tristis</i>		2	

FROGS**MYOBATRACHIDAE**

Common Eastern Froglet	<i>Crinia signifera</i>		2	3
Eastern Sign-bearing Froglet	<i>Crinia parinsignifera</i>		2	
Eastern Banjo Frog	<i>Limnodynastes dumerilii</i>	1	2	3
Brown-striped Frog	<i>Limnodynastes peronii</i>		2	
Spotted Grass Frog	<i>Limnodynastes tasmaniensis</i>		2	3
Smooth Toadlet	<i>Uperoleia laevisgata</i>		2	3
Brown Toadlet	<i>Pseudophryne bibronii</i>		2	
Smooth Toadlet	<i>Uperoleia laevisgata</i>		2	
Wrinkled Toadlet	<i>Uperoleia rugosa</i>		2	

HYLIDAE

Brown Tree Frog	<i>Litoria ewingii</i>		2	
Broad-palmed Frog	<i>Litoria latopalmata</i>		2	
Freycinet's Frog	<i>Litoria freycineti</i>		2	
Jervis Bay Tree Frog	<i>Litoria jervisiensis</i>		2	
Lesueur's Frog	<i>Litoria lesueuri</i>		2	
Peron's Tree Frog	<i>Litoria peronii</i>		2	
Verreaux's Tree Frog	<i>Litoria verreauxii</i>		2	

REPTILES**CHELIDAE**

Long-necked Tortoise	<i>Chelodina longicollis</i>		2	3
----------------------	------------------------------	--	---	---

GEKKONIDAE

Marbled Gecko	<i>Christinus marmoratus</i>	1	2
Thick-tailed Gecko	<i>Underwoodisaurus milii</i>	1	

AGAMIDAE

Jacky Lizard	<i>Amphibolurus muricatus</i>		2
Eastern Water Dragon	<i>Physignathus lesueurii</i>		2
Bearded Dragon	<i>Pogona barbata</i>		2

PYGOPODIDAE

Plain Snake-lizard	<i>Delma inornata</i>		2
--------------------	-----------------------	--	---

FAMILY		Wildlife Atlas	Cadia area ^c	This Study 2008/09
SPECIES				
VARANIDAE				
Lace Monitor	<i>Varanus varius</i>		2	
SCINCIDAE				
Red-throated Skink	<i>Pseudemoia platynota</i>		2	
Southern Rainbow-Skink	<i>Carlia tetradactyla</i>		2	
Speckled Tree Skink	<i>Cryptolepharus xanabyi</i>		2	
Striped Skink	<i>Ctenotus robustus</i>		2	
Copper-tailed Skink	<i>Ctenotus taeniolatus</i>		2	
Cunningham's Skink	<i>Egernia cunninghami</i>		2	3
Tree Skink	<i>Egernia striolata</i>		2	
Eastern Water Skink	<i>Eulamprus quoyii</i>		2	
Three-toed Skink	<i>Hemiergis decresiensis</i>		2	
Delicate Skink	<i>Lampropholis delicata</i>		2	
Grass Skink	<i>Lampropholis guichenoti</i>		2	
South-eastern Slider	<i>Lerista bougainvillii</i>		2	
South-eastern Morethia Skink	<i>Morethia boulengeri</i>		2	
Weasel Skink	<i>Saproscincus mustelinus</i>		2	
Eastern Blue-tongued Lizard	<i>Tiliqua scincoides</i>		2	3
Blotched Blue-tongued Lizard	<i>Tiliqua nigrolutea</i>		2	
Shingle-back	<i>Trachydosaurus rugosus</i>		2	
ELAPIDAE				
Eastern Blind Snake	<i>Ramphotyphlops nigescens</i>		2	
Lowland Copperhead	<i>Austrelaps superbus</i>		2	
Common Death Adder	<i>Acanthophis antarcticus</i>		2	
Copperhead	<i>Austrelaps superbus</i>		2	3 ^d
Red-bellied Black Snake	<i>Pseudechis porphyriacus</i>		2	3 ^d
Eastern Brown Snake	<i>Pseudonaja textilis</i>		2	3 ^d
Bandy-Bandy	<i>Vermicella annulata</i>		2	
Dwyer's Black-headed Snake	<i>Suta dwyeri</i>		2	

Appendix 4

Bird Survey Sheets

Bird Survey Sheet			Kevin Mills & Associates		
Project: Flyers Creek Wind Farm			Date: 23 February 2009		
Location: Halls Road south				No.: FC01	
GPS (start): WGS84 55 0692669 6283066			(finish): 0694100 6283571		
Time: 1.10 – 1.40 pm			Photo: yes		
Habitat: <i>Eucalyptus goniocalyx</i> , <i>E. blakelyi</i> , <i>E. melliodora</i> , grassy understorey – no shrubs.					
Species	Ground	<10m	10-20m	20-50m	>50m
Australian Raven		1			
Buff-rumped Thornbill	1	1			
Crested Pigeon			1		
Crimson Rosella			3		
Dusky Woodswallow			2		
Eastern Rosella			5		
Galah	2	5			
Australian Magpie	2	1	1		
Magpie-lark	1	3			
Superb Fairy-wren	6				
White-throated Treecreeper		1			
Willie Wagtail		2			
Notes: Thickets of young <i>E. blakelyi</i> . 28° cloud cover 50%. Light breeze.					

Bird Survey Sheet			Kevin Mills & Associates		
Project: Flyers Creek Wind Farm			Date: 24 February 2009		
Location: Halls Road south.				No.: FC02	
GPS (start): WGS84 55 0692669 6283066			(finish): 0694100 6283571		
Time: 07.35 - 08.15 am			Photo:		
Habitat:					
Species	Ground	<10m	10-20m	20-50m	>50m
Australian Magpie	4	2	1		
Australian Raven			1		
Black-faced Cuckoo-shrike			1		
Buff-rumped Thornbill		1			
Crested Pigeon		1			
Crimson Rosella	8	3	2		
Diamond Firetail	10			0693986	6283555
Dusky Woodswallow	1	1	1		
Eastern Rosella			4		
Galah	5	2			
Grey Fantail		1			
Magpie-lark		2			
Pied Currawong				2	
Sacred Kingfisher			1		
Spotted Pardalote		4			
Sulphur-crested Cockatoo		1			
White-plumed Honeyeater			2		
White-throated Gerygone			1		
White-throated Treecreeper		2			
Willie Wagtail	1	1			
Yellow Thornbill		1			
Yellow-rumped Thornbill	5				

Bird Survey Sheet			Kevin Mills & Associates		
Project: Flyers Creek Wind Farm			Date: 24 February 2009		
Location: Halls Road – Gap Road				No.: FC03	
GPS (start): WGS84 55 0694100 6283571			(finish): not recorded		
Time: 8.30 am – 9.00 am			Photo: yes		
Habitat:					
Species	Ground	<10m	10-20m	20-50m	>50m
Australian Magpie	4	3			
Buff-rumped Thornbill	4				
Crimson Rosella		1	2		
Dollarbird		1			
Eastern Rosella		3	2		
Galah		1			
Grey Fantail		4			
Laughing Kookaburra		1	2		
Long-billed Corella*		2			
Magpie-lark		1			
Spotted Pardalote			1		
Striated Pardalote			1	1	
White-throated Treecreeper		1			
White-throated Gerygone			1		
Yellow-rumped Thornbill	7				

Bird Survey Sheet				Kevin Mills & Associates	
Project: Flyers Creek Wind Farm				Date: 23 February 2009	
Location: Roweth Property				No.: FC04	
GPS (start): WGS84 0693641 6284400			(finish): 0693176 6284410		
Time: 1.45 – 2.05			Photo:		
Habitat: <i>E. blakelyi</i> , <i>E. melliodora</i> , <i>E. goniocalyx</i> , <i>E. macrorhyncha</i> . Grassy understorey, no shrubs. Thickets of young <i>E. blakelyi</i> .					
Species	Ground	<10m	10-20m	20-50m	>50m
Australian Magpie			6		
Australian Raven			2		
Crimson Rosella			5		
Dollarbird			1		
Eastern Rosella			1		
Laughing Kookaburra		2	1		
Rufous Whistler		1			
Spotted Pardalote			1		

Bird Survey Sheet				Kevin Mills & Associates		
Project: Flyers Creek Wind Farm				Date: 24 February 2009		
Location: Northeast section.					No.: FC05	
GPS (start): WGS84 not recorded			(finish):			
Time: 9.03 – 9.35 am			Photo:			
Habitat: <i>E. blakelyi</i> , <i>E. goniocalyx</i> . Understorey exotic.						
Species	Ground	<10m	10-20m	20-50m	>50m	
Australian Magpie	4	2				
Common Starling*	1		1			
Crested Pigeon	4					
Crimson Rosella	8	3				
Dusky Woodswallow		3				
Galah		6		2		
Grey Fantail		1				
Magpie-lark	2					
Red Wattlebird		1				
Superb Fairy-wren	6					
Willie Wagtail	1					

Bird Survey Sheet			Kevin Mills & Associates		
Project: Flyers Creek Wind Farm			Date: 23 February 2009		
Location: Nullewonga, road side, Halls Road north				No.: FC06	
GPS (start): WGS84 0694522 6284307			(finish): 0695290 6284841		
Time: 2.40 – 3.00 pm			Photo:		
Habitat: Roadside tree.s <i>E. melliodora</i> , <i>E. goniocalyx</i> .					
Species	Ground	<10m	10-20m	20-50m	>50m
Australian Magpie	2		1		
Eastern Rosella	3	1			
Galah			1		
Noisy Miner			1		
Superb Fairy Wren	6				
Welcome Swallow				1	

Bird Survey Sheet			Kevin Mills & Associates		
Project: Flyers Creek Wind Farm			Date: 23 February 2009		
Location: Dunstaffnage Road				No.: FC07	
GPS (start): WGS84 0695486 6283031			(finish): 0694430 6285226		
Time: 3.05 – 3.35 pm			Photo:		
Habitat: Woodland trees roadside. Eucalyptus saplings.					
Species	Ground	<10m	10-20m	20-50m	>50m
Australasian Grebe	1				
Australian Magpie	7		3	1	
Australian Raven			1		
Australian Wood Duck	18				
Common Starling*			1		
Eastern Rosella				8	
Galah		2		1	
Grey Fantail		4			
Laughing Kookaburra		1			
Mistletoebird			1		
Noisy Miner			1		
Spotted Pardalote			1		
Superb Fairy-wren	2	2			
Yellow-rumped Thornbill	1	1			
Notes: <i>E. blakelyi</i> , <i>E. dives</i> , <i>E. goniocalyx</i> , Ungrazed understorey grassland. Occasional shrubs.					

Bird Survey Sheet			Kevin Mills & Associates		
Project: Flyers Creek Wind Farm			Date: 23 February 2009		
Location: Corromilla"" property (ridge crest)				No.: FC08	
GPS (start): WGS84 6094819 6288143			(finish):		
Time: 4.00 – 4.30 pm			Photo:		
Habitat: Woodland trees roadside					
Species	Ground	<10m	10-20m	20-50m	>50m
Australian Magpie	3			1	
Black-faced Cuckoo Shrike			1		
Crimson Rosella			2		
Dusky Woodswallow			2		
Eastern Rosella	2		2		
Galah		4			
Nankeen Kestrel				2	
Varied Sittella		1	1		
Notes: <i>E. melliodora</i> , <i>E. goniocalyx</i> , exotic grassland understorey. No shrubs.					

Bird Survey Sheet			Kevin Mills & Associates		
Project: Flyers Creek Wind Farm			Date: 24 February 2009		
Location: Corromilla property (ridge crest)				No.: FC09	
GPS (start): WGS84 0693791 6280909			(finish): 0692729 6280869		
Time: 6.35 am – 7.30 am			Photo:		
Habitat: Roadside trees					
Species	Ground	<10m	10-20m	20-50m	>50m
Australian Magpie			2	3	
Australian Raven		1			
Common Starling*			26		
Crimson Rosella			6	1	
Dollarbird				1	
Eastern Rosella				2	
Galah			6	8	2
Grey Fantail			2		
Long-billed Corella*				4	
Laughing Kookaburra				1	
Red-rumped Parrot				2	
Spotted Pardalote			2		
Striated Pardalote			3		
Sulphur-crested Cockatoo			15	86	
Superb Fairy-wren	5				
White-faced Heron				1	
White-throated Treecreeper		1			
White-winged Chough		6			
Willie Wagtail		1			
Yellow-rumped Thornbill	1				
Notes: <i>E. blakelyi</i> , <i>E. melliodora</i> (flowering), <i>E. goniocalyx</i> . Exotic understorey. No shrubs.					

Bird Survey Sheet			Kevin Mills & Associates		
Project: Flyers Creek Wind Farm			Date: 24 February 2009		
Location: Wallaby				No.: FC10	
GPS (start): WGS84 0691495 6290673			(finish): not recorded		
Time: 11.00 am – 11.35 am			Photo:		
Habitat: Paddock trees					
Species	Ground	<10m	10-20m	20-50m	>50m
Australian Magpie	7	1			
Black-faced Cuckoo-shrike			2		
Common Starling*			6		
Crimson Rosella		2	1		
Dollarbird				1	
Dusky Woodswallow		1	3		
Eastern Rosella			11		
Galah			5		
Little Pied Cormorant	1				
Noisy Miner			3		
Pacific Black Duck	2				
Red-rumped Parrot			1		
Superb Fairy-wren	2				
Wedge-tailed Eagle					1
White-winged Chough	7				
Willie Wagtail	1			1	
Notes: Tall <i>E. melliodora</i> around creek to sparse trees on ridge above.					

Bird Survey Sheet			Kevin Mills & Associates		
Project: Flyers Creek Wind Farm			Date: 25 February 2009		
Location: Wallaby				No.: FC11	
GPS (start): WGS84 55 0691495 6290673			(finish): not recorded		
Time: 6.55 am – 7.25			Photo:		
Habitat:					
Species	Ground	<10m	10-20m	20-50m	>50m
Australian Magpie	2				1
Common Starling*	8				
Crested Pigeon		2			
Crimson Rosella				3	
Diamond Firetail		2		0691768	6290514
Dusky Woodswallow				8	
Eastern Rosella				4	
Galah			3	9	2
Magpie-lark	5				
Nankeen Kestrel			1		
Noisy Friarbird				1	
Pacific Black Duck	2				
Pied Currawong				1	
Red-rumped Parrot			3	1	
Striated Pardalote				3	
White-browed Woodswallow	9	2			
White-faced Heron				2	
White-plumed Honeyeater				2	
White-throated Gerygone		1			
White-throated Treecreeper					
White-winged Chough	1		8		
Willie Wagtail	2				
Yellow-rumped Thornbill	2				

Bird Survey Sheet				Kevin Mills & Associates	
Project: Flyers Creek Wind Farm				Date: 24 February 2009	
Location: Wallaby				No.: FC12	
GPS (start): WGS84 0692230 6290043			(finish): 0692677 6290062		
Time: 11.35 am – 12.30 pm			Photo:		
Habitat:					
Species	Ground	<10m	10-20m	20-50m	>50m
Australasian Grebe	2				Dam
Australian Magpie			5		
Black Kite					2
Crimson Rosella			3		
Dusky Woodswallow			2		
Eastern Rosella			7		
Galah			2		
Grey Teal	4				Dam
Noisy Miner			4		
Striated Pardalote			6		
Varied Sittella			3		
White-faced Heron	3				Dam

Bird Survey Sheet				Kevin Mills & Associates		
Project: Flyers Creek Wind Farm				Date: 25 February 2009		
Location: Wallaby area						No.: FC13
GPS (start): WGS84 not recorded			(finish):			
Time: 7.25 – 7.55 am			Photo:			
Habitat:						
Species	Ground	<10m	10-20m	20-50m	>50m	
Australian Magpie	4		1			
Australian Raven			1			
Common Starling*	2					
Crimson Rosella		4	2			
Eastern Rosella			12	1		
Galah	2					
Laughing Kookaburra			1			
Magpie-lark	1					
Noisy Miner			2			
Striated Pardalote			1			
White-faced Heron	2					
White-winged Chough	5					

Bird Survey Sheet				Kevin Mills & Associates		
Project: Flyers Creek Wind Farm				Date: 24 February 2009		
Location: Wallaby				No.: FC14		
GPS (start): WGS84 0695486 6283031				(finish): 0694430 6285226		
Time: 12.40 – 1.15 pm				Photo:		
Habitat: <i>E. melliodora</i> trees paddocks.						
Species	Ground	<10m	10-20m	20-50m	>50m	
Australian Magpie			2	2		
Eastern Rosella			1	2		
Noisy Miner			2			

Bird Survey Sheet				Kevin Mills & Associates		
Project: Flyers Creek Wind Farm				Date: 25 February 2009		
Location: Wallaby					No.: FC15	
GPS (start): WGS84 0695486 6283031				(finish): 0694430 6285226		
Time: 7.55 – 8.25 am				Photo:		
Habitat: <i>E. melliodora</i>						
Species	Ground	<10m	10-20m	20-50m	>50m	
Australian Magpie		1	6	1		
Dusky Woodswallow			9			
Eastern Rosella		4				
Galah		2				
Laughing Kookaburra			3			
Magpie-lark		2				
Striated Pardalote			3			

Project: Flyers Creek Wind Farm			Date: 25 February 2009		
Location: Wallaby				No.: FC16	
GPS (start): WGS84 0690488 6286333			(finish): 0691245 6285797		
Time: 8.45 am -			Photo:		
Habitat:					
Species	Ground	<10m	10-20m	20-50m	>50m
Australasian Pipit	2				
Australian Magpie	3	2	1		
Black-faced Cuckoo-shrike			1		
Common Starling*			2		
Eastern Rosella		2			
Galah			1		
Magpie-lark		2			
Pied Butcherbird		2			
Striated Pardalote			1		
Sulphur-crested Cockatoo			1		
Notes: Roadside <i>E. melliodora</i> , <i>E. blakelyi</i> . Exotic understorey					

Project: Flyers Creek Wind Farm			Date: 6 October 2010		
Location: Halls Road south				No.: FC17	
GPS (start): WGS84 55 0692669 6283066			(finish): 0693962 6285021		
Time: 2.45 - 3.50 pm EDST			Photo: no		
Habitat: Paddocks; roadside <i>E. melliodora</i> , <i>E. blakelyi</i> . Exotic understorey					
Species	Ground	<10m	10-20m	20-50m	>50m
Australian Magpie	35	5			
Australian Raven	1	3			3
Australian Wood Duck	14				
Black-faced Cuckoo-shrike			1		
Buff-rumped Thornbill	3	1			
Crimson Rosella		6			
Dusky Woodswallow			1		
Eastern Rosella	2	6			
Galah		2			
Grey Fantail		1			
Grey Shrike-thrush		1			
Laughing Kookaburra		2			
Magpie-lark	1	1			
Noisy Friarbird		1	1		
Pied Currawong			1		
Red Wattlebird			1		
Rufous Whistler		1	1		
Striated Pardalote			4		
Sulphur-crested Cockatoo	14		1		
Welcome Swallow		1			
White-plumed Honeyeater		1			
White-throated Treecreeper		1			
White-winged Chough	4			3	
Willie Wagtail	1	2			
Yellow-faced Honeyeater			2		
Yellow-rumped Thornbill	2	2			

Project: Flyers Creek Wind Farm			Date: 6 October 2010		
Location: Gap Road				No.: FC18	
GPS (start): WGS84 55 0695922 6285189			(finish): 0696556 6281721		
Time: 3.55 – 4.40 pm EDST			Photo: no		
Habitat: Paddocks; roadside <i>E. melliodora</i> , <i>E. blakelyi</i> . Exotic understorey					
Species	Ground	<10m	10-20m	20-50m	>50m
Australasian Grebe	2 (dam)				
Australian Magpie (young)	9	1			
Australian Raven					2
Australian Wood Duck (young)	9				
Black-faced Cuckoo-shrike			3		
White-throated Honeyeater			1	0696079	6283014
Crimson Rosella	1	2	1		
Galah	10				
Grey Fantail		2			
Grey Shrike-thrush			1		
Laughing Kookaburra			1		
Magpie-lark (nest)	1	1			
Noisy Friarbird		1			
Rufous Whistler			2		
Satin Flycatcher			1		
Striated Pardalote			3		
Superb Fairy-wren	4				
Sulphur-crested Cockatoo			4		
White-plumed Honeyeater			1		
White-throated Treecreeper		1			
White-winged Chough	2				
Willie Wagtail	1	1			

Project: Flyers Creek Wind Farm			Date: 7 October 2010		
Location: Gap Road				No.: FC19	
GPS (start): WGS84 55 0695922 6285189			(finish): 0696556 6281721		
Time: 7.35 – 8.20 am EDST			Photo: no		
Habitat: Paddocks; roadside <i>E. melliodora</i> , <i>E. blakelyi</i> . Exotic understorey					
Species	Ground	<10m	10-20m	20-50m	>50m
Australasian Grebe (dam)	2				
Australian Magpie	5	2			1
Australian Raven			1	1	
Crimson Rosella	2	1	9		
Galah	6	3	2	1	
Grey Fantail		3			
Grey Shrike-thrush		3			
Grey Teal (dam)	2				
Laughing Kookaburra		1	2		
Magpie-lark		2	1		
Nankeen Kestrel				2	
Pacific Black Duck		1			
Pied Butcherbird			1		
Rufous Whistler			2		
Sacred Kingfisher		1			
Striated Pardalote			1		
Sulphur-crested Cockatoo	1	3	1	2	
Superb Fairy-wren		2			
White-plumed Honeyeater			4		
White-throated Treecreeper		1			
Willie Wagtail		2			
Yellow-rumped Thornbill		5			

Project: Flyers Creek Wind Farm			Date: 7 October 2010		
Location: <i>Panuana Road north to Wallaby gate.</i>				No.: FC20	
GPS (start): WGS84 55 0689109 6288301			(finish): 55 0690847 6290791		
Time: 4.00 – 4.51 pm EDST			Photo: no		
Habitat: Paddocks; roadside <i>E. melliodora</i> , <i>E. blakelyi</i> . Exotic understorey					
Species	Ground	<10m	10-20m	20-50m	>50m
Australian Magpie	7		3		
Australian Raven					3
Common Blackbird*	1				
Common Starling*			1	2	
Crested Pigeon	10				
Crimson Rosella		3			
Eastern Rosella	1	1	4		
Galah	14			1	1
Grey Fantail		1			
Magpie-lark	2				
Nankeen Kestrel			1	1	
Noisy Miner		1			
Pied Currawong			1		
Red-rumped Parrot	3				
Striated Pardalote			2		
Sulphur-crested Cockatoo		1			
Superb Parrot	2	5		3	
Wedge-tailed Eagle					1
Willie Wagtail	1				
Yellow-rumped Thornbill	2				

Project: Flyers Creek Wind Farm			Date: 8 October 2010		
Location: Halls Road south				No.: FC21	
GPS (start): WGS84 55 0692669 6283066			(finish): 0693962 6285021		
Time: 1.35 – 2.25 pm EDST			Photo: no		
Habitat: Paddocks; roadside <i>E. melliodora</i> , <i>E. blakelyi</i> , <i>E.goniocalyx</i> . Exotic understorey					
Species	Ground	<10m	10-20m	20-50m	>50m
Australian Magpie	10	1	1		
Australian Wood Duck (dam)	3				
Black-faced Cuckoo-shrike		1	1		
Brown Goshawk					1
Buff-rumped Thornbill		3			
Crimson Rosella	2				
Eastern Rosella	1	1			
Galah		2			
Grey Fantail		1			
Magpie-lark	2				
Noisy Friarbird		2	1		
Pied Currawong	1		1		
Rainbow Bee-eater		1			
Rufous Whistler		1	1		
Striated Pardalote			1		
Striated Thornbill		3			
Superb Fairy-wren	1				
Welcome Swallow		1			
White-throated Gerygone			1		
White-throated Treecreeper		1			
White-winged Chough	8				
Willie Wagtail	1				

Project: Flyers Creek Wind Farm			Date: 8 October 2010		
Location: Lowe Property				No.: FC22	
GPS (start): WGS84 55 0694705 6284180			(finish): 0695194 6283070		
Time: 2.30 – 3.25 EDST			Photo: no		
Habitat: Paddocks; woodland of <i>E. macrorhyncha</i> with <i>E. blakelyi</i> . Exotic understorey					
Species	Ground	<10m	10-20m	20-50m	>50m
Australian Magpie	5				
Australian Raven				1	
Crimson Rosella	2				
Eastern Rosella	2	5			
Noisy Friarbird		1	2	2	
Rufous Whistler		1	2		
Striated Thornbill		1			
Superb Fairy-wren	2				
White-throated Treecreeper		1			
White-winged Chough	5				
Yellow-faced Honeyeater			1		

Project: Flyers Creek Wind Farm			Date: 8 October 2010		
Location: Gap Road				No.: FC23	
GPS (start): WGS84 55 0695922 6285189			(finish): 0696556 6281721		
Time: 3.30 – 4.15 pm EDST			Photo: no		
Habitat: Paddocks; roadside <i>E. melliodora</i> , <i>E. blakelyi</i> , <i>E. goniocalyx</i> . Exotic understorey					
Species	Ground	<10m	10-20m	20-50m	>50m
Australasian Grebe (dam)	1				
Australian Magpie	4		3	1	
Australian Wood Duck	4	2			
Black-faced Cuckoo-shrike			2		
Buff-rumped Thornbill	3	3			
Galah		1			
Grey Fantail		1	1		
Grey Teal	2				
Laughing Kookaburra			1		
Magpie-lark	1				
Masked Lapwing	2				
Nankeen Kestrel			1		
Noisy Friarbird		2			
Rufous Whistler			1		
Striated Pardalote			1		
Superb Fair-wren	2	3			
Welcome Swallow		2			
White-throated Treecreeper		1			
White-winged Chough	4				
Willie Wagtail		1	1		
Yellow-faced Honeyeater		1	1		
Yellow-rumped Thornbill	1				

APPENDIX 5

Tree Hollow Survey Sheets

Tree Hollow Survey Form		Kevin Mills & Associates			
Site Name: Flyers Creek		Site No. FCH 01			
Location: Roweth property		Date: 23.02.09			
Vegetation Edge of woodland - paddock trees					
GPS (WGS84):Start 0693176 6284409		GPS Finish: 0693165 6284145			
Topography: Ridge crest		Geology:			
Altitude: m	Aspect: W	Slope: Gentle			
Species	GPS (WGS84)	Hollows¹ <10cm	10-20cm	>20cm	dch
Dead trunk	0693194 6284364			T	96 cm
<i>Eucalyptus blakelyi</i>	0693179 6284343	B			98 cm
<i>Eucalyptus melliodora</i>	0693174 6284325	B B B		T B	102 cm
<i>Eucalyptus blakelyi</i>	0693172 6284310	B	T B		112 cm
<i>Eucalyptus melliodora</i>	0693165 6284251	B B B		T	77 cm
Dead tree	0693182 6284219	B B T	B		41 cm
<i>Eucalyptus goniocalyx</i>	0693180 6284212	B			53 cm
Dead tree	0693178 6284198	B B B			54 cm
No. trees surveyed live – NR Dead – NR					

1. T - trunk hollow; B - branch hollow.

Tree Hollow Survey Form		Kevin Mills & Associates			
Site Name: Flyers Creek		Site No. FCH 02			
Location: Corromilla		Date: 23.02.09			
Vegetation Paddock trees/patch of trees					
GPS (WGS84):Start 0693972 6287927		GPS Finish: 0693368 6288167			
Topography:		Geology:			
Altitude: m	Aspect: W	Slope: Gentle			
Species	GPS (WGS84)	Hollows¹ <10cm	10-20cm	>20cm	dch
<i>Eucalyptus melliodora</i>	0693972 6287927	B			47 cm
<i>Eucalyptus melliodora</i>	0693942 6287953	B B			42 cm
<i>Eucalyptus melliodora</i>	0693889 6287957	B			59 cm
<i>Eucalyptus goniocalyx</i>	0693848 6288006	B B			104 cm
<i>Eucalyptus goniocalyx</i>	0693368 6288167	B			NR
<i>Eucalyptus melliodora</i>	0693405 6288143	B			NR
No. trees surveyed Live – 70 Dead – 3					

1. T - trunk hollow; B - branch hollow.

Tree Hollow Survey Form		Kevin Mills & Associates			
Site Name: Flyers Creek		Site No. FCH 03			
Location: Wallaby		Date: 24.02.09			
Vegetation Woodland – Paddock trees					
GPS (WGS84):Start 0692230 6290043		GPS Finish: 0692677 6290062			
Topography: Ridge crest		Geology:			
Altitude: m	Aspect: W	Slope:			
Species	GPS (WGS84)	Hollows¹ <10cm	10-20cm	>20cm	dch
<i>Eucalyptus goniocalyx</i>	0692240 6290024	B			108 cm
<i>Eucalyptus melliodora</i>	0692363 6290041	B			115 cm
<i>Eucalyptus melliodora</i>	0692369 6290015		T		92 cm
<i>Eucalyptus melliodora</i>	0692394 6290020	B			96 cm
<i>Eucalyptus melliodora</i>	0692525 6290081	T			60 cm
<i>Eucalyptus melliodora</i>	0692581 6290062		T		65 cm
<i>Eucalyptus goniocalyx</i>	0692584 6290035	T			NR
No. tree ssurveyed Live – 74 Dead - 0					

1. T - trunk hollow; B - branch hollow.

Tree Hollow Survey Form		Kevin Mills & Associates			
Site Name: Flyers Creek		Site No. FCH 04			
Location: Wallaby		Date: 23.02.09			
Vegetation Paddock trees					
GPS (WGS84):Start 0692631 6290350		GPS Finish: 0692998 6290424			
Topography: Ridge crest		Geology:			
Altitude: m	Aspect: W	Slope: Gentle			
Species	GPS (WGS84)	Hollows¹ <10cm	10-20cm	>20cm	dch
<i>Eucalyptus melliodora</i>	0692653 6290379	B B			118 cm
<i>Eucalyptus melliodora</i>	0692699 6290324	T			98 cm
<i>Eucalyptus melliodora</i>	0692826 6290383	T			91 cm
<i>Eucalyptus melliodora</i>	0692886 6290408	T			100 cm
Dead	0692991 6290440	T			66 cm
<i>Eucalyptus melliodora</i>	0692998 6290424	T	T		74 cm
<i>Eucalyptus melliodora</i>	0693013 6290470	B			92 cm
No. trees surveyed Live – 41 Dead – 1					

1. T - trunk hollow; B - branch hollow.

Tree Hollow Survey Form		Kevin Mills & Associates			
Site Name: Flyers Creek		Site No. FCH 05			
Location: Wallaby		Date: 24.02.09			
Vegetation Paddock trees					
GPS (WGS84):Start 0692274 6289396		GPS Finish: 0692514 6289350			
Topography:		Geology:			
Altitude: m	Aspect: N	Slope: Gentle			
Species	GPS (WGS84)	Hollows¹ <10cm	10-20cm	>20cm	dch
Nil hollows					
No. trees surveyed Live – 17 Dead – 4					

1. T - trunk hollow; B - branch hollow.

Tree Hollow Survey Form		Kevin Mills & Associates			
Site Name: Flyers Creek		Site No. FCH 06			
Location: Hillview		Date: 24.02.09			
Vegetation Paddock trees/patch of trees					
GPS (WGS84):Start 0691822 6284535		GPS Finish: 0691975 6284451			
Topography: Ridge crest		Geology:			
Altitude: m	Aspect: N	Slope: Gentle			
Species	GPS (WGS84)	Hollows¹ <10cm	10-20cm	>20cm	dch
<i>Eucalyptus goniocalyx</i>	0691924 6284436	B			146 cm
<i>Eucalyptus goniocalyx</i>	0691917 6284432		T		67 cm
<i>Eucalyptus melliodora</i>	0691902 6284426		T		64 cm
<i>Eucalyptus goniocalyx</i>	0691905 6284453	B			49 cm
<i>Eucalyptus goniocalyx</i>	0691893 6284464	T B B	T		48 cm
<i>Eucalyptus goniocalyx</i>	0691862 6284458		T		48 cm
Dead	0691857 6284465		T		35 cm
<i>Eucalyptus melliodora</i>	0691861 6284474	B			50 cm
<i>Eucalyptus melliodora</i>	0691890 6284509	B T	B	T T T	142 cm
<i>Eucalyptus albens</i>	0691863 6284515	B B B B B			87 cm
<i>Eucalyptus albens</i>	0691822 6284535		T		100 cm
<i>Eucalyptus melliodora</i>	0691828 6284487	T			57 cm
<i>Eucalyptus melliodora</i>	0691975 6284451	T T B	T	T	
No. tree surveyed Live – 46 Dead - 7					

1. T - trunk hollow; B - branch hollow.