7.0 Biodiversity Offset Strategy

A Biodiversity Offset Strategy (BOS) is proposed to ensure the Project maintains or improves the terrestrial biodiversity values of the region in the medium to long term. Through the Project design phase, NPM has modified the Project to avoid and minimise ecological impacts. As outlined in **Section 5.1**, project refinements have resulted in:

- avoidance of 57 hectares of White Box – Yellow Box – Blakely's Red Gum Woodland (CEEC – EPBC Act/EEC – TSC Act);
- avoidance of 486 hectares of Grey Box Grassy Woodlands (EEC – EPBC Act/EEC – TSC Act);
- avoidance of up to 2.8 hectares of Weeping Myall Woodland EEC;
- avoidance of approximately 430 hectares of potential habitat for the swift parrot and regent honeyeater; and
- avoidance of approximately 3 hectares of potential superb parrot breeding habitat, represented by mature river red gums, along Bogan River.

In addition to the above avoidance measures, NPM commit to implementing a range of impact mitigation strategies have been included in the Project to mitigate the impact on ecological values (refer to **Section 6.0**). Impact avoidance, minimisation and mitigation strategies have resulted in the reduction of impacts on threatened and migratory species and EECs.

This section documents the approach that has been taken to develop a comprehensive BOS, and provides information on how the BOS will compensate for significant, or potentially significant, residual impacts on species, communities and ecological features, together with a framework on how the BOS will be implemented and monitored.

As stated in **Section 6.0**, the precautionary principle has been considered in the development of the mitigation and offsetting strategies. The precautionary principle assumes the maximum potential impact is applied to these species in the impact assessment and therefore helps ensure robust requirements for mitigation and offsetting.

The objectives of the BOS are to:

- provide for the maintenance and enhancement of biodiversity values of the region in the medium to long term;
- provide an offset that contains as many as possible of the threatened vegetation communities, endangered flora populations, threatened flora species and threatened fauna species impacted by the Project;
- provide an offset that is strategically located or in a regionally significant position;
- provide an offset in which an environmental gain can be made via appropriate management strategies;
- secure an offset in perpetuity;

- to develop a management strategy for the positive environmental management of the proposed offset site, but with appropriate consideration of the existing rural nature of the area;

- as a minimum provide an offset that has the same ecological value as the residual significant impacts of the Project on threatened vegetation communities, endangered flora populations, threatened flora species and threatened fauna species; and

- where possible provide an offset that exceed the ecological value of the residual significant impacts of the Project on threatened vegetation communities, endangered flora populations, threatened flora species and threatened fauna species.

7.1 Assessment of Ecological Values to be Offset

A preliminary ecological values assessment and impact assessment was undertaken during Project planning to determine the potential impact of the Project on ecological values. The overall process that was used to consider and assess ecological impacts, and the role that impact avoidance, minimisation, mitigation and offsetting have in counterbalancing impacts, is displayed in **Figure 1.4**.

The Project would result in the loss of habitat for a range of threatened woodland birds, threatened hollow roosting micro-bat species, and threatened cave-roosting micro-bat species (foraging habitat). In addition, the Project would result in the loss of areas of Grey Box (*Eucalyptus microcarpa*) Grassy Woodland and Derived Native Grassland of South-eastern Australia EEC and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. Many of these matters overlap, e.g. the loss of the woodland form of Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grassland of South-eastern Australia EEC is also the loss of habitat for threatened woodland birds. Accordingly, the BOS has been developed to specifically focus on the key ecological values of the Project Area and measures designed to compensate for residual impacts of the Project on these species, habitats or features.

Following on from the application of impact avoidance, minimisation and mitigation measures (refer to **Sections 5.1** and **6.0** and **Figure 1.4**), **Table 7.1** shows how each of the threatened species, communities and features affected by the Project will be addressed by the proposed BOS. **Table 7.1** provides a summary of each of these matters and how they will be affected, as well as the habitat they require, and finally the approach taken to the development of the BOS. The means through which these species are addressed by the BOS are documented in the remainder of **Section 7.0**, with a summary tabulation of the species-specific elements of the strategy in **Tables 7.7** and **7.8**.

Table 7.1 – Summary of Key Habitat Features to be Targeted in the Biodiversity Offset Strategy

Offset Target	Area of Impact (ha)	Habitat Requirements	Proposed Offset Approach
Grey Box Grassy Woodland	23 ha woodland 15 ha DNG	Typically occurs in the form of an open forest or woodland and generally occurs on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.	Direct land-based offset.
White Box – Yellow Box – Blakely's Red Gum Woodland	0.28 ha	Typically occurs in the form of an open forest or woodland and occurs on deep sandy-loam alluvial soils of the eastern Riverina and Eastern South-western Slopes Bioregions.	Direct land-based offset.
Habitat for the regent honeyeater and swift parrot	37 ha	Flowering eucalypt woodlands during winter months.	Direct land-based offset.
Habitat for the superb parrot	52 ha	Eucalypt woodlands and derived native grasslands.	Direct land-based offset.
Habitat for Sloanes froglet	127 ha	Grassland, woodland and disturbed habitats (excluding cultivated land) that are associated with nearby water sources, and that become inundated during rainfall events	Direct land-based offset.
Habitat for threatened woodland birds and bats	52 ha	Eucalypt and non-eucalypt woodland habitats.	Direct land-based offset.

DNG = derived native grassland
ha = hectares

7.2 Biodiversity Offset Strategy Components

The BOS comprises the following approach designed to maintain or enhance the ecological values of EECs and threatened species and their habitats in the region. These measures include:

- immediate establishment and long-term protection of an off-site offset area to allow for the conservation of large areas of existing vegetation and the protection of threatened woodland birds, micro-bats and EECs;
- the development, and implementation, of an active ecological restoration and regeneration program within the proposed offset area to enhance existing EECs and threatened species habitat; and
- the development of an appropriate ecological monitoring program to assess the success of the BOS in counterbalancing the residual impacts of the Project on ecological values.

Throughout the Project design phase, NPM have actively investigated a range of land based and other non land based strategies that would effectively contribute to the BOS for the Project. This process has included targeted searches and inspections of a range of properties that had the potential to contain target vegetation communities and habitat values required for the Project. In addition, NPM have consulted with the Lachlan CMA and Department of Lands to identify potential offset properties and other regional biodiversity conservation programs being implemented in regard to the target vegetation communities and species.

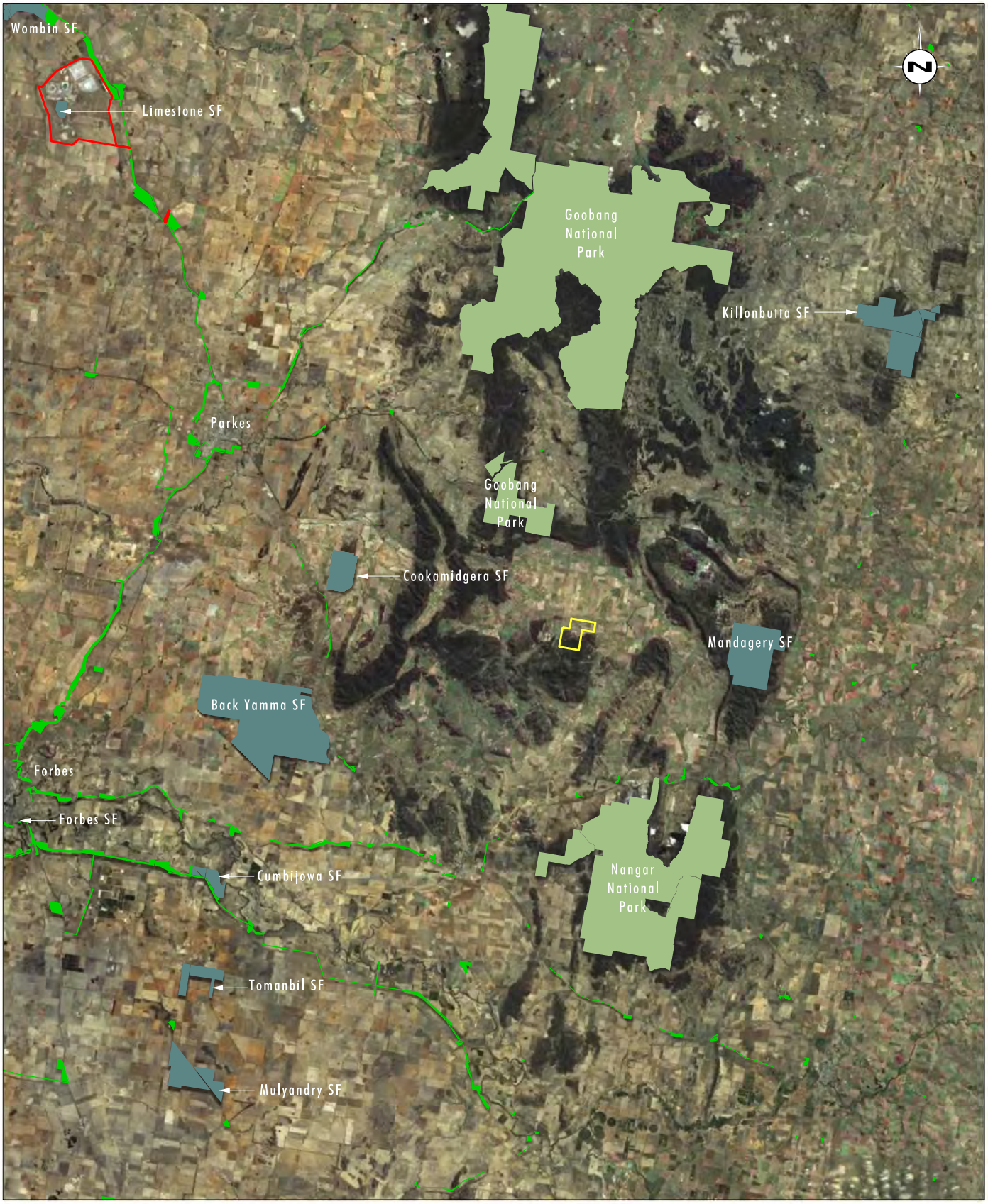
On the basis of these reviews, areas within the local area and region (within approximately 50 kilometres of the Project Area) were identified, that could provide suitable offset properties through containing target vegetation communities, including derived native grassland components, and habitat features necessary to offset the residual impacts of the Project. This sizeable search area was necessary given that in proximity to the Project Area, the majority of native vegetation occurs as highly fragmented remnants located along road reserves and property margins, or located within State Forests and Travelling Stock Reserves (TSRs).

7.3 Kokoda Biodiversity Offset Site

The Kokoda Offset Site is a 350 hectare site located in the Mandagery locality of the Central West Slopes of NSW. The Kokoda Offset Site is strategically located along a north-south potential corridor of remnant woodland and forest vegetation that runs along ridges and hills from north of Eugowra in the south to east of Narromine in the north (refer to **Figure 7.1**). The north-south potential corridor includes Goobang National Park, the largest conserved remnant of woodland and forest vegetation in the Central West region of NSW.

The Kokoda Offset Site is located approximately 12 kilometres north-west of Nangar National Park, approximately 8 kilometres south of Goobang National Park, approximately 12 kilometres west of Mandagery State Forest, approximately 17 kilometres east of Cookamidgera State Forest, and approximately 20 kilometres east of Back Yamma State Forest (refer to **Figure 7.1**).

The Kokoda Offset Site comprises lower fertility soils in the north, predominately cleared for grazing, and densely woodland covered slopes and ridge lines in the south.



Source: Google Earth (2012), NPM (2011), Department of Lands (2011)

0 5 10 20 km
1: 400 000

Legend

- Project Area
- Proposed Kokoda Offset Site
- National Parks and Nature Reserves
- State Forest
- Travelling Stock Reserves

FIGURE 7.1

Proposed Kokoda Offset Site Regional Location

7.3.1 Kokoda Offset Site Survey Methods

A detailed survey methodology was undertaken across the Kokoda Offset Site to determine the ecological attributes of the site. Field surveys were undertaken from 27 to 31 May 2013. Flora survey comprised systematic plots, rapid assessments, general reconnaissance and targeted eucalypt sampling. Fauna survey comprised area search methods including targeted winter migratory bird surveys, walking and driving spotlight surveys, micro-bat echolocation recording, remote cameras, nocturnal call playback and targeted survey and call playback for Sloanes froglet. **Table 7.2** summarises the survey methods and survey effort undertaken across the Kokoda Offset Site. A detailed description of the methodology undertaken across the Kokoda Offset Site is provided in **Appendix H**.

Table 7.2 – Kokoda Offset Site Survey Methodology and Survey Effort Summary

Method	Effort
Flora	
Systematic Plot Based Survey	17 plots
Eucalypt Sampling Methodology	7 trees
Rapid Vegetation Assessments	35 sites
Field Reconnaissance	Carried out during all aspects of survey
Fauna	
Walking Spotlighting	4 person hours
Driving Spotlighting	1.8 person hours (7 kilometres)
Signs of Presence Searches	Carried out during all aspects of survey
Call playback surveys	4 sessions
Remote Cameras	40 camera entire days
Micro-bat Echolocation Recording	16 entire nights
2013 Targeted Winter Bird Surveys	10 person hours

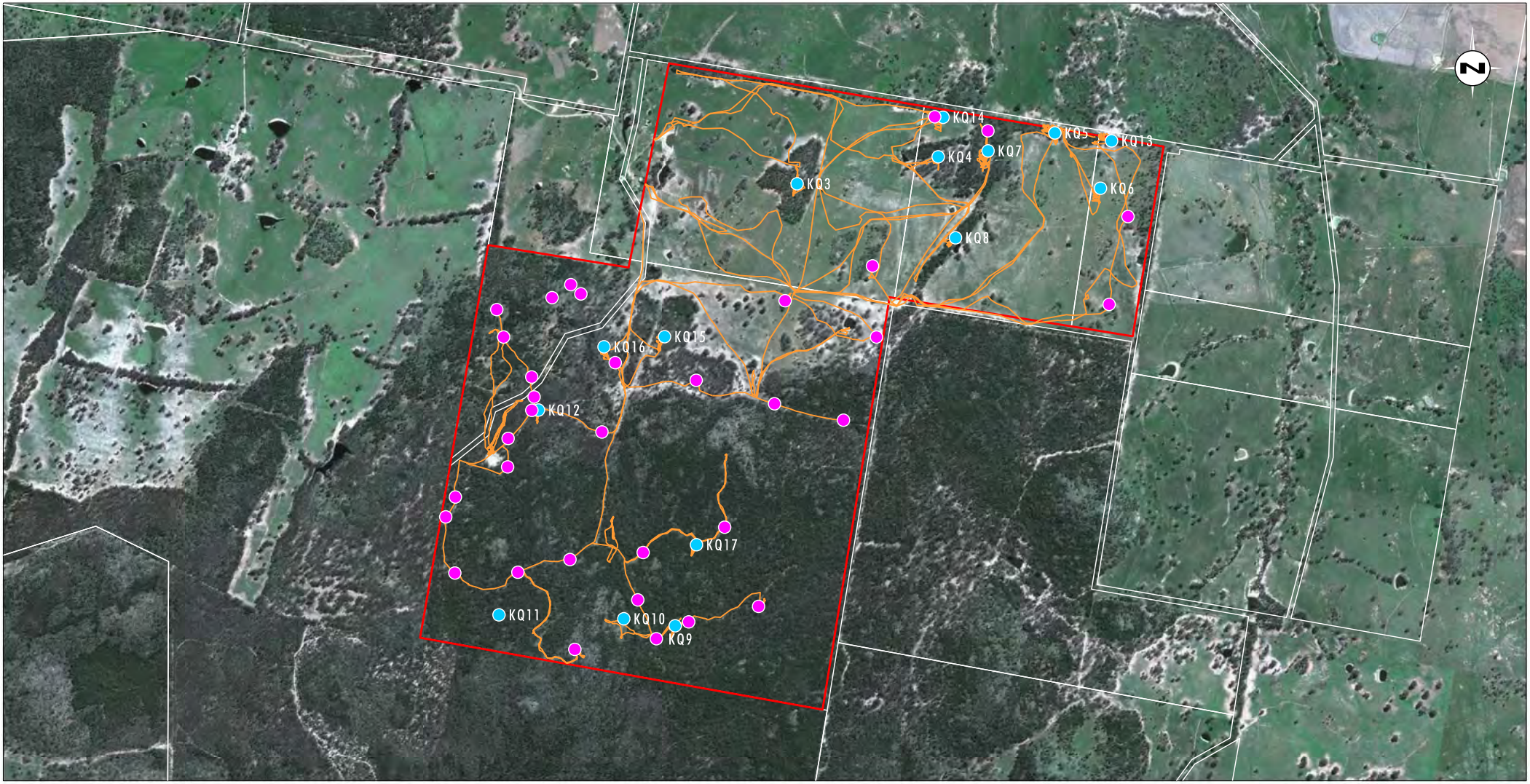
Figures 7.2 and **7.3** show the location of the flora and fauna survey techniques undertaken across the Kokoda Offset Site.

7.3.2 Kokoda Offset Site Flora Survey Results

This section summarises the flora survey results from the surveys undertaken across the Kokoda Offset Site. A total of 348 hectares of vegetation communities occurred across the Kokoda Offset Site and comprised 237 hectares of woodland and 111 hectares of DNG. A detailed description of the survey results can be found in **Appendix I**.

7.3.2.1 Threatened Ecological Communities

Two TECs that correspond with two TECs at the NSW and Commonwealth levels were recorded across the Kokoda Offset Site. **Table 7.3** lists the two TECs and area of each TEC recorded within the Kokoda Offset Site. **Figure 7.4** shows the location of the vegetation communities present on the Kokoda Offset Site.



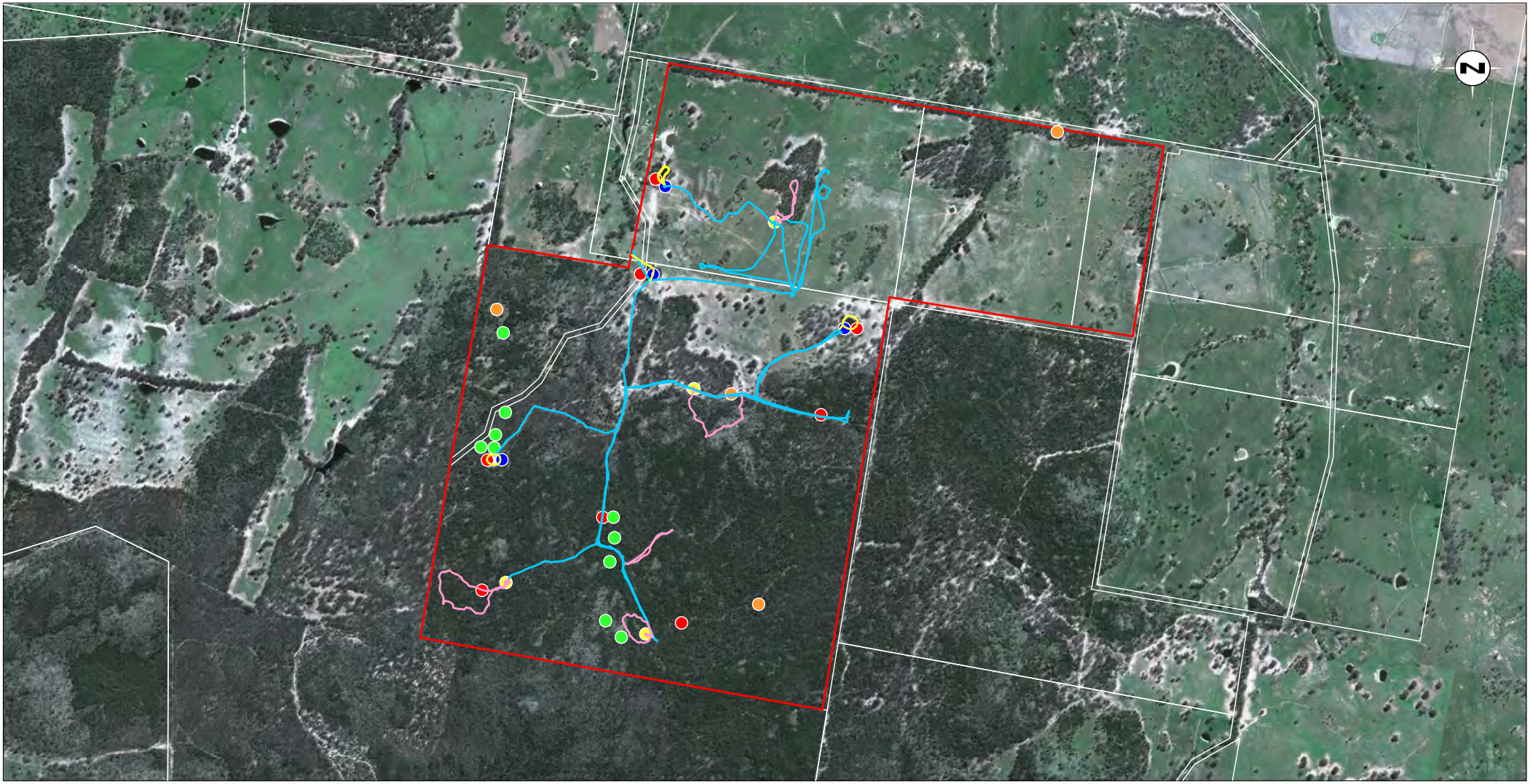
Source: Google Earth (2010), Department of Planning (2009) and Umwelt (2013)

Legend

- Proposed Kokoda Offset Site Boundary
- Systematic Flora Quadrats
- Rapid Flora Quadrats
- General Floristic Transects

FIGURE 7.2

Flora Survey Effort



Source: Google Earth (2010), Department of Planning (2009) and Umwelt (2013)

0 0.25 0.5 1.0km

Legend

- Proposed Kokoda Offset Site Boundary
- Anabat Detector
- Bird and Mammal Call Playback
- Trail Camera
- Frog Call Playback
- Targeted 2013 Bird Surveys
- Driving Spotlight
- Frog Search
- Walking Spotlight

FIGURE 7.3

Fauna Survey Effort

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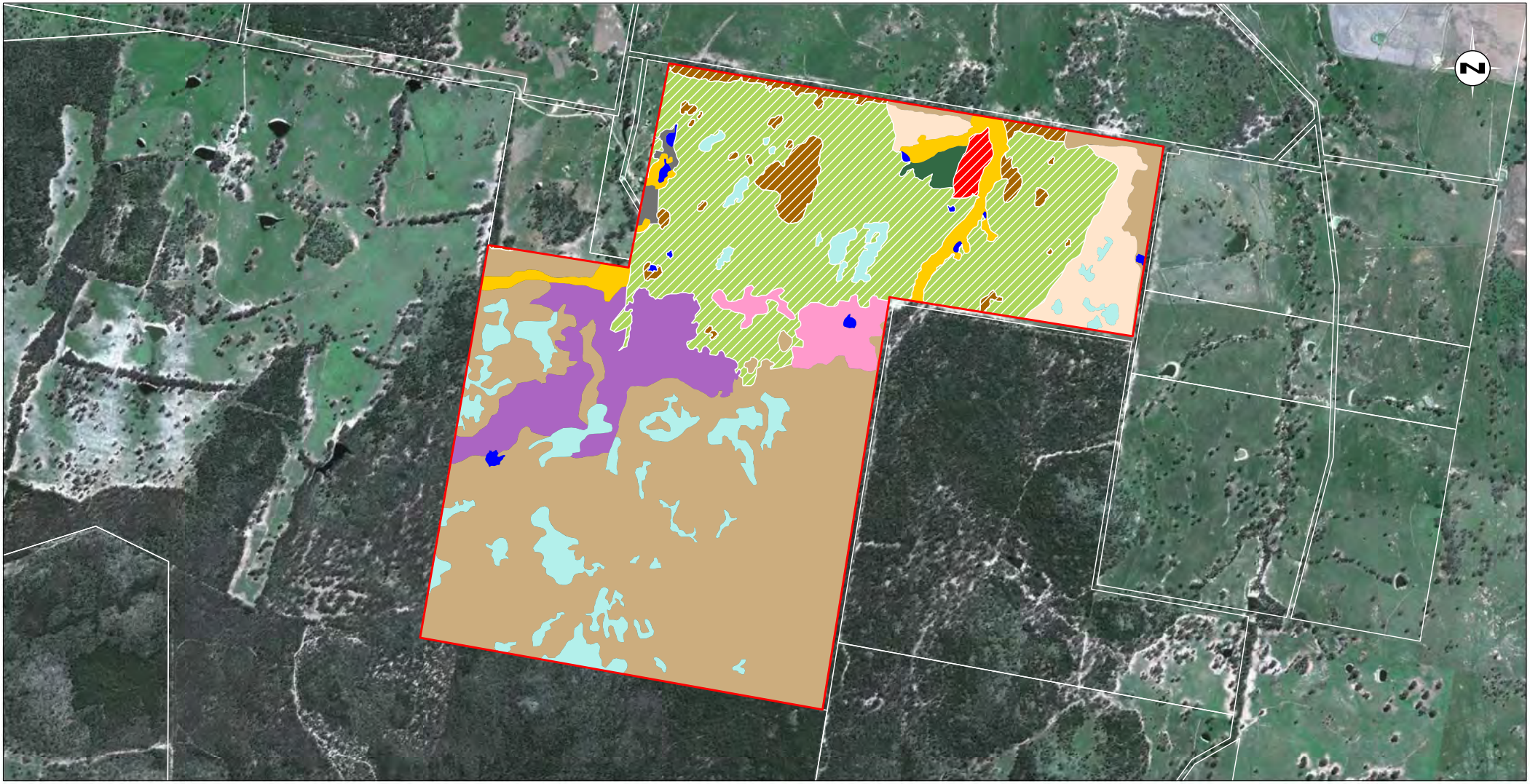
20130703 13.24



Source: Google Earth (2010), Department of Planning (2009) and Umwelt (2013)

0 0.25 0.5 1.0km
1:20 000

Legend

- Proposed Kokoda Offset Site Boundary
- Grey Box Grassy Woodland (EEC - TSC Act/CEEC - EPBC Act)
- Grey Box Grassy Woodland - DNG (EEC - TSC Act/CEEC - EPBC Act)
- White Box Grassy Woodland (EEC - TSC Act/CEEC - EPBC Act)
- Dwyer's Red Gum Creekline Woodland
- Dwyer's Red Gum - Grey Box - Mugga Ironbark - Black Cypress Pine Forest
- Dwyer's Red Gum - Grey Box - Mugga Ironbark - Black Cypress Pine Forest DNG
- Dwyer's Red Gum - Grey Box - Mugga Ironbark - Black Cypress Woodland Low Quality
- Farm Dam
- Farm Track - Disturbed Land
- Grey Box - Ironbark Woodland
- Mugga Ironbark Woodland
- Rocky Rise Shrubby Woodland

FIGURE 7.4

Vegetation Community Mapping - Proposed Kokoda Offset Site

File Name (A4): R08/2949_320.dgn
20130703 15.21

Table 7.3 – TECs Recorded across the Kokoda Offset Site

TEC	Status		Area (ha)
	TSC Act	EPBC Act	
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions AND Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	EEC	EEC	106
White Box – Yellow Box – Blakely's Red Gum Woodland[1] AND White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	EEC	EEC	2.2
		Total[1]	**108**

1 Rounding of totals applied (numbers greater than 10 - zero decimal places)
CEEC Critically Endangered Ecological Community
EEC Endangered Ecological Community
EPBC Act *Environment Protection and Biodiversity Conservation Act 1999*
TSC Act *Threatened Species Conservation Act 1995*

7.3.2.2 Non-threatened Ecological Communities

Seven vegetation communities (excluding disturbed communities and farm dams) were recorded that were not considered to conform to TECs listed on the TSC Act or EPBC Act. **Table 7.4** lists the seven non-threatened ecological communities and the area of each recorded within the Kokoda Offset Site. **Figure 7.4** shows the location of each of the seven non-threatened ecological communities across the Kokoda Offset Site. Descriptions of each of the seven non-threatened vegetation communities are detailed in **Appendix I**.

Table 7.4 – Non-threatened Vegetation Communities Recorded across the Kokoda Offset Site

Vegetation Community	Area (ha[1])
Dwyer's Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Forest	151
Dwyer's Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Forest - DNG	15
Dwyer's Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Woodland Low Quality	8.6
Dwyer's Red Gum Creekline Woodland	9.4
Grey Box – Ironbark Woodland	27
Mugga Ironbark Woodland	1.9
Rocky Rise Shrubby Woodland	26
Total	**240**

1 Rounding of totals applied (numbers less than 1 – 2 decimal places, numbers between 1 and 10 – 1 decimal place, and greater than 10 no decimal places)
DNG Derived Native Grasslands.
ha hectares

7.3.2.3 Threatened Flora Species

No threatened flora species were recorded on the Kokoda Offset Site during May 2013.

7.3.2.4 Endangered Flora Populations

No endangered flora populations were recorded on the Kokoda Offset Site during May 2013.

7.3.2.5 Non-threatened Flora Species

A total of 103 plant species were identified in the Kokoda Offset Site during surveys in 2011 and 2012. Plants were recorded from three major vascular plant classes and from 38 plant families. A total of 18 introduced flora species were recorded (17 per cent). A list of all flora species recorded can be found in **Appendix J**.

7.3.3 Kokoda Offset Site Fauna Survey Results

Following is a summary of the results of the fauna surveys undertaken across the Kokoda Offset Site. A detailed description of the survey results can be found in **Appendix I**.

7.3.3.1 Threatened Fauna Species

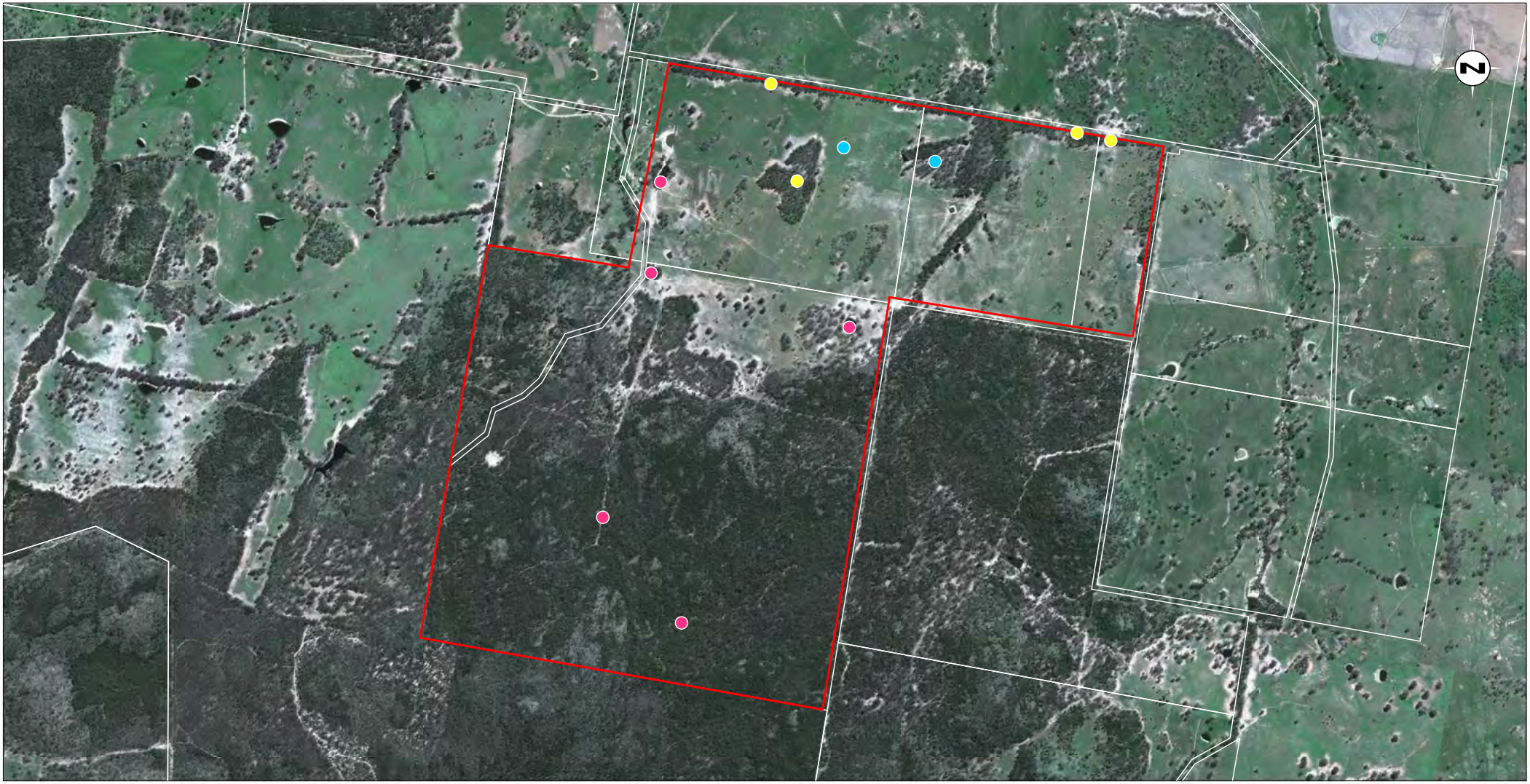
A total of three threatened fauna species were identified across the Kokoda Offset Site during field surveys in May 2013 (refer to **Figure 7.5**). **Table 7.5** lists the three threatened species and the likely frequency of occurrence of each species.

Table 7.5 – Threatened Fauna Species Recorded Across the Kokoda Offset Site

Common Name	Scientific Name	TSC Act	EPBC Act	Likely Frequency of Occurrence
Little lorikeet	*Glossopsitta pusilla*	V		Occasional visitor
Grey-crowned babbler	*Pomatostomus temporalis temporalis*	V		Likely resident species
Eastern bentwing-bat	*Miniopterus schreibersii oceanensis*	V		Likely resident species although no roosting habitat is present

V Vulnerable
TSC Act *Threatened Species Conservation Act 1995*
EPBC Act *Environment Protection and Biodiversity Conservation Act 1999*

In addition to providing habitat for threatened fauna species recorded on the Kokoda Offset Site, the site also provides potential habitat for a further 25 threatened fauna species that were identified as occurring or potentially occurring within a 20 kilometre radius of the Kokoda Offset Site (refer to **Table 7.6** and **Appendix I**).



Source: Google Earth (2010), Department of Planning (2009) and Umwelt (2013)

0 0.25 0.5 1.0km
1:20 000

Legend

- Proposed Kokoda Offset Site Boundary
- Grey-crowned babbler
- Little lorikeet
- Eastern bentwing-bat

FIGURE 7.5

Threatened Fauna Locations - Proposed Kokoda Offset Site

File Name (A4): R08/2949_321.dgn
20130703 15.17

Table 7.6 – Threatened Fauna Species with Potential to Occur on the Kokoda Offset Site

Common Name	Scientific Name	Status	
		TSC Act	EPBC Act
Pink-tailed worm-lizard	*Aprasia parapulchella*	V	V
Little eagle	*Heiraaetus morphnoides*	V	
Grey falcon	*Falco hypoleucos*	E	
Black falcon	*Falco subniger*	V	
Glossy black-cockatoo	*Calyptorhynchus lathami*	V	
Turquoise parrot	*Neophema pulchella*	V	
Superb parrot	*Polytelis swainsonii*	V	V
Swift parrot	*Lathamus discolor*	E	E
Barking owl	*Ninox connivens*	V	
Brown treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	
Speckled warbler	*Chthonicola saggitatus*	V	
Regent honeyeater	*Anthochaera phrygia*	CE	E, MIG
Black-chinned honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V	
Hooded robin (south-eastern form)	*Melanodryas cucullata cucullata*	V	
Scarlet robin	*Petroica boodang*	V	
Flame robin	*Petroica phoenicea*	V	
Varied sittella	*Daphoenositta chrysoptera*	V	
Gilbert's whistler	*Pachycephala inornata*	V	
Diamond firetail	*Stagonopleura guttata*	V	
Spotted-tailed quoll	*Dasyurus maculatus*	V	E
Koala	*Phascolarctos cinereus*	V	V
Eastern pygmy-possum	*Cercartetus nanus*	V	
New Holland mouse	*Pseudomys novaehollandiae*		V
Corben's long-eared bat	*Nyctophilus corbeni*	V	V
Little pied bat	*Chalinolobus picatus*	V	

CE Critically Endangered
E Endangered Species
MIG Migratory species
V Vulnerable Species
TSC Act *Threatened Species Conservation Act 1995*
EPBC Act *Environment Protection and Biodiversity Conservation Act 1999*

7.3.3.2 Endangered Fauna Populations

No endangered fauna populations were recorded or are likely to occur within or adjacent to the Kokoda Offset Site.

7.3.3.3 Migratory Species

No migratory species listed on the EPBC Act were recorded on the Kokoda Offset Site during May 2013 however potential habitat occurs for nine migratory species that were identified as occurring or potentially occurring within a 20 kilometre radius of the Kokoda Offset Site (refer to **Table 7.7** and **Appendix I**).

Table 7.7 – Migratory Species with Potential Habitat on the Kokoda Offset Site

Common Name	Scientific Name	Status		Likelihood of Occurrence
		TSC Act	EPBC Act	
Great egret	*Ardea alba*		MIG	Potential
Cattle egret	*Ardea ibis*		MIG	Potential
White-bellied sea-eagle	*Haliaeetus leucogaster*		MIG	Potential
White-throated needletail	*Hirundapus caudacutus*		MIG	Potential
Fork-tailed swift	*Apus pacificus*		MIG	Potential
Rainbow bee-eater	*Merops ornatus*		MIG	Potential
Regent honeyeater	*Anthochaera phrygia*	CE	E, MIG	Potential
Satin flycatcher	*Myiagra cyanoleuca*		MIG	Potential
Latham's snipe	*Gallinago hardwickii*		MIG	Potential

CE Critically Endangered
E Endangered
MIG Migratory Species
TSC Act *Threatened Species Conservation Act 1995*
EPBC Act *Environment Protection and Biodiversity Conservation Act 1999*

7.3.3.4 Non-threatened Fauna Species

A total of 59 vertebrate fauna species have been recorded across the Kokoda Offset Site, comprising two frogs, one reptile, 39 birds and 17 mammals. A full list of all the vertebrate fauna species recorded across the Kokoda Offset Site can be found in **Appendix K**.

7.3.3.5 Habitat Condition

Woodland areas of the Kokoda Offset Site were also in low to moderate condition and varied from being dominated by regenerating trees to being dominated by middle aged and mature trees. Sapling density was high in most areas and in some, particularly the southern woodland areas, saplings occurred at high density and were self-thinning. Woodland areas of the Kokoda Offset Site typically contained a sparse shrub layer. Woodland areas in the south of the Kokoda Offset Site contained in parts a high density of fallen logs, while woodland areas in the north were characterised by a low density of fallen logs. Tree hollows in woodland areas occurred at low density and were typically small to moderately sized. The condition of the woodland areas, along with large areas of DNG for this EEC, provide opportunity for active regeneration and enhancement of this community across broad areas of the Kokoda Offset Site as detailed further in **Section 7.3.4**.

7.3.4 Offset Management and Improvements

This section describes the improvements and management actions to be undertaken across the Kokoda Offset Site. As noted above in the condition assessment, approximately 111 hectares of the site has been mapped as DNG, which provides a broad scope for the implementation of improvements in condition to enhance the offset site.

A Biodiversity Offset Management Plan for the Kokoda Offset Site is proposed to be prepared to detail the planned improvements to the Kokoda Offset Site and its ongoing management for biodiversity conservation and enhancement purposes.

The Kokoda Offset Site will be managed to conserve and enhance ecological values with a focus on weed and pest control, and regeneration of DNG areas. A monitoring program will be established to assess the progress and determine the success of ongoing management actions.

Preliminary on-ground works are proposed to involve:

- weed and pest control programs;
- exclusion of stock from the Kokoda Offset Site;
- planting of DNG areas with poor recovery potential; and
- undertaking ecological monitoring across the Kokoda Offset Site to monitor the success of plantings and to monitor the recovery of DNG areas that have a high natural recovery potential.

Following the completion of the Biodiversity Offset Management Plan it will be submitted to DP&I for approval. The Biodiversity Offset Management Plan will include a concise and auditable strategy for the implementation of the offset, which will provide for the measurement of success of the proposed management initiatives and an adaptive approach to management in response to monitoring outcomes.

7.3.4.1 Access Management and Exclusion of Stock

All domestic stock will be excluded from the Kokoda Offset Site. All fences will be suitably signposted to identify the purpose of Kokoda Offset Site.

Any new fencing (other than the boundary fences with adjoining neighbours) used within, or on the boundary of, the Kokoda Offset Site will use plain (i.e. non-barbed) wire on the upper strands, and as little barbed wire generally as possible to minimise the impact on native fauna species. As part of the ongoing monitoring program, if a restricted level of barbed wire on fencing is shown to fail to exclude stock, additional measures that pose minimal impact to native fauna will be investigated and implemented.

Appropriate signage will be used throughout the Kokoda Offset Site to identify areas of high ecological significance, such as areas of regeneration and fenced areas containing threatened species, endangered populations or TECs.

7.3.4.2 Weed Management

Of the 103 flora species recorded, 18 (17 per cent) were introduced species. Introduced species recorded that are considered environmental weeds comprised black-berry nightshade (*Solanum nigrum*) and blackberry (*Rubus fruticosus* sp. agg.). Blackberry (*Rubus fruticosus* sp. agg.) is the only noxious weed species recorded on the Kokoda Offset Site, listed in the Cabonne LGA control area.

The success of the Kokoda Offset Site in enhancing ecological values will depend in part on the appropriate management of blackberry and other weeds if present in areas of ecological significance. A weed control program will be implemented to limit the spread and colonisation of noxious and environmental weeds within the Kokoda Offset Site, and this will include:

- an (initial) annual weed control program across the Kokoda Offset Site targeting noxious weeds (frequency to be refined through ongoing monitoring program);

- the implementation of weed management measures including hand removal, mechanical removal and application of herbicides in authorised areas when favourable conditions prevail;
- control of noxious weeds in accordance with the relevant legislation;
- monitoring and inspections of areas to assess the effectiveness of the weed control program and to ascertain the requirement for further work; and
- ongoing consultation with the relevant authorities regarding weed listings, weed occurrence and management technologies.

7.3.4.3 Pest Management

Part of the Biodiversity Offset Management Plan will include the control and management of feral fauna species. Known feral fauna within the Kokoda Offset Site are presented in **Table 7.8**.

Table 7.8 – Feral Fauna Species Recorded within the RVBOS

Common Name	Scientific Name
Fox	*Vulpes vulpes*
Rabbit	*Oryctolagus cuniculus*
brown hare	*Lepus capensis*

These species may impact on the native fauna species through predation and competition for resources such as food, shelter, and breeding sites. Feral animals can also have a detrimental effect on regenerating areas as well as soil stability.

Monitoring will include surveys for the presence of significant populations of feral fauna species. Records of significant populations of such species may trigger appropriate control strategies to reduce and control numbers.

7.3.5 Offset Site In-perpetuity Conservation

The Kokoda Offset Site will be secured for in perpetuity conservation. The mechanism for securing this conservation will be placing a convenant over the land reflecting this conservation status along with appropriate management mechanisms. This will be developed with the landholder and in consultation with DP&I, OEH, and DSEWPC (as relevant). The property will be secured by NPM within 3 months of the granting of Project Approval.

7.3.6 Key Ecological Values of the Kokoda Offset Site

The Kokoda Offset Site provides the following key ecological values.

7.3.6.1 Threatened Ecological Community Habitat Areas

Table 7.9 identifies the area of TECs within the Kokoda Offset Site.

Table 7.9 – Area of TEC Vegetation within the Kokoda Offset Site

TEC	Status		Area (ha)
	TSC Act	EPBC Act	
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions AND Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	EEC	EEC	106
White Box – Yellow Box – Blakely's Red Gum Woodland[1] AND White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	EEC	EEC	2.2
		Total[1]	**108**

1 Rounding of totals applied (numbers greater than 10 - zero decimal places)
CEEC Critically Endangered Ecological Community
EEC Endangered Ecological Community
EPBC Act *Environment Protection and Biodiversity Conservation Act 1999*
TSC Act *Threatened Species Conservation Act 1995*

Both Grey Box Grassy Woodland EECs listed in **Table 7.8** represent like-for-like offsets for the same Grey Box Grassy Woodland EECs identified in the proposed disturbance area. The availability and relative abundance of areas of DNG of this EEC provides broad scope for ecological enhancement of the EEC across the offset site.

Similarly both White Box – Yellow Box – Blakely's Red Gum Woodland EECs listed in **Table 7.8** represent like-for-like offsets for the same White Box – Yellow Box – Blakely's Red Gum Woodland EECs identified in the proposed disturbance area.

7.3.6.2 Habitat for Threatened Fauna Species

The Kokoda Offset Site provides known habitat for the grey-crowned babbler, little lorikeet and eastern bentwing-bat, with each of those species recorded during May 2013. The grey-crowned babbler was recorded twice in the proposed disturbance area and regularly throughout the Project Area and is likely a resident species in the Project Area. At the Kokoda Offset Site the grey-crowned babbler was recorded four times during the week of survey in May 2013 and is likely a resident species at the Kokoda Offset Site.

The eastern bentwing-bat is likely a regular visitor to the Project Area where it was recorded six times during surveys, but not from within the proposed disturbance area. The proposed disturbance area provides potential foraging habitat for the eastern bentwing-bat which as a cave dweller likely roosts in caves in or nearby Goobang National Park. At the Kokoda Offset Site the eastern bentwing-bat was recorded five times during the week of survey in May 2013. It is likely that the eastern bentwing-bat is a regular foraging visitor to the Kokoda Offset Site as the Kokoda Offset Site lacks cave and escarpment habitats were the species may roost. Eastern bentwing-bats that forage across the Kokoda Offset Site likely also roost in Goobang National Park to the north or other conservation reserves in the local area that have cave and escarpment habitats.

The little lorikeet has not been recorded in the proposed disturbance area or Project Area. The little lorikeet was recorded twice on the Kokoda Offset Site during May 2013 and is likely an occasional visitor when eucalypt trees flower on the Kokoda Offset Site.

The Kokoda Offset Site also provides potential habitat for the following threatened fauna species that were recorded in the proposed disturbance area or Project Area:

- Grey falcon;
- Black falcon;
- Spotted harrier;
- Little eagle;
- Bush stone-curlew;
- Superb parrot;
- Swift parrot;
- Masked owl;
- Brown treecreeper;
- Painted honeyeater; and
- Little pied bat.

7.3.6.3 Regional Location of the Kokoda Offset Site

The Kokoda Offset Site is strategically positioned within the regional landscape, occurring along a north-south potential corridor of remnant woodland and forest vegetation that runs along ridges and hills from north of Eugowra in the south, to east of Narromine in the North (refer to **Figure 7.1**). The north-south potential corridor includes Goobang National Park, the largest remaining conserved remnant of woodland and forest vegetation in the Central West region of NSW.

Searches for potential offset sites identified that there were no suitable potential offset sites in proximity (approximate 20 kilometre radius) to the Project Area that provided suitable habitat areas for impacted TECs or threatened species. Due to the high level of fragmentation of woodland habitats in the local area (approximate 20 kilometre radius) from historic clearing for farming practices, almost all remaining moderately sized or larger woodland habitat remnants were restricted to State Forests, TSRs or private land that was not available. Accordingly, the search for suitable offset sites was extended to a 50 kilometre radius of the Project Area to include areas where historic clearing for farming had not resulted in an extensively cleared local landscape.

The positioning of the Kokoda Offset Site along a regional north-south potential corridor of remnant woodland and forest vegetation is of higher conservation value than positioning within an agricultural landscape where such an offset would essentially would be highly isolated within a broader area of agricultural land. The Kokoda Offset Site's position along a regional north-south potential corridor of remnant woodland and forest vegetation increases the habitat area for species and communities along the potential corridor and at the same time strengthens the potential corridor by increasing the area of habitats within the potential corridor.

Within the north-south potential corridor of remnant woodland and forest vegetation the Kokoda Offset Site is also located approximately 12 kilometres north-west of Nangar National Park, approximately 8 kilometres south of Goobang National Park, approximately 12 kilometres west of Mandagery State Forest, approximately 17 kilometres east of Cookamidgera State Forest, and approximately 20 kilometres east of Back Yamma State Forest (refer to **Figure 7.1**). The Kokoda Offset Site, particularly through the recovery of DNG areas will facilitate the movement of species between these conservation areas and state forests by securing the conservation future of the site and through the increase in woodland habitat areas as the DNG areas return to woodland habitats.

7.3.7 Other Ecological Values of the Kokoda Offset Site

In addition to the key ecological values that the Kokoda Offset Site provides (listed above), the Kokoda Offset Site also provides other ecological values, such as the following.

7.3.7.1 Habitat for Non-threatened Vegetation Communities

The Kokoda Offset Site provides habitat areas for the non-threatened vegetation communities listed in **Table 7.4** above. Non-threatened vegetation communities provide habitat for a wide range of flora and fauna species.

7.3.7.2 Habitat for Potentially Occurring Threatened Fauna Species

In addition to the threatened fauna species listed in **Table 7.5** above, the Kokoda Offset Site also provides potentially suitable habitat for threatened fauna species that have not been recorded in the Kokoda Offset Site but which may occur. Threatened species may not have been recorded due to temporal and spatial variation of species distribution across the Kokoda Offset Site or due to the cryptic nature of some species. **Table 7.6** lists the 25 locally-occurring threatened fauna species which may occur within the Kokoda Offset Site due to the presence of suitable habitat areas.

7.4 Overall Assessment of Biodiversity Offset Strategy

The BOS provides an adequate and appropriate means to counterbalance the residual impacts of the Project on ecological values and provides for the enhancement of ecological values in the medium to long term. **Table 7.10** shows the threatened species, EECs and other significant ecological features impacted by the Project and indicates how the BOS addresses these residual impacts.

Table 7.10 – Project Impacts and Offset Actions for Key Matters to be Impacted

Values to be Offset	Project Area Habitat to be Impacted and Likely Size/Area of Impact	Kokoda Offset Site	20 Year Offset Outcome
Grey Box Grassy Woodland	23 ha woodland 15 ha DNG	10 ha woodland 96 ha DNG (with active regeneration to woodland)	106 ha woodland
White Box – Yellow Box – Blakely's Red Gum Woodland	0.28 ha	2.2 ha	2.2 ha
Habitat for the regent honeyeater and swift parrot[1]	37 ha	95 ha of equivalent habitat[2]	191 ha of equivalent habitat[2]
Habitat for the superb parrot[1]	52 ha	206 ha of potential habitat	206 ha of potential habitat
Habitat for threatened woodland birds and bats[1]	52 ha	236 ha of potential habitat	348 ha of potential habitat

1= The assessment of significance concluded that there was no potential for a significant impact on the regent honeyeater, swift parrot, grey-headed flying-fox, and threatened woodland birds and microbats in the Project Area, however they are included here to show that they are adequately covered by the BOS.

2 = Areas containing non-eucalypt species were devalued according to the percentage of non-eucalypt species (e.g. a 10 ha patch containing approximately 30 per cent non-eucalypts was given the equivalent habitat value of 7 ha).

**Potential habitat for Sloanes froglet and *Diuris tricolor* within the proposed disturbance area will be informed through further survey during suitable conditions to determine presence and/or refine extent of potential habitat. The outcomes of this assessment will be further considered as part of the implementation of the BOS.

Further survey of the Kokoda Offset Site will be undertaken during Spring 2013 and will target the potential occurrence of *Diuris tricolor* and threatened fauna species. Additional mapping of DNG areas will also be undertaken to refine management areas for the regeneration of DNG areas to woodland areas.

7.4.1 Assessment of the Biodiversity Offset Strategy Against Offsetting Guidelines

The following sections document the BOS against the NSW and Commonwealth guidelines for biodiversity offsetting.

7.4.1.1 Assessment of the Biodiversity Offset Strategy against the NSW OEH Principles for Biodiversity Offsetting (DECC 2008b)

The following provides an assessment of the BOS against DECC (2008b) Principles for Biodiversity Offsetting.

1. Impacts must be avoided first by using prevention and mitigation measures.

The Project has been designed in a manner that aims to avoid disturbance to the ecological features of the Project Area where possible, whilst maintaining the economic feasibility and practicality of all components of the Project. **Section 5.1** of this report documents the key Project avoidance measures undertaken. Where impact on ecological features has been unavoidable, a robust Impact Mitigation Strategy (refer to **Section 6.0**) has been provided that addresses the mitigation of these impacts in the long term.

NPM has sought to avoid and minimise potential impacts on the ecological values of the Project Area throughout the Project planning process. This has included avoidance of important areas of TECs during the project design phase (refer to **Section 5.1**).

As documented in **Section 6.0**, a comprehensive Impact Mitigation Strategy will be implemented to manage potential impacts of the Project. Key impact mitigation strategies include weed and feral animal control, general operation controls such as dust and fugitive light, rehabilitation of impact areas, surface water and groundwater management, habitat enhancement and a comprehensive tree felling procedure.

2. All regulatory requirements must be met.

The BOS for this Project (including all of its components) has been developed in accordance with the necessary offsetting regulatory requirements, particularly the EA requirements of the Director-General of DP&I (which includes consideration of all other relevant regulatory authorities).

3. Offsets must never reward ongoing poor performance.

NPM and Rio Tinto have a long history of sound environmental management within the Central West, including approximately 20 years of management of on-site environmental matters with a sound record. Specifically, NPM has a long established record of effective on ground environmental restoration activities, including the planting of approximately 10,000 native trees per year across its landholdings.

4. Offsets will complement other government programs.

The proposed BOS has been designed to complement government programs, where possible. Within the north-south potential corridor of remnant woodland and forest vegetation in which the Kokoda Offset Site occurs, the Kokoda Offset Site is located 12 kilometres from Nangar National Park and approximately 8 kilometres from Goobang National Park (refer to **Figure 7.1**). The Kokoda Offset Site, particularly through the recovery of DNG areas will facilitate the movement of species between these conservation areas (and nearby state forests) by securing the conservation future of the site and through the increase in woodland habitat areas as the DNG areas return to woodland habitats.

Further, the Strategy does not contradict any government programs relevant to the local area, nor does it negatively impact on national parks, nature reserves, state conservation areas, Ramsar sites or state forests in the area.

5. Offsets must be underpinned by sound ecological principles.

The BOS for the Project has been developed with the aim to maintain or improve the biodiversity values of the surrounding region in the medium to long term. To achieve this, a variety of actions/strategies will be employed to address specific residual impacts of the Project. Such actions and strategies are commonly employed in projects of this type and magnitude, and are well tested and accepted in relation to their ability to address impacts.

The land-based Kokoda Offset Site has been selected because of the significant ecological features it contains and the potential for habitat restoration over the medium to long term. The proposed offset property would offer an addition to the area of conservation lands (national parks, nature reserves, offsets, etc) in the region.

6. Offsets should aim to result in a net improvement in biodiversity over time.

The proposed BOS for the Project has been developed with the aim to maintain or improve the biodiversity values of the surrounding region in the medium to long term. With the various impact mitigation and offset strategies to be employed as part of the Project, it is likely that such an improvement will occur, particularly given that the Kokoda Offset Site is situated amongst existing conservation reserves in the region.

The Kokoda Offset Site will contribute towards a net improvement in biodiversity over time through the restoration and protection of areas of CEEC and EEC, the protection of areas of threatened species habitat, and through long-term ecological management and monitoring of these areas. A monitoring program will be developed through the preparation of an Biodiversity Offset Management Plan to assess the progress and determine the success of ongoing management actions. Adaptive management will be undertaken with the results of monitoring surveys determining the type and frequency of management and monitoring actions, as detailed in the Biodiversity Offset Management Plan.

7. Offsets must be enduring and they must offset the impact of the development for the period that the impact occurs.

The proposed BOS commitments for the Project will occur over the long-term, until such time that the commitments have been achieved, completion criteria have been met and sign-off has occurred. NPM commit to the ongoing management of the offset site in accordance with the Biodiversity Offset Management Plan.

The Kokoda Offset Site will be secured for in-perpetuity conservation. The mechanism for securing this conservation will be placing a covenant over the land reflecting this conservation status along with appropriate management mechanisms. This will be developed with the landholder and in consultation with DP&I, OEH, and DSEWPC (as relevant). The offsite property will be secured within 3 months of the granting of the Project approval.

8. Offsets should be agreed prior to the impact occurring.

The BOS allows for the up-front protection and pro-active conservation management of the Kokoda Offset Site, to provide immediate compensation for loss of habitat from the Project Area. A Biodiversity Offset Management Plan for the Kokoda Offset Site will be prepared to detail the planned improvements to the Kokoda Offset Site and its ongoing management for biodiversity conservation and enhancement purposes. Following the completion of the Biodiversity Offset Management Plan it will be submitted to DP&I for approval. The Biodiversity Offset Management Plan will include a concise and auditable strategy for the implementation of the offset.

NPM is in negotiations with the landholder to secure the offset property for the Project. It is anticipated that the offset will be secured within three months of the granting of Project approval.

9. Offsets must be quantifiable and the impacts and benefits must be reliably estimated.

The BOS has been developed through detailed consideration of known impacts on known records of threatened species (including their habitats) and TECs, which have been identified and discussed in **Section 5.0**. The selection of the Biodiversity Offset site took into account such identified impacts, and identified preferences based on the ability of such available areas to appropriately address such impacts. The potential for restoration and recreation of substantial areas of threatened species habitat was also prioritised in the selection of the Biodiversity Offset site.

In all cases the residual impacts and benefits of the Project were determined using the application of the precautionary principle. The area of impact has been derived from detailed GIS mapping of Project boundaries and impact areas, and the ecological survey, mapping and impact assessments have been completed by experienced ecologists.

All relevant ecological features of the Kokoda Offset Site are quantifiable and, where the information is available, are presented in such a manner in this report. The quantification is documented in **Table 7.10** of the report.

10. Offsets must be targeted.

The development of the BOS for the Project has been based on addressing the identified ecological residual impacts of the Project (refer to **Section 5.0**). These impacts have been identified via a thorough survey and assessment process, which has been described in detail within this document. Following this identification of residual impact, the BOS has been designed to provide mitigation actions targeted at each of the major impacts. **Table 7.1** clearly documents the key ecological species, communities and features that would be impacted by the Project and are hence targeted for offsetting.

11. Offsets must be located appropriately.

The Biodiversity Offset Site is located in an area that contains the relevant ecological features required for offsetting the residual impacts of the Project, as well as providing for the enhancement of the biodiversity values of the region in the medium to long term. The habitats represented within the Biodiversity Offset Site are representative of the habitats that will be lost within the Project Disturbance Area.

The Kokoda Offset Site is strategically positioned within the regional landscape, occurring along a north-south potential corridor of remnant woodland and forest vegetation that runs along ridges and hills from north of Eugowra in the south, to east of Narromine in the north (refer to **Figure 7.1**). The Kokoda Offset Site is also located in proximity to local national parks and state forests, occurring approximately 12 kilometres north-west of Nangar National Park, approximately 8 kilometres south of Goobang National Park, approximately 12 kilometres west of Mandagery State Forest, approximately 17 kilometres east of Cookamidgera State Forest, and approximately 20 kilometres east of Back Yamma State Forest (refer to **Figure 7.1**).

12. Offsets must be supplementary.

The land-based offset proposed as part of the Project does not overlap with any other government funded protection or habitat restoration program on that site. The Kokoda Offset Site is located on currently non-reserved land and will complement the reserve system through the in perpetuity conservation mechanism.

13. Offsets and their actions must be enforceable through development consent conditions, licence conditions, conservation agreements or a contract.

As the Impact Mitigation Strategy and BOS is being proposed as an integral component of the Project, it is expected that the commitments in these strategies will be included within future development consent conditions, and any other relevant legally binding consents. As outlined above NPM commit to the preparation of a Biodiversity Offset Management Plan, which will be submitted for approval to DP&I. The Biodiversity Offset Management Plan will detail specific management actions that will be auditable, along with an ongoing monitoring program.

NPM will secure the Kokoda Offset Site through placing a covenant over the land to provide for in perpetuity conservation. The covenant will be linked to appropriate management measures and obligations, as detailed in the Biodiversity Offset Management Plan. NPM will secure the property within 3 months of the granting of Project approval.

7.4.1.2 Assessment of the Biodiversity Offset Strategy against the Commonwealth Environmental Offsets Policy 2012

This section provides an assessment of the BOS proposed as part of the Project against the Commonwealth Government's Environmental Offset Policy (DSEWPC 2012). The Project was declared a controlled action on 21 May 2013 and requires approval from DSEWPC. The controlled action will be assessed via Preliminary Documentation prepared separately to this report. The assessment against the Commonwealth EPBC Act Environmental Offsets Policy and Offset Assessment Guide (October 2012) indicates that the proposed offset site provides in excess of the minimum requirements to offset the relevant Matters of National Environmental Significance.

1. Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matter.

The BOS for the Project has been developed with the aim to maintain or improve the biodiversity values of the surrounding region in the medium to long term. With the various impact mitigation and offset strategies to be employed as part of the Project, it is likely that such an improvement will occur as woodland and DNG areas are managed for conservation and DNG areas are managed to return to woodland condition.

The Kokoda Offset Site will be secured for in-perpetuity conservation. The mechanism for securing this conservation will be placing a covenant over the land reflecting this conservation status along with appropriate management mechanisms. This will be developed with the landholder and in consultation with DP&I, OEH, and DSEWPC (as relevant).

2. Suitable offsets must be built around direct offsets but may include other compensatory measures.

The BOS is based on the use of a direct off-site land-based offset that occurs within the South Western Slopes Bioregion.

3. Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter.

The level of statutory protection that applies to the impacted Matters of National Environmental Significance was considered during Project planning to ensure that an adequate offset was obtained, commensurate with the status of the threatened or migratory species. Assessment against the Commonwealth EPBC Act Environmental Offsets Policy and Offset Assessment Guide (October 2012) indicates that the proposed offset site provides in excess of the minimum requirements to offset the relevant Matters of National Environmental Significance. This is further detailed in the Preliminary Documentation report supporting DSEWPC assessment of the controlled action.

4. Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter.

Section 5.6 documents the area of impact on matters of national environmental significance, together with the relevant ecological features within the Kokoda Offset Site that is proposed for each Matter of National Environmental Significance. These show that the BOS is at least commensurate with the magnitude of impacts and delivers an outcome that is better than 'like for like'.

5. Suitable offsets must effectively account for and manage the risks of the offset not succeeding.

The BOS is based on the use a direct land-based offset that occurs within the South Western Slopes Bioregion. Project consent conditions and subsequent auditing processes will ensure that the offset is established removing the risk of the offset sites not becoming established. The Kokoda Offset Site contains existing woodland vegetation and areas of DNG. Once established and managed as offset sites, the risk of the offset not succeeding is related to the return of DNG communities to woodland communities, and to the management of threats such as weeds and pests. NPM has a record of successful tree plantings within the Project Area and the risk of regeneration areas failing is low. NPM has a good record of pest and weed management and current management strategies will be extended across the Kokoda Offset Site.

6. Suitable offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs.

The land-based offset proposed as part of the Project does not overlap with any other government funded protection or habitat restoration program at the site. The Kokoda Offset Site is located on currently non-reserved land and will add an area of conserved land to the region.

7. Suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable.

The BOS allows for the up-front protection and pro-active conservation management of the Biodiversity Offset site, to provide immediate compensation for loss of habitat from the Project Area. The Kokoda Offset Site will be secured by NPM as an offset site within three months of securing Project approval.

The area of impact has been derived from detailed GIS mapping of Project boundaries and impact areas, and the ecological survey, mapping, impact assessments and design of the BOS have been completed by qualified ecologists ensuring that the Strategy is scientifically robust, transparent and reasonable.

This report clearly documents the survey methods undertaken (refer to **Section 3.0**), the results of all surveys (refer to **Section 4.0** and appendices), the assessment of the level of impacts (refer to **Section 5.0** and appendices), the mitigation and management measures to be undertaken (refer to **Section 6.0**) and the development of and justification for the offset strategy (refer to **Section 7.0**) to compensate for the residual impacts of the Project.

8. Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.

As the Impact Mitigation Strategy and BOS is an integral component of the Project, it is expected that the commitments in this strategy will be included within the Project development consent conditions, and any other legally binding consents. It is anticipated that regular auditing of offset sites will be undertaken.

Currently no annual ecological monitoring is undertaken at NPM. As part of the revision of the existing FFMP (NPM 2008) for this Project it is proposed that an ecological monitoring program is established, focusing on the monitoring of utilisation and function of nest boxes to be installed following clearing activities (see **Section 6.1.4.2**) and flora and fauna monitoring of biodiversity offset areas, both existing and proposed. The proposed ecological monitoring program will include various targeted ecological surveys which:

- provide a good indication of the status of the ecological values being monitored;
- are relatively simple to measure and are reproducible; and
- are cost effective.

Details on the monitoring program will be documented within the revised FFMP (NPM 2008), to be completed post-approval, and prior to the commencement of works in the proposed disturbance area. This document will contain the specific requirements of the monitoring program, including methods to be used, monitoring frequencies and locations.

7.4.2 Conclusion

The impact assessment (refer to **Section 5.0**) identified the need for a comprehensive BOS to compensate for the likely residual impacts of the Project that could not be avoided or mitigated. The aim of the BOS is to maintain and enhance the biodiversity values of the region in the medium to long term. The proposed BOS comprises the establishment of the Kokoda Offset Site, a land based offset that provides for both the immediate protection and conservation of relevant ecological values impacted by the Project and also enhancement of these values through active re-establishment of EEC and threatened species habitat across the landholdings.

The BOS described in this document has outlined the proposed offsetting components that have demonstrated an appropriate and valuable offsetting outcome in achieving the goals of:

- providing an offset that maintains and enhances the biodiversity values of the regional in the medium to long term;
- providing an offset that contains as many as possible of the threatened vegetation communities, endangered flora populations, threatened flora species and threatened fauna species impacted by the Project;
- providing an offset that is strategically located or in a regionally significant position;
- providing an offset in which an environmental gain can be made via appropriate management strategies;
- securing an offset in perpetuity;
- developing a management strategy for the positive environmental management of a proposed offset site, but with appropriate consideration of the existing rural nature of the area;
- as a minimum provide an offset that has the same ecological value as the residual significant impacts of the Project on threatened vegetation communities, endangered flora populations, threatened flora species and threatened fauna species; and
- where possible provide an offset that exceed the ecological value of the residual significant impacts of the Project on threatened vegetation communities, endangered flora populations, threatened flora species and threatened fauna species.

The Kokoda Offset Site provides conservation of, 106 hectares of Grey Box Grassy Woodland EEC (including 96 hectares of DNG that will be returned to woodland form), 2.2 hectares of White Box – Yellow Box – Blakely's Red Gum Woodland EEC/CEEC, known habitat areas for the grey-crowned babbler, little lorikeet and Eastern bentwing-bat, and potential habitat for a number of threatened fauna species.

This represents an environmental gain and a net improvement in the conservation of these species in the region, and more broadly in the South Western Slopes bioregion.

Together, the Kokoda Offset Site and the proposed mitigation measures (refer to **Section 6.0**) ensure that the residual ecological impacts of the Project are adequately mitigated, offset and counterbalanced.

8.0 Conclusion

The Northparkes Mines Step Change Project will result in impacts on native vegetation communities, native flora species and native fauna species. Where possible NPM has avoided or minimised impacts to TECs, threatened flora species and threatened fauna species, through a detailed assessment of the ecological value of the Wider Study Area (refer to **Section 5.1**). In addition to the avoidance and/or minimisation of areas of impact to TECs and threatened flora and fauna species, NPM also proposes a range of mitigation strategies to minimise impacts on such TECs and threatened species (refer to **Section 6.0**).

The Project will result in the removal of 37 hectares of native woodland communities, 15 hectares of derived native grassland communities, 25 hectares of plantation, 39 hectares of exotic grassland, 112 hectares of cultivated land and 11 hectares of disturbed land. Of these communities, two TECs will be impacted with the removal of:

- 38 hectares (23 hectares woodland and 15 hectares DNG) of Grey Box Grassy Woodland EEC (TSC and EPBC Act); and
- 0.28 hectare of White Box – Yellow Box – Blakely's Red Gum Woodland EEC (TSC Act)/CEEC (EPBC Act).

The impact of the Project on these TECs is unlikely to be significant.

A total of six threatened flora species were identified with potential to occur in the proposed disturbance area. None of the six species were recorded in the proposed disturbance area however, one of those species, the pine donkey orchid (*Diuris tricolor*), was recorded in the surrounding Wider Study Area. The pine donkey orchid may occur in the proposed disturbance area and if it does occur, the Project may have a potentially significant impact on the species. The remaining five threatened flora species are unlikely to be significantly impacted by the Project.

A total of 25 threatened fauna species were identified with potential to occur in the proposed disturbance area and of which two were identified in the proposed disturbance area and 15 were identified in the Wider Study Area. Twenty four of the threatened fauna species are unlikely to be significantly impacted by the Project. The potential presence of one species in the proposed disturbance area, Sloane's froglet (*Crinia sloanei*), a ground dwelling sedentary species, could not be ruled out and the species may potentially be significantly impacted by the Project.

A BOS will be developed by NPM to address the residual impacts of the Project.

The impact assessment identified the need for a comprehensive BOS to compensate for the likely residual significant impacts of the Project that could not be avoided or mitigated. The proposed BOS comprises the establishment of the Kokoda Offset Site a 350 hectare property located south of Mandagery, approximately 50 kilometres south-east of the Project Area. The Kokoda offset site provides, habitat for both TECs to be impacted by the Project, habitat for two threatened fauna species to be impacted by the Project and potential habitat for other threatened fauna species to be impacted by the Project. Additionally the BOS provides for the recovery of 111 hectares of Grey Box Grassy Woodland EEC from DNG form to woodland form through active planting and maintenance.

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APPENDIX A

Comparison of the Fauna Survey Effort
Undertaken Compared to the Guidelines

Appendix A – Comparison of the Fauna Survey Effort Undertaken Compared to the Guidelines

Table 1 – Application of DECCW 2004 and 2009 Fauna Field Survey Guidelines

Field Survey Techniques Applied[1]	Suggested Minimum Effort[1]	Effort Achieved & Commentary
Amphibians[2]		
Crinia sloanei - Combination of call surveys and nocturnal searches in suitable habitat after rain. Minimum of one 200-metre transect per water body or inundated area, repeated on a minimum of two separate nights. Tadpole surveys are not suitable for this species as they are unable to be distinguished from *Crinia parinsignifera* or *C. signifera*. Survey March to November.		Suitable habitat was recorded within Project Disturbance Area and species was recorded in Wider Study Area. This species was targeted (refer to Section 3.4.6 of main report). Call surveys conducted on eight occasions during appropriate survey period, although not following rain events. A total of 20.5 hours of nocturnal amphibian surveys were conducted including 10.5 person hours after rain out of season for the species. No searches were undertaken across the Project Disturbance Area.
Neobatrachus pictus - Search intermittent puddles and other water sources in the nights following heavy rain for two nights. Searches for tadpoles in permanent water sources at other times of the year. One light trap per water source for water bodies less than 50 metres in area, or one dip net sweep from each water body. Survey any time of the year after heavy rain.		Potentially suitable habitat was identified within the Wider Study Area. This species was not specifically targeted. However, 10.5 person hours of nocturnal searches of puddles and inundated areas were undertaken following heavy rainfall over one night (refer to Section 3.4.3.2 of the main document). A related species, common spadefoot (*Neobatrachus sudelli*) was recorded in the Wider Study Area. No specific searches were undertaken across the Project Disturbance Area.
Reptiles		
Habitat search	30 minute search on two separate days targeting specific habitat.	21 person hours of diurnal reptile and amphibian survey were completed over a total of 11 days across the Wider Study Area. No specific searches were undertaken across the Project Disturbance Area.
Pitfall traps	24 trap nights, preferably using six traps for a minimum of four consecutive nights.	Not undertaken. Habitat searches, spotlighting and opportunistic sightings adequately sampled reptile species.
Spotlighting	30 minute search on two separate nights targeting specific habitat.	10 person hours of nocturnal reptile and amphibian survey were completed over a total of five nights across the Wider Study Area. No spotlighting was undertaken across the Project Disturbance Area.

Field Survey Techniques Applied[1]	Suggested Minimum Effort[1]	Effort Achieved & Commentary
Diurnal Birds		
Area search	Species time curve approach should be utilized.	33.5 person hours of bird survey were completed over 15 separate days across the Wider Study Area. When combined with opportunistic sightings at each site, few new bird species were recorded by the end of the third survey period. Two surveys totaling two person hours were undertaken across the Project Disturbance Area.
Wetland census	A one-hour census at dawn or dusk, for each identified wetland.	No suitable wetland habitat was present.
Water source census	A 20 minute census at dawn or dusk, for each identified water source.	Farm dams were not large enough to warrant individual surveys. Farm dam birds were surveyed opportunistically during travel around the Wider Study Area.
Nocturnal Birds		
Call playback	Sites should be separated by 800 metres to 1 kilometre and each site must have the playback session repeated as follows: • At least 5 visits per site, on different nights are required for the powerful owl, barking owl and the grass owl; • At least 6 visits per site for the sooty owl, and 8 visits per site for the masked owl are required. Sites for bush stone-curlew surveys should be 2 to 4 kilometre apart and conducted during the breeding season.	At total of 20 call playback sessions were completed on five different nights. Of these, 11 sessions targeted owls and the bush stone-curlew, while the remaining nine sessions targeted the bush stone-curlew only. Minimum effort achieved for the powerful and barking owl. Minimum effort not achieved for the masked owl however this species was recorded in the Wider Study Area. Minimum effort achieved for the bush stone-curlew. 10 surveys were conducted for the bush stone-curlew during the breeding season. Of these, nine sessions were conducted 2-4 km apart, and surveys spanned two seasons over a total of three nights. No call playback sessions were undertaken across the Project Disturbance Area, however two were undertaken in the vicinity of the Project Disturbance Area and surveyed parts of the Project Disturbance Area.
Day habitat search	Search habitat for pellets and likely hollows. Flushing of bush stone-curlews by walking through potential habitat.	Pellets were searched for opportunistically during reptile and amphibian searches, koala SAT and habitat tree assessments and general habitat surveys. Reptile and amphibian searches and bird searches covered areas of potential habitat for the bush stone-curlew. Two koala SAT and habitat tree assessments were undertaken across the Project Disturbance Area.

Field Survey Techniques Applied[1]	Suggested Minimum Effort[1]	Effort Achieved & Commentary
Stag watching	Observing potential roost hollows for 30 minutes prior to sunset and 60 minutes following sunset.	No potential roost hollows were identified. Suitably sized hollows existed but none were more suitable that others. As such stag watching was not undertaken due to the extremely low chance of selecting a potential roost hollow. Spotlighting and call playback also sampled nocturnal birds.
Spotlighting	Spotlighting for plains wanderer and bush stone-curlew by foot or from a vehicle driven in first gear.	10 one person hour nocturnal walking spotlight searches were completed on five separate nights across the Wider Study Area. A total of 8.95 km of driving spotlight transects were also completed across the Wider Study Area. No spotlighting was undertaken across the Project Disturbance Area.
Mammals (excluding bats)		
Small Elliott traps (small mammals)	100 trap nights over 3 to 4 consecutive nights.	Minimum effort exceeded. Three survey sites were surveyed over two seasons for a total of 200 trap nights over eight nights. A fourth site was surveyed over one survey period for a total of 100 trap nights over four nights. In total, 700 trap nights over 20 nights were achieved across the Wider Study Area. No trapping was undertaken across the Project Disturbance Area.
Large Elliott traps (medium to large animals)	100 trap nights over 3 to 4 consecutive nights.	Minimum effort exceeded. Two survey sites were surveyed over two seasons for a total of 200 trap nights over eight nights. A third trap site was surveyed over two survey periods for a total of 176 trap nights spanning eight nights. A fourth site was surveyed over one survey period for a total of 100 trap nights over four nights. In total, 676 trap nights over 20 nights across the Wider Study Area. No trapping was undertaken across the Project Disturbance Area.
Arboreal Elliott traps (arboreal animals)	24 trap nights over 3 to 4 consecutive nights	Minimum effort exceeded. Three survey sites were surveyed over two seasons for a total of 144 trap nights over eight nights. A fourth site was surveyed over one survey period for a total of 24 trap nights over four nights. In total, 168 trap nights over 20 nights was achieved across the Wider Study Area. No trapping was undertaken across the Project Disturbance Area.

Field Survey Techniques Applied[1]	Suggested Minimum Effort[1]	Effort Achieved & Commentary
Wire cage traps (medium to large animals)	24 trap nights over 3 to 4 consecutive nights	Minimum effort exceeded. Three survey sites were surveyed over two seasons for a total of 144 trap nights over eight nights. A fourth site was surveyed over one survey period for a total of 24 trap nights over four nights. In total, 168 trap nights over 20 nights was achieved in the Wider Study Area. No trapping was undertaken across the Project Disturbance Area.
Pitfall traps with drift nets (small mammals)	24 trap nights over 3 to 4 consecutive nights	Not undertaken. Elliott trapping and hair tubes adequately sampled small mammal species.
Hair tubes (Small to medium animals)	10 large and 10 small tubes in pairs for at least 4 days and 4 nights	Minimum effort exceeded. Three survey sites were surveyed over two seasons for a total of 4800 hair tube nights over 40 nights. A fourth site was surveyed over one survey period for a total of 180 hair tube nights over 9 nights. In total, 4980 terrestrial hair tube nights over 49 nights was achieved in the Wider Study Area. No hair tube surveys were undertaken across the Project Disturbance Area.
Arboreal hair tubes (arboreal animals)	3 tubes in each of 10 habitat tree up to 100 hectares of stratification unit, for at least 4 days and 4 nights	Minimum effort exceeded. Three survey sites were surveyed over two seasons for a total of 2400 hair tube nights over 40 nights. A fourth site was surveyed over one survey period for a total of 90 hair tube nights over 9 nights. In total, 2490 arboreal hair tube nights over 49 nights was achieved in the Wider Study Area. No hair tube surveys were undertaken across the Project Disturbance
Spotlighting on foot (arboreal and terrestrial mammals)	2 x 1 hour and 1 kilometre up to 200 hectares of stratification unit, walking at approximately 1 kilometre per hour on 2 separate nights	Minimum effort exceeded. A total of 10 person hour searches were undertaken across the Wider Study Area spanning the spring, summer and autumn survey periods. No spotlighting by foot was undertaken across the Project Disturbance Area.
Spotlighting from vehicle (arboreal and terrestrial mammals)	2 x 1 kilometre of track at maximum speed of 5 kilometre per hour, up to 200 hectares of stratification unit, on 2 separate nights	19.58 km of spotlighting from a vehicle was undertaken over the summer and autumn survey periods. No driving spotlighting was undertaken across the Project Disturbance Area.
Sand plots (mostly medium to large terrestrial mammals)	6 soil plots for 4 nights	Sand plots were not undertaken. Spotlighting surveys and opportunistic sightings sampled terrestrial mammals.

Field Survey Techniques Applied[1]	Suggested Minimum Effort[1]	Effort Achieved & Commentary
Call playback (gliders, koalas)	2 sites per stratification unit up to 200 hectares, plus an additional site per 100 hectares above 200 hectares. Each playback site must have the session conducted twice on separate nights.	Minimum effort exceeded. A total of 11 call playback sessions including the calls of the koala and squirrel glider were completed on five different nights. These sessions were conducted at a total of four sites, each of which was surveyed a minimum of two times spanning spring, summer and autumn survey periods.
Stag-watching (gliders and possums)	Observing potential roost hollows for 30 minutes prior to sunset and 60 minutes following sunset.	Suitable sized hollows existed but none were more suitable that others. As such stag watching was not undertaken due to the extremely low chance of selecting a potential den hollow. Spotlighting and call playback also sampled arboreal mammals.
Search for scats and signs (all mammals)	30 minutes searching each relevant habitat, including trees for scratch marks.	Scat and sign searches were undertaken as part of diurnal reptile and amphibian searches, koala SAT and habitat tree assessments and general habitat surveys. 21 person hours of diurnal reptile and amphibian survey were completed over eight days spanning the spring, summer and autumn survey periods. 15 koala SATs were undertaken over five days during the autumn survey period. A total of 450 trees were searched for signs of use. Two koala SATs and habitat tree assessments were undertaken across the Project Disturbance Area during the autumn survey period.
Track search (Mostly medium to large terrestrial mammals)	1 kilometre of track search with emphasis where substrate is soft.	Undertaken opportunistically during all other survey activities. No areas of soft substrate existed along tracks.
Collection of predator scats (all mammals)	Opportunistic collection of predators scats for hair analysis.	Undertaken opportunistically.
Bats		
Harp trapping	Four trap nights over two consecutive nights (with one trap placed outside the flyways for one night).	Three survey sites were surveyed over two seasons for a total of 24 harp trap nights over 6 nights. A fourth site was surveyed over one survey period for a total of 8 harp traps nights over 4 nights. In total, 32 harp trap nights over 10 nights was achieved in the Wider Study Area. No harp trapping was undertaken across the Project Disturbance Area.

Field Survey Techniques Applied[1]	Suggested Minimum Effort[1]	Effort Achieved & Commentary
Ultrasonic call recording	Two sound activated recording devices utilized for the entire night (a minimum of four hours) starting at dusk for two nights.	Three survey sites were surveyed over two seasons for a total of 24 entire nights of ultrasonic call recording over 6 nights. A fourth site was surveyed over one survey period for a total of 8 entire nights of ultrasonic call recording over 4 nights. In total, 32 entire nights of ultrasonic call recording over 10 nights was achieved in the Wider Study Area. No ultrasonic call recording was undertaken across the Project Disturbance Area.
Mist netting	For targeted survey: one trap set for at least two hours duration starting at dusk, for two nights.	Not undertaken due to the requirement for a specific licence.
Trip line	For targeted survey of water bodies; at least two hours' duration starting at dusk, for two nights.	Not undertaken. Anabat surveys and harp trapping sampled micro-bats.
Spotlighting and transect walking	For targeted survey near likely food sources: 2 x 1 hour spotlighting on two separate nights.	A total of 10 person hour searches were undertaken across the Wider Study Area over the spring, summer and autumn survey periods. No spotlighting or transect walking was undertaken across the Project Disturbance Area.
Day habitat search	Search for bat excreta at or near potential habitats.	Undertaken opportunistically.

1 – Adapted or repeated from DEC (2004) and DECC (2009).
2 – Only those amphibian species identified in Section 4.0 of the main document or likely to occur based on the presence of suitable habitat are included.

APPENDIX B

Literature Review

Appendix B – Literature Review

The results of the literature review undertaken as described in Section 3.1 are presented below.

Sinclair G, McMullen A & Peters R 1997. A case study of bird mortality and cyanide management at Northparkes.

This report discusses the events that lead to mass bird mortality events at the NPM goldmine as a result of cyanide poisoning. It also details the outcomes of this event, in terms of improvements to rehabilitation management planning.

During the Stage 1 processes of gold extraction at NPM between 1994 and 1995 open cut mining of gold was being undertaken which involved the processing of transition gold ore with a high copper content which lead to the build up of soluble copper-cyanide complexes in the tailings dam resulting in the death of the birds.

At the time, the most significant bird species that were considered to potentially use the habitat on the NPM site included the superb parrot (*Polytelis swainsonii*), painted honeyeater (*Grantiella picta*) and bush-stone curlew (*Burhinus grallarius*).

The problem arose as there was no regulatory need to monitor for the presence of weak acid dissociable cyanide complexes, which was consequently not detected at the tailings dam. This coupled with a period of increased seasonal bird movements due to unseasonal rain events; resulted in approximately 2700 bird fatalities.

As a direct result of the problems associated with the Stage 1 processing a conventional flotation method of extraction was utilised for the Stage 2 processes which did not involve the use of cyanides for extraction. Remedial actions undertaken were inclusive of bird management, monitoring, cyanide detoxification, compliance and reporting, safety, security and information gathering as well as community information sharing.

This bird mortality event had significant flow-on effects for future approvals for NPM and likely other companies involved in gold extraction and processing as it exposed clear weaknesses in the impact assessment process. This event also highlighted the need for detailed analysis and assessment of all potential hazards prior to the commissioning of mines.

As a consequence continual improvement via adoption of best practice is now central to the Northparkes environmental policy.

North Mining Limited 2006. Management Plan – Site Wide – Landuse.

The Landuse Management Plan applies to NPM operational areas and the surrounding lands managed by NPM and addresses issues of land management, biodiversity conservation, environmental offsets, and interactions with adjoining lands, as required under Rio Tinto Environmental Standards. The management plan covers nearly 90,000 hectares of mining and exploration leases.

The management plan addresses how NPM should manage issues of biodiversity conservation inclusive of:

- fencing measures for remnant vegetation;
- rehabilitating areas;
- areas of remnant vegetation;
- crop management techniques and farming practices;
- weed and pest control;
- environmental offsets; and
- interactions with adjoining lands/communities.

NPM has, where possible been able to maintain large sections of remnant vegetation. These remnant areas provide a basis from which NPM has planned rehabilitation work, with the objective that by the end of mine life these remnant areas would have some level of connectivity.

R. W. Corkery & Co. Pty. Limited. 2006. Environmental Assessment: Northparkes Mine – E48 Project.

This document was prepared to accompany an application for the extension of the life of the NPM, as the current ore resource being mined at the time was due to run-out in 2009. The proposed project covered a total of 2500 hectares of which approximately 930 hectares was already considered to be disturbed.

The project was proposed to remove approximately 108 hectares of land with scattered woodland vegetation to be mitigated by the use of biodiversity offsets. While local fauna habitat would be removed, no significant impacts were considered likely to occur to threatened fauna species.

GHD 2007. Pre Clearing Survey.

GHD was engaged by NPM in order to conduct a pre-clearing and clearing survey at Northparkes mine with surveys concentrated on the footprint of the proposed E22 Waste Dump. The main objective of the surveys was the identification of vegetation that may harbour fauna.

The superb parrot was observed on a numerous occasions during the survey period, including a fledgling. Most of these were observed flying over Limestone State Forest.

The grey-crowned babbler was also identified in nearby woodland, although due to a lack of favoured ground-cover they were not considered likely to be using the site as core habitat.

No threatened flora species, endangered flora populations or EECs were identified during the survey.

North Mining Limited 2008. Management Plan – Site Wide – Flora and Fauna.

NPM is responsible for impacts to flora and fauna on the mining leases as well as land that it manages that is not a part of mining or associated activities. As a consequence, the Northparkes Flora and Fauna Management Plan was developed to ensure the protection and management of remnant ecosystems, significant flora and fauna, and ecological communities within the NPM site.

The following four vegetation communities have previously been identified across the NPM site:

- Tall *Eucalyptus moluccana* (Grey Box) Open Woodlands;
- Mid – High/Tall *Callitris glaucophylla* (White Cypress Pine) – *Eucalyptus populnea* (Popular Box) open woodland to savannah grassland;
- Mid – High/Tall *Eucalyptus populnea* (Popular Box) open woodland to woodland; and
- Mid – High/Tall *Eucalyptus albens* (White Box) – *Callitris glaucophylla* (White Cypress Pine) woodland.

Note that the identification of *Eucalyptus moluccana* above is erroneous, and should refer to *Eucalyptus microcarpa*.

The communities were generally confined to scattered remnants within agricultural areas and were considered to be in generally poor condition and of low conservation value. However some of them were considered to constitute the state listed White Box – Yellow Box – Blakely's Red Gum Woodland EEC and the Commonwealth listed White Box – Yellow Box – Blakely's Red Gum Woodland and Derived Native Grasslands CEEC.

No threatened flora species were recorded in the NPM site.

A total of 78 vertebrate fauna species were identified during comprehensive fauna surveys of the NPM site during the environmental assessment process. Those surveys indicated the presence of one threatened species, the yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*), within the NPM site and two other threatened species, the grey-crowned babbler (*Pomatostomus temporalis*) and the superb parrot (*Polytelis swainsonii*), within the vicinity of the NPM site.

GHD 2008. Anna's Island – Pre Clearing Survey.

GHD was engaged by NPM to conduct a fauna pre-clearing and clearing survey at the NPM site. Surveys were conducted in an area known as Annas Island.

No threatened fauna species were identified during the survey, however one disused nest that was consistent with that of a grey-crowned babbler was identified.

GHD 2009a. North Mining Limited – Northparkes Mines Section 75W Environmental Assessment.

GHD was commissioned to undertake an Environmental Assessment for Northparkes for the continuation of underground gold/copper mining of the E48 ore body which would replace the E26 underground operation. The EA involved the development of approximately 12 kilometres of underground works, construction of 214 draw points, a new crusher, workshops and facilities, a new section of underground conveyor and the construction of a surface overland conveyor.

The proposed modification was considered to have a potentially significant impact on approximately 14.3 hectares of remnant habitat; inclusive of 1.1 hectares of White Box Yellow Box Blakely's Red Gum EEC and 13.2 hectares of Inland Grey Box Woodland EEC. It was also considered likely to have an impact on a local population of the grey-crowned babbler.

The outcome of the ecological assessment was that the proposed modification would require an offsets strategy consisting of 65 hectares of 'like for like' vegetation communities to be conserved for perpetuity. Given the proposed offset strategy and the proposed management and mitigation measures outlined in the EA, it was concluded that the proposed modification was unlikely to impose a significant impact on any matters of National Environmental Significance and a referral under the EPBC Act was not made.

The methodology undertaken for the project was inclusive of desk-top investigations as well as field surveys. The flora survey component included six 20 metre by 20 metre quadrats in native vegetation, four random meander transects of approximately 300 metre by 10 metre through regrowth, planted and/or highly disturbed communities; and additional random meander surveys noting species not detected during other surveys.

The fauna survey methodology was undertaken from 12 to 15 October 2008 and was targeted towards the detection of threatened species identified during the literature review, including bird searches, active searches for herpetofauna, Anabat call surveys, call playback, stag watching, spotlighting, habitat assessment and opportunistic observation.

Surveys identified 94 plant species, none of which were identified as threatened species. However potential suitable habitat was identified for:

- Austrostipa wakoolica;
- silky Swainson pea (*Swainsona sericea*); and
- slender darling pea (*Swainsona murrayana*).

Two EECs were identified within the study area; White Box Yellow Box Blakelys Red Gum Woodland EEC; as well as the Inland Grey Box Woodland Listed as an EEC under the TSC Act. The noxious weed species *Xanthium occidentale* was also identified.

Fauna surveys identified 13 mammals, 44 birds, five frogs and two reptiles. One threatened bird species, the grey-crowned babbler was identified and one other threatened species the superb parrot was identified adjacent to the study area in the Limestone State Forest. One potentially occurring threatened species, the squirrel glider was potentially identified, however this was not a confirmed record, and may have been a sugar glider. However GHD used the precautionary principle and documented the record as a squirrel glider.

GHD 2009b. North Mining Limited - Northparkes Mines Section 75W Modification– Biodiversity Offset Strategy.

GHD was engaged by NPM to identify a suitable offset strategy to be associated with the Section 75W modification application to the existing development consent (DC-06-0026); consequently an offset strategy was prepared as an accompaniment to the Environmental Assessment and assessed the Director General's requirements.

The offset area is located in the northern portion of Lot 3, DP 830291 in the Parkes Local Government Area and has connectivity with a large travelling stock route. The offset will conserve and rehabilitate 65 hectares of native vegetation, which is includes approximately 42 hectares of native grassy woodland vegetation communities which are similar to those

within the development area. Additionally both the grey-crowned babbler and superb parrot had previously been recorded in the offset area.

GHD 2009c. Northparkes Mines Water Pipeline Removal of Two Additional Trees.

A brief letter was prepared for NPM to document the results of a clearing inspection undertaken at NPM. The clearing event was undertaken on Thursday 12 November 2009 and involved the removal of two grey box (*Eucalyptus microcarpa*) trees. No threatened species were identified during the tree-felling.

GHD 2009d. E22 Waste Dump (W4) Extension – Pre-clearing and Clearing Survey.

GHD was engaged by NPM to undertake clearing and pre-clearing surveys of the proposed E22 W4 waste dump footprint. Survey effort was concentrated on vegetation surrounding the disused 'Braeside' Homestead, part of which was assessed during the 2007 pre-clearing survey undertaken by GHD (2007).

Threatened species identified during the surveys were the grey-crowned babbler, identified from the adjacent Limestone State Forest and the superb parrot.

GHD 2009e. Northparkes Mine. Development of Conveyor Alignment and E48 Subsidence Zone Pre Clearing and Clearing Surveys.

The study area of the report included the E48 Overland Conveyor Alignment and associated Retention Pond, access roads, laydown yards, and E48 subsidence Zone. The site is adjacent to Limestone State Forest; with approximately 4 hectares of the conveyor occurring inside the Limestone State Forest.

Threatened species identified during the surveys were the grey-crowned babbler and superb parrot. The grey-crowned babblers were observed throughout the study area while the superb parrot was observed less frequently foraging in eucalypt trees.

DnA Environmental 2010a. 2010 Estcourt Offset Area Monitoring Report.

This report is the result of 2010 monitoring undertaken in the Estcourt Offset Area rehabilitation monitoring. DnA was commissioned by NPM in order to satisfy monitoring requirements of the voluntary conservation agreement with the then DECCW.

Rehabilitation monitoring was undertaken on 24 September 2010. The monitoring methodology was consistent with that used in the NPM annual revegetation monitoring program.

The offset site monitored comprised 65 hectares of remnant vegetation and agricultural land in the northern portion of Lot 3, DP 830291 in the Parkes LGA. The five Estcourt monitoring sites were compared to woodland reference sites to assess the changes occurring within the existing woodland and active revegetation areas. Monitoring undertaken was inclusive of photo monitoring, landscape function analysis, and 5 vegetation monitoring sites of dimensions 50 metres by 20 metres. The focus of monitoring undertaken was on flora and vegetation recovery.

No threatened species were identified.

DnA Environmental 2010b. 2010 Rehabilitation Monitoring Report.

DnA Environmental was commissioned by NPM to undertake rehabilitation monitoring. Rehabilitation monitoring occurred between 13 and 24 September 2010. The methodology utilised was consistent with that of the 2009 monitoring (DnA Environmental 2010a and 2010b).

Four woodland and three native grassland reference sites and six woodland and eight grassland rehabilitation sites were monitored for comparative purposes. The results of each rehabilitation site were referenced against their corresponding reference sites and were also measured against key performance indicators.

No significant flora or fauna species were identified during these surveys.

GHD 2010a. Vegetation Management Plan 2010.

The vegetation management plan was prepared in response to an offset site identified in the Biodiversity Offset Strategy (GHD 2009b). The offset consisted of 65 hectares of remnant vegetation and agricultural land in the northern portion of Lot 3, DP 830291 in the Parkes LGA that is owned and managed by NPM.

The plan provides details on plant species, planting techniques, revegetation methods and maintenance requirements for the offset site.

Two threatened fauna species, the grey crowned babbler (*Pomatostomus temporalis temporalis*) and superb parrot (*Polytelis swainsonii*) are known to use the habitat of the offset site. The offset site was found to contain the Inland Grey Box Woodland state listed EEC, and additionally has strong connectivity with an adjacent travelling stock route to the east.

GHD 2010b. Northparkes Mines Vegetation Mapping Project – Vegetation Communities, Land Use and Conservation Significance.

GHD was commissioned by NPM to prepare maps of the NPM land under the categories of vegetation communities, conservation significance and land use.

The vegetation mapping project adopted a methodology comparable to undertaking preliminary mapping of the study area and focussed on rapid surveys of flora and vegetation present within the project area.

While a single quadrat was completed within each vegetation community, the following was not recorded:

- the location of the quadrats;
- how quadrat locations were selected;
- the size of the quadrats; and
- the cover-abundance score of each species present within each quadrat (only presence-absence was recorded).

The study area consisted of 6100 hectares of surrounding properties owned by NPM. Approximately 1630 hectares of the study area were under active mining leases and the remaining land consisted of agricultural land managed by NPM or under lease agreements.

A total of 18 vegetation communities were mapped during surveys, comprising 14 native remnant vegetation communities and 4 non-native communities. The mapped native remnant vegetation community types were based on the nomenclature of Benson *et*. *al*. (2006) and are listed below:

- ID No. 7 – River Red Gum – Warrego Grass – herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion.

- ID No. 26 – Weeping Myall open woodland of the Riverina and NSW South-western Slopes Bioregions.

- ID No. 28 – White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone.

- ID No. 74 – Yellow Box – River Red Gum tall grassy riverine woodland of NSW South West Slopes and Riverina Bioregions.

- ID No. 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.

- ID No. 80 – Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South-western Slopes and Riverina Bioregions.

- ID No. 82 – Western Grey Box – Poplar Box – White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion.

- ID No. 83 – Yellow Box woodland on sandy loam soils on alluvial plains mainly in the upper Darling Riverine Plain Bioregion.

- ID No. 105 – Poplar Box grassy woodland on flats mainly in the Cobar Peneplain and Murray-Darling Depression Bioregions.

- ID No. 110 – Western Grey Box – Cypress Pine shrubby woodland on stony footslopes in the NSW South Western Slopes and Riverina Bioregions.

- ID No. 201 – Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South-western Slopes Bioregion.

- ID No. 248 – Mixed box eucalypt woodland on low sandy-loam rises on alluvial plains in central western NSW.

- ID No. 267 – White Box – White Cypress Pine – Western Grey Box shrub/grass/forb woodland in the NSW South-western Slopes Bioregion.

- ID No. 279 – Blakelys Red Gum – White Cypress Pine woodland on footslopes of hills in central part of the NSW South-western Slopes Bioregion.

The following TECs were identified as occurring or have the potential to occur within the areas surveyed:

- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (EEC – TSC Act)/Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (EEC – EPBC Act).

- White Box Yellow Box Blakely's Red Gum Woodland (Box (EEC – TSC Act)/White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC – EPBC Act).

- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions (EEC – TSC Act)/Weeping Myall Woodlands (EEC – EPBC Act).

- Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions (EEC – TSC Act only).

- Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions (EEC – TSC Act only).

Although no threatened flora species were identified during these surveys, the following species were considered to have potential to occur:

- Tylophora linearis;

- silky Swainson pea (*Swainsona sericea*);

- Austrostipa wakoolica;

- Philotheca ericifolia; and

- Keiths zieria (*Zieria ingramii*).

Additionally, one threatened fauna species was opportunistically identified during vegetation mapping surveys, the grey-crowned babbler (*Pomatostomus temporalis temporalis*).

Benson, J. S.*et al.* 2010. New South Wales Vegetation Classification and Assessment: Part 3 Plant Communities of the NSW Brigalow Belt south, Nandewar and West New England Bioregions and Update of NSW Western Plains and South-western Slopes Plant Communities, Version 3 of the NSWVCA Database.

A number of woodland and derived grassland communities are present in the Project Area, as detailed in previous ecological reports. The most recent and comprehensive mapping of the Project Area was detailed in GHD (2010) which mapped vegetation community types based on the nomenclature of Benson *et*. *al*. (2006). The vegetation community types have since been updated for the South West Slopes bioregion as part of Benson *et*. *al*. (2010) and vegetation within the Project Area have been assigned according to this most recent vegetation classification.

Eco Logical Australia 2011. Estcourt Tailings Storage Facility - Pre-clearing and Clearing Surveys.

EcoLogical was commissioned by NPM to undertake pre-clearing surveys prior to clearing events and to undertake fauna monitoring during clearing for the Estcourt Tailings Storage Facility in accordance with Development Consent 06-0026 Modification 1.

The pre-clearing survey was undertaken between 7 and 11 June 2010. Surveys identified the following threatened species:

- grey falcon (*Falco hypoleucos* – two birds recorded);
- brolga (*Grus rubicunda* – one bird recorded);
- swift parrot (*Lathamus discolor* – two birds recorded);
- grey-crowned babbler (*Pomatostomus temporalis temporalis*);
- little pied bat (*Chalinolobus picatus*); and
- eastern bentwing bat (*Miniopterus schreibersii oceanensis*).

APPENDIX C

Flora Species List

Appendix C – Flora Species List

The following list was developed from surveys across the Wider Study Area (which includes the Project Disturbance Area) as detailed in Section 3.3 of the main report. It includes all species of vascular plants observed within the Wider Study Area during fieldwork completed by Umwelt during 2011 and 2012. Although substantial, the list will not be comprehensive, because not all species are readily detected at any one time of the year. Many species flower only during restricted periods of the year, and some flower only once in several years. In the absence of flowering material, many of these species cannot be identified, or even detected.

Names of classes and families follow a modified Cronquist (1981) System.

Any species that could not be identified to the lowest taxonomic level are denoted in the following manner:

sp.	specimens that are identified to genus level only.

The following abbreviations or symbols are used in the list:

1 to 6	modified Braun-Blanquet cover-abundance score (see Section 3.3.3.1 of the main report);
X	species recorded in proximity to, but outside of, quantitative floristic quadrat, or during rapid assessments, or opportunistically during survey events;
asterisk (*)	denotes species not native to the Wider Study Area;
subsp.	subspecies;
var.	variety;
f.	form; and
Bold	font denotes threatened plant species or populations.

All vascular plants recorded or collected were identified using keys and nomenclature in Harden (1992, 1993, 2000 & 2002) and Wheeler *et al*. (2002). Where known, changes to nomenclature and classification have been incorporated into the results, as derived from *PlantNET* (Botanic Gardens Trust 2013), the on-line plant name database maintained by the National Herbarium of New South Wales.

Common names used follow Harden (1992, 1993, 2000 & 2002) where available, and draw on other sources such as local names where these references do not provide a common name. **Table 1** lists the flora species recorded across the Wider Study Area (which includes the Project Disturbance Area) in floristic quadrats, rapid assessments (qualitative), rapid assessments (quantitative), targeted threatened flora searches and opportunistic transects.

Table 1 – Flora Species Recorded within the Wider Study Area (which includes the Project Disturbance Area) in Floristic Quadrats, Rapid Assessments (qualitative and quantitative), Targeted Threatened Flora Searches and Opportunistic Transects.

Family	Scientific Name	Common Name	Floristic Quadrats																																	RAPIDS	OPS
			Project Disturbance Area			Wider Study Area																																	
						20 x 20 metre Quadrats																											20 x 50 metre Quadrats						
			1B	3B	6B	6C	2A	2B	Q03	3A	Q04	5A	6A	Q07	7A	Q08	8A	8C	8D	Q09	9A	Q10	10A	Q11	11A	11B	13A	13B	Q14	Q15	SQ2	Q06	Q12	12A	Q13	MelA		
Coniferopsida																																							
Cupressaceae	*Callitris glaucophylla*	white cypress pine	2	2					4		4				2	2	9		1			2		3			2	3			1	1	2	2			X	X
Filicopsida																																						
Adiantaceae	*Cheilanthes distans*	bristly cloak fern							2																													X
Adiantaceae	*Cheilanthes sieberi* subsp. *sieberi*	poison rock fern	2	1					2		2				2							1		2			2	1				2	1	2	2	2	X	X
Aspleniaceae	*Pleurosorus rutifolius*								1																													
Marsileaceae	*Marsilea drummondii*	common nardoo															1																				X	
Magnoliopsida (Liliidae)																																						
Anthericaceae	*Arthropodium* sp.														1																							
Anthericaceae	*Arthropodium* species B																																					X
Anthericaceae	*Dichopogon fimbriatus*	nodding chocolate lily	2																				1								1	1				X	X
Anthericaceae	*Tricoryne elatior*	yellow autumn-lily																																	1			
Asphodelaceae	*Bulbine bulbosa*	bulbine lily																																				X
Asphodelaceae	*Bulbine semibarbata*	wild onion																																				X
Cyperaceae	*Carex inversa*	knob sedge				3	1			2				1				2		2			2	2	2	2			1	2				1		2	X	X
Cyperaceae	*Cyperus gracilis*								1																													
Cyperaceae	*Cyperus gunnii* subsp. *gunnii*																																					X
Cyperaceae	**Cyperus rotundus*	nutgrass																																			X	
Cyperaceae	*Cyperus* sp.																																			1		
Cyperaceae	*Eleocharis plana*																						4														X	
Cyperaceae	*Fimbristylis dichotoma*	common fridge-sedge																		1				2								1					X	
Juncaceae	*Juncus aridicola*																						2		1	2										1		
Juncaceae	**Juncus cognatus*																													1								
Juncaceae	*Juncus remotiflorus*																2																					
Juncaceae	*Juncus* sp.																																					X
Juncaceae	*Juncus subsecundus*													1						1																	X	
Lomandraceae	*Lomandra filiformis*	wattle matt-rush																																		2		
Lomandraceae	*Lomandra filiformis* subsp. *coriacea*								1							2						1		2													X
Lomandraceae	*Lomandra filiformis* subsp. *filiformis*																																		2			
Lomandraceae	*Lomandra multiflora* subsp. *multiflora*	many-flowered mat-rush																																				X

Family	Scientific Name	Common Name	Floristic Quadrats																																		RAPIDS	OPS
			Project Disturbance Area			Wider Study Area																																		
			20 x 20 metre Quadrats																													20 x 50 metre Quadrats						
			1B	3B	6B	6C	2A	2B	Q03	3A	Q04	5A	6A	Q07	7A	Q08	8A	8C	8D	Q09	9A	Q10	10A	Q11	11A	11B	13A	13B	Q14	Q15	SQ2	Q06	Q12	12A	Q13	MelA		
Lomandraceae	*Lomandra* sp.		1	1											1								3				1											
Orchidaceae	***Diuris tricolor***	**pine donkey orchid**																																				**X**
Orchidaceae	*Pterostylis bicolor*																																					X
Phormiaceae	*Dianella longifolia*																																					X
Poaceae	**Aira caryophyllea*	silvery hairgrass																																			X	
Poaceae	*Aristida behriana*	bunch wiregrass														1						1									2						X	
Poaceae	*Aristida calycina* var. *praealta*																														2							
Poaceae	*Aristida jerichoensis* var. *subspinulifera*	Jericho wiregrass	2	2												3																			2	1		
Poaceae	*Aristida personata*																																				X	
Poaceae	*Aristida* sp.						1																															
Poaceae	*Austrostipa aristiglumis*	plains grass																																	4		X	X
Poaceae	*Austrostipa bigeniculata*		3			3		2	2	3	2			1	3	4		1		5		5		3				2	3		3	3	2			2	X	
Poaceae	*Austrostipa elegantissima*	feather speargrass																												1								
Poaceae	*Austrostipa scabra* subsp. *falcata*	speargrass	3	3			2		3		3	3				2		3	3			2		3	3	2	1	3	5		3		4	2	3	2	X	X
Poaceae	*Austrostipa* sp.																									3												
Poaceae	*Austrostipa verticillata*	slender bamboo grass																																	1			X
Poaceae	**Avena fatua*	wild oats			9			1												2																	X	
Poaceae	*Bothriochloa decipiens*	red grass	2																																			
Poaceae	*Bothriochloa macra*	red grass					2		1															1											1		X	
Poaceae	**Briza minor*	shivery grass																																				X
Poaceae	**Bromus cartharticus*	prairie grass																					2													3		
Poaceae	**Bromus hordeaceus*	soft brome												2														1			2	1		1		X	X
Poaceae	*Chloris divaricata*																		1																			
Poaceae	**Chloris gayana*	Rhodes grass																					3														X	
Poaceae	*Chloris truncata*	windmill grass			1		2		2	2	2	3			1		3	3	2		5				2	1		3		4				2		X	X
Poaceae	*Chloris ventricosa*	tall chloris																																	1		X	
Poaceae	*Cymbopogon refractus*	barbed wire grass																																			X	
Poaceae	*Cynodon dactylon*	common couch																					2															
Poaceae	*Dichanthium sericeum* subsp. *sericeum*	Queensland bluegrass											2	X																	1						X	
Poaceae	*Digitaria brownii*	cotton panic grass									1									2				2							2				2		X	
Poaceae	*Echinochloa colona*	awnless barnyard												2																							X	

Family	Scientific Name	Common Name	Floristic Quadrats																																RAPIDS	OPS
			Project Disturbance Area			Wider Study Area																																
			20 x 20 metre Quadrats																												20 x 50 metre Quadrats					
			1B	3B	6B	6C	2A	2B	Q03	3A	Q04	5A	6A	Q07	7A	Q08	8A	8C	8D	Q09	9A	Q10	10A	Q11	11A	11B	13A	13B	Q14	Q15	SQ2	Q06	Q12	12A	Q13	MelA		
		grass																																				
Poaceae	*Elymus scaber* var. *scaber*	common wheatgrass							2		2				1		1	2	1			1		1			1	2				2				1	X	X
Poaceae	*Enneapogon gracilis*	slender nineawn																																			X	
Poaceae	*Enteropogon acicularis*													3								1		2					2	3					2		X	X
Poaceae	*Eragrostis brownii*	Browns lovegrass		1			2		1			2					1	2	1		2				1	1	1	3										
Poaceae	**Eragrostis cilianensis*	stinkgrass						1																		2												
Poaceae	*Eragrostis leptostachya*	paddock lovegrass																						1														
Poaceae	*Eragrostis parviflora*	weeping lovegrass																						1						3							X	
Poaceae	*Eragrostis* sp.																															1					X	
Poaceae	*Eriochloa pseudoacrotricha*	early spring grass												3						2									2		2						X	
Poaceae	*Eulalia aurea*	silky browntop																																			X	
Poaceae	**Hordeum glaucum*	northern barley grass																																				X
Poaceae	**Lolium perenne*	perennial ryegrass								1																				2								X
Poaceae	**Panicum capillare*	witchgrass																												1							X	
Poaceae	*Panicum effusum*	poison or hairy panic	3				3		2		3		2	3	2		2	3	2		2			2	2	2	3	2	1			3	1	2		2	X	X
Poaceae	*Panicum queenslandicum* var. *queenslandicum*		3	2	5	4				2			5							2		2			3	4				2					3	X	
Poaceae	*Panicum* sp.																		1																			
Poaceae	*Paspalidium constrictum*	knottybutt grass							1		2				3	1		1																				
Poaceae	*Paspalidium distans*														3																							
Poaceae	*Paspalidium gracile*	slender panic						2									1		2							2										2		
Poaceae	*Paspalidium jubiflorum*	warrego grass																					2							1								
Poaceae	*Paspalidium* sp.																																1				X	
Poaceae	**Paspalum dilatatum*	paspalum																																			X	
Poaceae	*Poa labillardierei* var. *labillardierei*	tussock	3			3	1	4							3				1						4	3		1										
Poaceae	*Rytidosperma bipartitum*	wallaby grass		2		2	2	1		2				2	2		3	2	2	2	2					2	2	1								3	X	X
Poaceae	*Rytidosperma caespitosum*	ringed wallaby grass							1		2											2		3							3	2					X	X
Poaceae	*Rytidosperma fulvum*	wallaby grass																	1						2	1												
Poaceae	*Rytidosperma laeve*																																				X	
Poaceae	*Rytidosperma racemosum* var. *racemosum*								3		4																											

Family	Scientific Name	Common Name	Floristic Quadrats																																		RAPIDS	OPS
			Project Disturbance Area			Wider Study Area																																		
			20 x 20 metre Quadrats																													20 x 50 metre Quadrats						
			1B	3B	6B	6C	2A	2B	Q03	3A	Q04	5A	6A	Q07	7A	Q08	8A	8C	8D	Q09	9A	Q10	10A	Q11	11A	11B	13A	13B	Q14	Q15	SQ2	Q06	Q12	12A	Q13	MelA		
Poaceae	*Rytidosperma setaceum*	smallflower wallaby grass																																2		X	
Poaceae	*Rytidosperma* sp.						1																				1						2				
Poaceae	*Sporobolus creber*	slender rat's tail grass							1																						1					X	
Poaceae	*Themeda australis*	kangaroo grass																																		X	
Poaceae	*Themeda avenacea*	native oatgrass						2																													
Poaceae	**Vulpia myuros*	rats tail fescue																																			X
Magnoliopsida (Magnoliidae)																																					
Acanthaceae	*Brunoniella australis*	blue trumpet								1								1	1																			
Acanthaceae	*Rostellularia adscendens* subsp. *adscendens*																											1							2		
Aizoaceae	*Zaleya galericulata* subsp. *australis*																																2				
Amaranthaceae	*Alternanthera denticulata*	lesser joyweed						2			1						2		1	2			2	1	1	2	1					2	1	1			X	
Amaranthaceae	**Alternanthera pungens*	khaki weed																									1										
Amaranthaceae	**Amaranthus hybridus*	slim amaranth					1																				2										
Amaranthaceae	*Ptilotus erubescens*		1																																		
Amaranthaceae	*Ptilotus semilanatus*																			1																	X
Amaranthaceae	*Ptilotus* sp.																																			X	
Anacardiaceae	**Schinus areira*	pepper tree																																			X
Apiaceae	*Daucus glochidiatus*	native carrot																																			X
Apiaceae	*Hydrocotyle laxiflora*	stinking pennywort																													1						
Apocynaceae	*Parsonsia eucalyptophylla*	gargaloo																																			X
Asteraceae	**Arctotheca calendula*	capeweed										1																									
Asteraceae	**Aster subulatus*	wild aster	1		2	1							2		1								3		2	2											
Asteraceae	**Bidens pilosa*	cobblers pegs					2																												2		
Asteraceae	**Bidens* sp.										1																						1			X	
Asteraceae	**Bidens subalternans*	greater beggar's ticks	2	3	1			2		2			2		1				2														3				
Asteraceae	*Brachyscome chrysoglossa*																																			X	
Asteraceae	*Brachyscome* sp.																		1																		X
Asteraceae	*Calotis anthemoides*	cut-leaved burr-daisy													2		1	1				2				1	1							2		X	X
Asteraceae	*Calotis cuneifolia*	purple burr-daisy									1																									X	X

Family	Scientific Name	Common Name	Floristic Quadrats																																		RAPIDS	OPS
			Project Disturbance Area			Wider Study Area																																		
			20 x 20 metre Quadrats																													20 x 50 metre Quadrats						
			1B	3B	6B	6C	2A	2B	Q03	3A	Q04	5A	6A	Q07	7A	Q08	8A	8C	8D	Q09	9A	Q10	10A	Q11	11A	11B	13A	13B	Q14	Q15	SQ2	Q06	Q12	12A	Q13	MelA		
Asteraceae	*Calotis lappulacea*	yellow burr-daisy	2								1											1							1		1	2					X	
Asteraceae	**Carthamus lanatus*	saffron thistle																		1	2									2							X	X
Asteraceae	*Cassinia aculeata*	dolly bush																																			X	
Asteraceae	**Centaurea calcitrapa*	star thistle																																			X	
Asteraceae	**Centaurea melitensis*	Maltese cockspur	2																																			X
Asteraceae	**Chondrilla juncea*	skeleton weed																												2							X	
Asteraceae	*Chrysocephalum apiculatum*	common everlasting								9																												X
Asteraceae	*Chrysocephalum semipapposum*	clustered everlasting			2																																X	
Asteraceae	**Cirsium vulgare*	spear thistle	1		2	2			1	2			2	2	1		2		2	2	1	2		1					1							2	X	X
Asteraceae	**Conyza bonariensis*	flaxleaf fleabane	1	2	2	2	2	2			2	1	2	2	2		1	1	2		2	1		1	2	2			2	2		2	1	2			X	
Asteraceae	**Conyza* sp.								2											2							2			1				1		X	
Asteraceae	**Conyza sumatrensis*	tall fleabane																								2												
Asteraceae	*Eclipta platyglossa*																														2						
Asteraceae	*Euchiton gymnocephalus*	creeping cudweed																				1															X	
Asteraceae	*Euchiton involucratus*	star cudweed			1						1		2	2											2			2	2		2			2	1	X	X
Asteraceae	*Helichrysum bracteatum*																																					X
Asteraceae	*Helichrysum viscosum*																																					X
Asteraceae	**Hypochaeris radicata*	catsear	1				1																			1											X
Asteraceae	**Lactuca serriola*	prickly lettuce											1	2						2				1												X	
Asteraceae	*Pseudognaphalium luteoalbum*	Jersey cudweed																																				X
Asteraceae	*Rhodanthe corymbiflora*	small white sunray																																				X
Asteraceae	*Senecio* sp.												1																									
Asteraceae	**Silybum marianum*	variegated thistle																																				X
Asteraceae	**Sonchus asper*	prickly sowthistle										1	2																					1				
Asteraceae	**Sonchus oleraceus*	common sowthistle			1				1	1	1			1			1			1						1		1		1						X	X
Asteraceae	**Taraxacum officinale*	dandelion											1																									
Asteraceae	*Triptilodiscus pygmaeus*																																					X
Asteraceae	*Vittadinia cervicularis* var. *subcervicularis*				2										3																							
Asteraceae	*Vittadinia cuneata* var. *cuneata* f. *cuneata*								2		2			2		2				2		2		2				2		2	2	2		2		X	X
Asteraceae	*Vittadinia gracilis*		2	2			3	2		2	1		2			2		2						2	1		2			2	1	2	3	2		3	X	X
Asteraceae	*Vittadinia scabra*																		2																			

Family	Scientific Name	Common Name	Floristic Quadrats																																	RAPIDS	OPS
			Project Disturbance Area			Wider Study Area																																	
			20 x 20 metre Quadrats																													20 x 50 metre Quadrats						
			1B	3B	6B	6C	2A	2B	Q03	3A	Q04	5A	6A	Q07	7A	Q08	8A	8C	8D	Q09	9A	Q10	10A	Q11	11A	11B	13A	13B	Q14	Q15	SQ2	Q06	Q12	12A	Q13	MelA		
Asteraceae	*Vittadinia* sp.											1																									
Asteraceae	*Vittadinia sulcata*										1																										
Asteraceae	**Xanthium spinosum*	Bathurst burr										1																								X	
Asteraceae	*Xerochrysum bracteatum*	golden everlasting									2											1										2	2		2		X	X
Asteraceae	*Xerochrysum viscosum*		2	1											1				2							2							2		1	X	
Boraginaceae	*Cynoglossum suaveolens*		1																																		
Boraginaceae	**Echium plantagineum*	Patterson's curse																																1		X	X
Boraginaceae	**Heliotropium europaeum*	common heliotrope																																			
Brassicaceae	**Capsella bursa-pastoris*																																				X
Brassicaceae	**Lepidium africanum*		1			1			1	2	1	2						1	2							1	1			1	1		2	1	2	X	X
Brassicaceae	*Sisymbrium erysimoides*	smooth mustard										2																									
Brassicaceae	**Sisymbrium irio*	London rocket								2																				1							
Campanulaceae	*Wahlenbergia gracilis*	sprawling or Australian bluebell									1			1									1				1		1		1					X	X
Campanulaceae	*Wahlenbergia luteola*		1													1		1													1	1				X	X
Campanulaceae	*Wahlenbergia* sp.																																				X
Caryophyllaceae	**Petrorhagia nanteulii*																																1				X
Caryophyllaceae	**Spergularia rubra*	sandspurry																		1									1								
Caryophyllaceae	*Stellaria pungens*	prickly starwort																																			X
Casuarinaceae	*Allocasuarina luehmannii*	bulloak															1																			X	
Casuarinaceae	*Casuarina* sp.																																				X
Chenopodiaceae	*Atriplex nummularia*	old man saltbush																																			X
Chenopodiaceae	*Atriplex semibaccata*	creeping saltbush												2	3							2			2					2			2		X	X
Chenopodiaceae	*Atriplex spinibractea*									3								3																			
Chenopodiaceae	*Chenopodium desertorum*																																				X
Chenopodiaceae	*Chenopodium melanocarpum*	black crumbweed										3																									
Chenopodiaceae	*Chenopodium pumilio*	small crumbweed							2		2																									X	
Chenopodiaceae	*Chenopodium* sp.			1																																	
Chenopodiaceae	*Einadia hastata*	berry saltbush							2		2																											X
Chenopodiaceae	*Einadia nutans*	climbing saltbush											2														1									X	
Chenopodiaceae	*Einadia nutans* subsp. *linifolia*	climbing saltbush	2												2				3							2				2			1				
Chenopodiaceae	*Einadia nutans* subsp. *nutans*	climbing saltbush		1			2		2	3	2			2		1						2		2			1		1			2	2		2		X	X

Family	Scientific Name	Common Name	Floristic Quadrats																																			RAPIDS	OPS
			Project Disturbance Area			Wider Study Area																																			
			20 x 20 metre Quadrats																															20 x 50 metre Quadrats						
			1B	3B	6B	6C	2A	2B	Q03	3A	Q04	5A	6A	Q07	7A	Q08	8A	8C	8D	Q09	9A	Q10	10A	Q11	11A	11B	13A	13B	Q14	Q15	SQ2	Q06	Q12	12A	Q13	MelA		
Chenopodiaceae	*Einadia polygonoides*		2	2				2		2								2	2									2						2		1		
Chenopodiaceae	*Enchylaena tomentosa*	ruby saltbush													2							1													2			X
Chenopodiaceae	*Maireana decalvans*	black cotton bush																																			X	
Chenopodiaceae	*Maireana enchylaenoides*	wingless bluebush										2				1				1																			
Chenopodiaceae	*Maireana microphylla*	small-leaf bluebush																	1	1																1		X	X
Chenopodiaceae	*Maireana* sp.									1								1	2																				
Chenopodiaceae	*Salsola kali* var. *kali*		1												1																				1			X	X
Chenopodiaceae	*Sclerolaena birchii*	galvinized burr								2		1		2		2	1	3		1	1				2	2			2	1					2		X	X
Chenopodiaceae	*Sclerolaena muricata* var. *villosa*																		2																				
Convolvulaceae	*Convolvulus erubescens*		1		1		1				1		1	2						1	1								2			1		1		2	X	X
Convolvulaceae	*Dichondra repens*	kidney weed	2	3	2		3	2	3	3	3	2	1	2	2	2	2	2	3			2		2	1	2	2	2	2	1	2	2	2	4	2		X	X
Convolvulaceae	*Dichondra* species A																																			2		
Crassulaceae	*Crassula sieberiana*	Australian stonecrop																																				X
Cucurbitaceae	**Cucumis myriocarpus* subsp. *leptodermis*	paddy melon		1																																		
Euphorbiaceae	*Chamaesyce drummondii*	caustic weed																1			1								2			2	1		1			
Fabaceae (Caesalpinioideae)	*Senna barclayana*	smooth senna																																			X	
Fabaceae (Caesalpinioideae)	*Senna* f.taxon *'zygophylla'*																																				X	X
Fabaceae (Faboideae)	*Desmodium brachypodum*	large tick-trefoil																																				X
Fabaceae (Faboideae)	*Desmodium varians*	slender tick-trefoil									1																				2					X	
Fabaceae (Faboideae)	*Glycine clandestina*										1	1																										
Fabaceae (Faboideae)	*Glycine tabacina*		3	3				2		2	2				1		1	1				1		2			1	1	2			2	2	2	2	2	X	X
Fabaceae (Faboideae)	**Medicago polymorpha*	burr medic																			2																	
Fabaceae (Faboideae)	**Medicago sativa*	lucerne										1									2																	
Fabaceae (Faboideae)	**Medicago* sp.							2			1		1	1													2			3								X
Fabaceae (Faboideae)	**Trifolium arvense*	haresfoot clover									1																											X
Fabaceae (Faboideae)	**Trifolium repens*	white clover		3																																		X
Fabaceae (Mimosoideae)	*Acacia decora*	western golden wattle																																			X	X
Fabaceae (Mimosoideae)	*Acacia hakeoides*	hakea wattle																												1							X	X

Family	Scientific Name	Common Name	Floristic Quadrats																																	RAPIDS	OPS
			Project Disturbance Area			Wider Study Area																																	
			20 x 20 metre Quadrats																													20 x 50 metre Quadrats						
			1B	3B	6B	6C	2A	2B	Q03	3A	Q04	5A	6A	Q07	7A	Q08	8A	8C	8D	Q09	9A	Q10	10A	Q11	11A	11B	13A	13B	Q14	Q15	SQ2	Q06	Q12	12A	Q13	MelA		
Fabaceae (Mimosoideae)	*Acacia melvillei*	yarran																																			X
Fabaceae (Mimosoideae)	*Acacia oswaldii*	miljee																																			X
Fabaceae (Mimosoideae)	*Acacia pendula*	boree																																		X	X
Fabaceae (Mimosoideae)	*Acacia spectabilis*	Mudgee wattle																																		X	
Fumariaceae	**Fumaria muralis*	wall fumitory																																			X
Gentianaceae	**Centaurium erythraea*	common centaury												2														1			2					X	
Geraniaceae	*Erodium crinitum*	blue storksbill					2	2	1	2		2														1											X
Geraniaceae	*Geranium solanderi* var. *solanderi*																													1							
Geraniaceae	*Geranium* sp.								1																												
Geraniaceae	*Pelargonium* sp.						2																														
Goodeniaceae	*Goodenia paniculata*																		1																2		
Goodeniaceae	*Goodenia pinnatifida*																													2	1					X	X
Lamiaceae	**Marrubium vulgare*	horehound	1	2			2		2	2	1													2			2				2	2	3	2	3	X	X
Lamiaceae	*Mentha satureioides*	native pennyroyal															2							2						2					2	X	
Lamiaceae	*Salvia plebeia*																																2				
Lamiaceae	**Salvia verbenaca*	wild sage		2			2	2					2																						2		
Lamiaceae	**Stachys arvensis*	stagger weed																													2	2		1		X	X
Lamiaceae	*Teucrium racemosum*	grey germander																																		X	
Linaceae	*Linum marginale*	native flax																																			X
Lobeliaceae	*Pratia concolor*	poison pratia																		1																X	
Lobeliaceae	*Pratia purpurascens*	whiteroot				1											2	1	2				2				1										
Loranthaceae	*Amyema quandang* var. *quandang*																																			X	X
Malvaceae	*Sida corrugata*		2	2			2	2	2	2	2	1			2	2		2	2	1		2		2	2	1	1	2	2		2	2	3	1	2	2	X	X
Malvaceae	*Sida* sp.																													1							
Malvaceae	*Sida trichopoda*				1	1							1	2		1				2					1											X	X
Myoporaceae	*Eremophila debilis*	amulla	1							1	1				1				2			2				1			2						X	
Myoporaceae	*Eremophila mitchellii*	budda																1																			X
Myoporaceae	*Myoporum montanum*	western boobialla																																			X
Myrtaceae	*Eucalyptus albens*	white box																																	2		X	
Myrtaceae	*Eucalyptus blakelyi*	Blakelys red gum																																			X	X
Myrtaceae	*Eucalyptus camaldulensis*	river red gum																					4			1											X	
Myrtaceae	*Eucalyptus conica*	fuzzy box																																				X

Family	Scientific Name	Common Name	Floristic Quadrats																																	RAPIDS	OPS
			Project Disturbance Area			Wider Study Area																																	
			20 x 20 metre Quadrats																													20 x 50 metre Quadrats						
			1B	3B	6B	6C	2A	2B	Q03	3A	Q04	5A	6A	Q07	7A	Q08	8A	8C	8D	Q09	9A	Q10	10A	Q11	11A	11B	13A	13B	Q14	Q15	SQ2	Q06	Q12	12A	Q13	MelA		
Myrtaceae	*Eucalyptus dwyeri*	Dwyers red gum										3																								X	
Myrtaceae	*Eucalyptus melliodora*	yellow box																													3	2	3		4	X	X
Myrtaceae	*Eucalyptus microcarpa*	western grey box															2	3	2											4						X	X
Myrtaceae	*Eucalyptus macrocarpa – pilligaensis*	western grey box / narrow-leaved grey box intergrade																3																			X
Myrtaceae	*Eucalyptus moluccana*	grey box									1																										
Myrtaceae	*Eucalyptus populnea* subsp. *bimbil*	bimble box	3	2						4					3	3						2														X	X
Myrtaceae	*Eucalyptus viridis*	green mallee																																		X	
Nyctaginaceae	*Boerhavia dominii*	tarvine							2		2			1		2						2		1					1				2		1		X	
Oleaceae	*Notelaea microcarpa* var. *microcarpa*	native olive																																	1		
Oxalidaceae	*Oxalis exilis*								2		2																										
Oxalidaceae	*Oxalis perennans*													2				1		2				1					2	1	2	2	1	1	2		X	X
Papaveraceae	**Papaver hybridum*	rough poppy																																			X
Phytolaccaceae	**Phytolacca octandra*	inkweed							2																												
Pittosporaceae	*Pittosporum angustifolium*								1																												X
Plantaginaceae	*Plantago debilis*																													2							X
Plantaginaceae	*Plantago drummondii*																	1																			
Polygonaceae	**Polygonum arenastrum*	wireweed			1	1															1																
Polygonaceae	**Polygonum patulum*	tree hogweed											2																								
Polygonaceae	*Polygonum* sp.																								2												
Polygonaceae	*Rumex brownii*	swamp dock		1		1		2	2	1					1	1							2	1	1	2		1					1	2		2	X	X
Polygonaceae	**Rumex crispus*	curled dock											2										2		2											X	
Polygonaceae	*Rumex* sp.				2												1						2			2											
Polygonaceae	*Rumex tenax*	shiny dock												2																						X	
Proteaceae	*Hakea tephrosperma*	hooked needlewood																																			X
Rubiaceae	*Asperula conferta*	common woodruff		1				2												1								2					3	1	X	X
Rubiaceae	*Canthium odoratum*	shiny-leaved canthium																																			X
Rutaceae	*Geijera parviflora*	wilga																																			X
Sapindaceae	*Alectryon oleifolius*	western rosewood, bonaree														1		1																1		1		X	X
Sapindaceae	*Dodonaea viscosa*	native hop-bush																																		X	

Family	Scientific Name	Common Name	Floristic Quadrats																																	RAPIDS	OPS
			Project Disturbance Area			Wider Study Area																																	
			20 x 20 metre Quadrats																													20 x 50 metre Quadrats						
			1B	3B	6B	6C	2A	2B	Q03	3A	Q04	5A	6A	Q07	7A	Q08	8A	8C	8D	Q09	9A	Q10	10A	Q11	11A	11B	13A	13B	Q14	Q15	SQ2	Q06	Q12	12A	Q13	MelA		
Sapindaceae	*Dodonaea viscosa* subsp. *cuneata*	native hop-bush																																		X	X
Sapindaceae	*Dodonaea viscosa* subsp. *mucronata*	native hop-bush																																			X
Sapindaceae	*Dodonaea viscosa* subsp. *viscosa*	native hop-bush																																1			
Solanaceae	**Lycium ferocissimum*	African boxthorn																																			X
Solanaceae	*Solanum cinereum*	Narrawa burr							1		1																										X
Solanaceae	*Solanum esuriale*	quena	2	2			1	1						1	2	2		1	2	2		2		2	1		1	1	2	1		2	2	2	2		X	
Solanaceae	**Solanum nigrum*	black-berry nightshade							2	1	1	1										1					1								2		
Stackhousiaceae	*Stackhousia monogyna*	creamy candles																																			X
Sterculiaceae	*Brachychiton populneus* subsp. *populneus*	kurrajong																																	1	X	X
Verbenaceae	**Verbena bonariensis*	purpletop																																		X	
Verbenaceae	**Verbena officinalis*	common verbena				2																														X	
Zygophyllaceae	*Tribulus micrococcus*	yellow vine, spineless caltrop							1													1										1						

APPENDIX D

Fauna Species Recorded within the Project Area

Appendix D – Fauna Species Recorded within the Project Area

The following list was developed from field surveys of the Wider Study Area as detailed in Section 3.4 of the main report. It includes all species of vertebrate fauna recorded within the Wider Study Area during field surveys by Umwelt.

The following abbreviation or symbols are used to identify the method of detection in the appendix table:

x	Identified from visual sighting or characteristic call;
#	Where possible the number of individuals of threatened species was recorded;
S	Identified from scat sample(s) in field;
D	'Definite' identification from scat or hair sample by Barbara Triggs;
Pr	'Probable' identification from scat or hair sample by Barbara Triggs;
H	Identified from hair funnel sample(s);
T	Identified from tracks and/or traces such as burrows, nests or feathers;
C	'Confident' identification by Fly by Night Bat Surveys Pty Ltd;
P	'Probable' identification by Fly by Night Bat Surveys Pty Ltd; and
Po	'Possible' identification by Fly by Night Bat Surveys Pty Ltd.

Any species that could not be identified to the species taxonomic level are denoted in the following manner:

sp.	specimens that are identified to genus level only;
?	specimens for which identification was uncertain;
prob.	specimens for which identification was considered highly likely but not definite; and
poss.	specimens for which identification was considered likely but not definite.

The following abbreviations or symbols are used in the list:

asterisk (*)	denotes species not indigenous to the study area;
subsp.	subspecies;
TSC Act	*Threatened Species Conservation Act 1995*;
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*;
MIG	Listed migratory species under the EPBC Act;
PD-V	Preliminary Determination to list as Vulnerable under Schedule 2 of the *Threatened Species Conservation Act* 1995 (TSC Act);
V	Vulnerable;
E	Endangered; and
Bold	Threatened Species.

Birds recorded were identified using descriptions in Slater *et al*. (2003) and the scientific and common name nomenclature of Birds Australia. Reptiles recorded were identified using keys and descriptions in Cogger (2000), Swan *et al.* (2004), Weigel (1990) and Wilson and Swan (2008) and the scientific and common name nomenclature of Cogger (2000).

Amphibians recorded were identified using keys and descriptions in Cogger (2000), Robinson (1998), Anstis (2002) and Barker *et al.* (1995) and the scientific and common name nomenclature of Cogger (2000). Mammals recorded were identified using keys and descriptions in Strahan (2002), Churchill (1998, 2008) and Menkhorst and Knight (2004) and the scientific and common name nomenclature of Strahan (2002) for non-bat species and Churchill (1998, 2008) for bats.

Table 1 – Fauna Species Recorded by Umwelt during Surveys between 2011 and 2012

Scientific Name	Common Name	Conservation Status		Project Disturbance Area 2012	Wider Study Area 2011/2012 Trap Sites				Opportunistic Records
		TSC Act	EPBC Act	Autumn	Winter	Spring	Summer	Autumn	
AMPHIBIANS									
Myobatrachidae									
Crinia parinsignifera	brown froglet								X
Crinia sloanei	**Sloane's froglet**	**V**					X		X
Limnodynastes dumerilii	banjo frog, eastern pobblebonk					X			
Limnodynastes fletcheri	barking marsh frog							X	
Limnodynastes salmini	pink striped frog, salmon striped frog						X		X
Limnodynastes tasmaniensis	spotted marsh frog					X	X	X	X
Neobatrachus sudelli	common spadefoot						X		X
Uperoleia rugosa	wrinkled, or eastern burrowing toadlet						X		X
Hylidae									
Litoria caerulea	green tree frog								X
Litoria latopalmata	broad-palmed frog								X
Litoria peronii	Perons tree frog					X			X
Litoria rubella	desert tree frog								X
REPTILES									
Cheloniidae									
Chelodina longicollis	snake-necked turtle								X

Scientific Name	Common Name	Conservation Status		Project Disturbance Area 2012	Wider Study Area 2011/2012 Trap Sites				Opportunistic Records
		TSC Act	EPBC Act	Autumn	Winter	Spring	Summer	Autumn	
Gekkonidae									
Diplodactylus vittatus	stone gecko						X		X
Gehyra variegate	tree dtella					X			
Varanidae									
Varanus varius	lace monitor				X		X		X
Agamidae									
Pogona barbata	eastern bearded dragon					X	X		X
Scincidae									
Cryptoblepharus virgatus	wall lizard					X	X		X
Cryptoblepharus sp.	skink			X				X	X
Lampropholis delicata	grass skink						X		X
Morethia boulengeri	Boulengers skink							X	
Tiliqua scincoides	eastern blue-tongued lizard								X
Trachydosaurus rugosus	shingleback lizard					X			X
Elapidae									
Pseudonaja textilis	eastern brown snake						X		X
Suta spectabilis dwyeri	Dwyers black-headed snake					X	X		X

Scientific Name	Common Name	Conservation Status		Project Disturbance Area 2012	Wider Study Area 2011/2012 Trap Sites				Opportunistic Records
		TSC Act	EPBC Act	Autumn	Winter	Spring	Summer	Autumn	
BIRDS									
Phasianidae									
Coturnix pectoralis	stubble quail						X		
Coturnix ypsilophora	brown quail					X	X	X	X
Anatidae									
Dendrocygna eytoni	plumed whistling-duck								X
Cygnus atratus	black swan								X
Chenonetta jubata	Australian wood duck				X	X	X	X	X
Anas gracilis	grey teal				X				X
Anas superciliosa	Pacific black duck						X		X
Aythya australis	hardhead						X		X
Podicipedidae									
Tachybaptus novaehollandiae	Australasian grebe				X		X		X
Columbidae									
Phaps chalcoptera	common bronzewing				X	X			X
Ocyphaps lophotes	crested pigeon			X	X	X	X	X	X
Podargidae									
Podargus strigoides	tawny frogmouth					X		X	
Aegothelidae									
Aegotheles cristatus	Australian owlet-nightjar					X			
Phalacrocoracidae									
Phalacrocorax melanoleucos	little pied cormorant				X		X	X	X

Scientific Name	Common Name	Conservation Status		Project Disturbance Area 2012	Wider Study Area 2011/2012 Trap Sites				Opportunistic Records
		TSC Act	EPBC Act	Autumn	Winter	Spring	Summer	Autumn	
Ardeidae									
Ardea pacifica	white-necked heron				X				X
Egretta novaehollandiae	white-faced heron				X		X	X	X
Nycticorax caledonicus	nankeen night heron						X		X
Threskiornithidae									
Threskiornis molucca	Australian white ibis				X				
Threskiornis spinicollis	straw-necked ibis				X	X			X
Platelea flavipes	yellow-billed spoonbill								X
Accipitridae									
Elanus axillaris	black-shouldered kite				X	X			X
Accipiter fasciatus	brown goshawk								X
Circus assimilis	**spotted harrier**	**V**						1,1	2,1,1,1
Aquila audax	wedge-tailed eagle					X		X	
Hieraaetus morphnoides	**little eagle**	**V**							1
Falconidae									
Falco cenchroides	nankeen kestrel			X	X		X	X	X
Falco berigora	brown falcon				X		X		X
Falco longipennis	Australian hobby								X
Falco subniger	**black falcon**	**PD-V**							1

Scientific Name	Common Name	Conservation Status		Project Disturbance Area 2012	Wider Study Area 2011/2012 Trap Sites				Opportunistic Records
		TSC Act	EPBC Act	Autumn	Winter	Spring	Summer	Autumn	
Burhinidae									
Burhinus grallarius	**bush stone-curlew**	**E**				X	X		2
Charadriidae									
Erythrogonys cinctus	red-kneed dotterel								X
Vanellus miles	masked lapwing				X	X			X
Cacatuidae									
Nymphicus hollandicus	cockatiel			X		X	X	X	X
Cacatua roseicapillus	galah			X	X	X	X	X	X
Cacatua sanguine	little corella					X			
Psittacidae									
Barnardius zonarius	Australian ringneck				X		X	X	X
Lathamus discolor	**swift parrot**	**E**	**E**					2	
Northiella haematogaster	blue bonnet			X	X	X	X	X	X
Polytelis swainsonii	**superb parrot**	**V**	**V**		1,3,2,2, ≥2	2	6,15,50+,1,2,2	1,2,3-5	3,2,1,3,>23,29
Psephotus haematonotus	red-rumped parrot			X		X	X	X	X
Platycercus eximius	eastern rosella			X	X	X	X	X	X
Cuculidae									
Chalcites basalis	Horsfields bronze-cuckoo								X
Cacomantis variolosus	brush cuckoo						X		X

Scientific Name	Common Name	Conservation Status		Project Disturbance Area 2012	Wider Study Area 2011/2012 Trap Sites				Opportunistic Records
		TSC Act	EPBC Act	Autumn	Winter	Spring	Summer	Autumn	
Strigidae									
Ninox novaeseelandiae	southern boobook					X			X
Tytonidae									
Tyto novaehollandiae	**masked owl**	**V**				1			
Tyto alba	barn owl					X	X	X	X
Halcyonidae									
Dacelo novaeguineae	laughing kookaburra			X	X	X	X	X	X
Todiramphus sanctus	sacred kingfisher					X			X
Meropidae									
Merops ornatus	rainbow bee-eater		MIG			X			
Climacteridae									
Climacteris picumnus victoriae	**brown treecreeper (eastern subsp.)**	**V**			X,1-2, ≥5,3-4	3-4,X	3		X
Acanthizidae									
Acanthiza pusilla	brown thornbill					X	X		
Acanthiza reguloides	buff-rumped thornbill					X			
Acanthiza chrysorrhoa	yellow-rumped thornbill					X	X		X
Acanthiza apicalis	inland thornbill								X
Acanthiza nana	yellow thornbill					X			
Gerygone fusca	western gerygone				X	X	X		X
Gerygone albogularis	white-throated gerygone					X			X

Scientific Name	Common Name	Conservation Status		Project Disturbance Area 2012	Wider Study Area 2011/2012 Trap Sites				Opportunistic Records
		TSC Act	EPBC Act	Autumn	Winter	Spring	Summer	Autumn	
Smicrornis brevirostris	weebill				X	X	X		
Pardalotidae									
Pardalotus punctatus	spotted pardalote							X	
Pardalotus striatus	striated pardalote				X	X	X	X	
Meliphagidae									
Entomyzon cyanotis	blue-faced honeyeater				X			X	
Manorina melanocephala	noisy miner			X	X	X	X	X	X
Acanthagenys rufogularis	spiny-cheeked honeyeater						X		
Lichenostomus penicillatus	white-plumed honeyeater				X		X		X
Lichenostomus chrysops	yellow-faced honeyeater					X			
Grantiella picta	**painted honeyeater**	**V**					1		
Pomatostomidae									
Pomatostomus temporalis temporalis	**grey-crowned babbler (eastern subsp.)**	**V**		4,5	≥17,.2, ≥4,9,8,X,X	3,3,9,X,1,X	5,4,3,5,4	X,>6, ,X	≥8,4,5,4,6,4,3, 6,3,2,9,2
Campephagidae									
Coracina novaehollandiae	black-faced cuckoo-shrike			X	X		X	X	X
Lalage sueurii	white-winged triller					X			

Scientific Name	Common Name	Conservation Status		Project Disturbance Area 2012	Wider Study Area 2011/2012 Trap Sites				Opportunistic Records
		TSC Act	EPBC Act	Autumn	Winter	Spring	Summer	Autumn	
Pachycephalidae									
Pachycephala rufiventris	rufous whistler				X	X	X		
Colluricincla harmonica	grey shrike-thrush				X				
Artamidae									
Cracticus torquatus	grey butcherbird				X	X	X		X
Cracticus nigrogularis	pied butcherbird				X	X	X	X	X
Gymnorhina tibicen	Australian magpie			X	X	X	X	X	X
Strepera graculina	pied currawong					X			X
Rhipiduridae									
Rhipidura leucophrys	willie wagtail				X	X	X		X
Corvidae									
Corvus coronoides	Australian raven				X	X	X	X	X
Monarchidae									
Myiagra inquieta	restless flycatcher				X				
Grallina cyanoleuca	magpie-lark			X	X	X	X	X	X
Corcoracidae									
Struthidea cinerea	apostlebird				X	X	X	X	X
Corcorax melanorhamphos	white-winged chough				X	X	X	X	X
Petroicidae									
Microeca leucophaea	jacky winter								X
Petroica goodenovii	red-capped robin					X			X
Eopsaltria australis	eastern yellow robin					X			

Scientific Name	Common Name	Conservation Status		Project Disturbance Area 2012	Wider Study Area 2011/2012 Trap Sites				Opportunistic Records
		TSC Act	EPBC Act	Autumn	Winter	Spring	Summer	Autumn	
Megaluridae									
Cincloramphus mathewsi	rufous songlark						X		X
Hirundinidae									
Hirundo neoxena	welcome swallow				X	X		X	X
Sturnidae									
**Sturnus vulgaris*	common starling								X
**Sturnus tristis*	common myna								X
Nectariniidae									
Dicaeum hirundinaceum	mistletoebird								X
Estrildidae									
Taeniopygia bichenovii	double-barred finch								X
Motacilidae									
Anthus novaeseelandiae	Australasian pipit							X	
MAMMALS									
Dasyuridae									
Antechinus flavipes	yellow-footed antechinus					X	X	X	X
Phanlangeridae									
Trichosurus vulpecula	common brushtail possum					X	X	X	X
Macropodidae									
Macropus giganteus	eastern grey kangaroo			X	X	X	X	X	X
Macropus robustus	common wallaroo					X			X

Scientific Name	Common Name	Conservation Status		Project Disturbance Area 2012	Wider Study Area 2011/2012 Trap Sites				Opportunistic Records
		TSC Act	EPBC Act	Autumn	Winter	Spring	Summer	Autumn	
Macropus rufogriseus	red-necked wallaby				X	X			
Wallabia bicolor	swamp wallaby					X			
Molossidae									
Mormopterus planiceps	southern freetail-bat					X			X
Nyctinomus australis	white-striped freetail-bat					X	X		
Mormopterus "Species 3"							X		
Mormopterus "Species 4"							X		
Vespertilionidae									
Miniopterus schreibersii oceanensis	**eastern bentwing-bat**	**V**				X			X
Nyctophilus geoffroyii	lesser long-eared bat						X		
Nyctophilus gouldii	Goulds long-eared bat					X	X		
Nyctophilus sp.	unidentified long-eared bat					X			X
Chalinolobus gouldii	Goulds wattled bat					X		X	X
Chalinolobus morio	chocolate wattled bat					X			X
Chalinolobus picatus	**little pied bat**	**V**				X			
Scotorepens balstoni	inland broad-nosed bat					X	X		

Scientific Name	Common Name	Conservation Status		Project Disturbance Area 2012	Wider Study Area 2011/2012 Trap Sites				Opportunistic Records
		TSC Act	EPBC Act	Autumn	Winter	Spring	Summer	Autumn	
Scotorepens greyii	little broad-nosed bat					X	X		
Scotorepens sp.	unidentified broad-nosed bat						X		
Vespadelus vulturnus	little forest bat					X	X		X
Vespadelus sp.	forest bat					X			
Muridae									
**Mus musculus*	house mouse					X	X		
**Rattus rattus*	black rat					X	X		
Canidae									
**Vulpes vulpes*	fox				X	X			X
Leporidae									
**Oryctolagus cuniculus*	rabbit				X				X
**Lepus capensis*	brown hare			X	X	X			X

Table 2 – Total Species per Fauna Group Recorded by Umwelt during Surveys between 2011 and 2012

Fauna Group	Total Number of Species	Conservation Status		Project Disturbance Area 2012	Wider Study Area	2011/2012 Trap Sites			Opportunistic Records
		TSC Act	EPBC Act	Autumn	Winter	Spring	Summer	Autumn	
Amphibians	**12**	1	0	0	0	3	5	2	10
Reptiles	**13**	0	0	1	1	5	7	2	11
Birds	**92**	10	2	14	41	50	45	33	63
Mammals	**27**	2	0	2	2	18	12	4	10

APPENDIX E

Threatened Species Assessment

Appendix E – Threatened Species Assessment

Tables 1 and **2** identify the threatened flora and fauna species, TECs, EPs and migratory species that have potential to occur within a 20 kilometre radius of the boundary of the Project Area (referred to as the local area). This information was obtained from searches undertaken of the OEH Atlas of NSW Wildlife (2013), the DSEWPC Protected Matters database (2013), the NSW OEH Threatened Species website (search for the Lachlan and Central West catchment management authorities), the Department of Primary Industries (DPI) – Fishing and Agriculture Threatened and Protected Species Records Viewer (2013) and literature reviews.

Tables 1 and **2** identify the status, specific habitat requirements, distribution, source of information, level of reservation within the region, potential for occurrence in the Project Disturbance Area and any requirement for an assessment of significance.

Tables 3 and **4** identify the threatened flora and fauna species, threatened ecological communities (TECs) and migratory species that have potential to occur within a 20 kilometre radius of the boundary of the Referral Area (referred to as the local area). This information was obtained from searches undertaken of the Office of Environment and Heritage (OEH) Atlas of NSW Wildlife (2012), the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) Protected Matters database (2013), the NSW OEH Threatened Species website (search for the Lachlan and Central West catchment management authorities), the Department of Primary Industries (DPI) – Fishing and Agriculture Threatened and Protected Species Records Viewer (2012) and literature reviews.

Tables 3 and **4** identify the status, specific habitat requirements, distribution, source of information, level of reservation within the region, potential for occurrence in the Referral Area and any requirement for an assessment of significance.

Table 1 – Likelihood of Occurrence Assessment of TECs, Endangered Flora Populations and Threatened Flora Species That May Occur Within the Project Disturbance Area

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
FLORA						
Austrostipa metatoris	V (EPBC) V (TSC) 3V (ROTAP)	This perennial grass grows in tussocks to 1 m in height. It is known to occur on sand hills, sand ridges, undulating plains and mallee country. It is usually found growing in red to red-brown clay-loam to sandy-loam soils. It is known to grow in association with *Eucalyptus populnea, E. intertexta, Callitris glaucophylla, Casuarina cristata, Santalum acuminatum* and *Dodonaea viscosa*.	This species is known from NSW and SA. In NSW it mostly occurs in the Murray Valley, as well as scattered records in Central NSW inclusive of Lake Cargelligo, east of Goolgowi, Condobolin and south-west of Nymagee.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Austrostipa wakoolica	E (EPBC) E (TSC) 2E (ROTAP)	This is a densely tufted grass that grows on the floodplains of the Murray River and its tributaries, in open woodland on grey, silty clay or sandy loam soils. Known habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open cypress pine forest on low sandy range; and a low, rocky rise. *Austrostipa wakoolica* is associated with the following species: *Callitris glaucophylla, Eucalyptus microcarpa, E. populnea, Austrostipa eremophila, A. drummondii, Austrodanthonia eriantha* and *Einadia nutans*.	This species is restricted in distribution to the floodplains of the Murray River tributaries of central-western and south-western NSW. Known locations are inclusive of Manna State Forest, Matong State Forest, and Mairjimmy State Forest, as well as the following NSW localities, Lake Tooim, Merran Creek, Tulla, Cunninyeuk.	Back Yamma SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Pine donkey orchid *Diuris tricolor*	V (TSC) 3K (ROTAP)	Sclerophyll forest among grass, often with *Callitris* spp. Usually on sandy soils, either on flats or small rises. In the Hunter Valley this species mostly occurs in native grassland in areas not subject to intensive grazing.	Found throughout central NSW from Nerrandera area in south to Moree in north. As far west as Cobar and east into the Muswellbrook area.	Blow Clear West SF Strahorn SF	This species has not been recorded within the Project Disturbance Area, but suitable habitat is present for the species. A population has been recorded north of the Project Disturbance Area within the Project Area and the Wider Study Area. This species is potentially sensitive to the development.	Yes.
Swainsona murrayana Slender Darling-pea, Slender Swainson, Murray Swainson-pea	V (EPBC) V (TSC) 3VCi (ROTAP)	Slender darling pea grows in clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. Often in areas with a degree of grazing or cultivation. It is known to occur in a variety of vegetation types including, bladder saltbush, black box and grassland communities on level plains, floodplains and depressions. It is typically associated with *Maireana* spp.	Slender darling pea occurs throughout NSW and is known from the locations of Jerilderie and Deniliquin areas of the southern riverine plain, the Hay Plain as far north as Willandra NP, near Broken Hill and in various localities between Dubbo and Moree. It is also known from Queensland, Victoria and SA.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Silky swainsona-pea *Swainsona sericea*	V (TSC)	Sometimes found in association with cypress pine *Callitris* sp. On the Monaro it is found in Natural Temperate Grassland and snow gum (*Eucalyptus pauciflora*) woodland. In the Southern Tablelands and the South West Slopes it is found in Box Gum Woodland.	This species ranges in distribution from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. It is also found in SA, Victoria and Queensland.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area.	Yes.
Tylophora linearis	E (EPBC) V (TSC) 3E (ROTAP)	This species has only been recorded in low abundances and flowers in spring. *Tylophora linearis* grows at low altitudes upon sedimentary flats in both dry scrub and dry open forests. Typical plant associations are inclusive of hakea wattle (*Acacia hakeoides*), streaked wattle (*Acacia lineata*), black cypress pine (*Callitris endlicheri*), white cypress pine (*Callitris glaucophylla*), *Casuarina* spp., red ironbark (*Eucalyptus fibrosa*), mugga ironbark (*Eucalyptus sideroxylon*), white box (*Eucalyptus albens*), bulloak (*Allocasuarina luehmannii*), and *Myoporum* spp.	*Tylophora linearis* is known from the northern and central western slopes of NSW, and from the western Darling Downs in Queensland. In NSW it is known to occur in the districts of Barraba, Mendooran, Temora and West Wyalong, but is believed to occur elsewhere.	Goobang NP	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
THREATENED ECOLOGICAL COMMUNITIES						
Fuzzy box (*Eucalyptus conica*) Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	EEC (TSC)	This community is a tall woodland or open forest community with a sparse shrub understorey and moderately dense groundcover. This community often occurs on alluvial soils.	Alluvial soils of the South West Slopes, Brigalow Belt South and Darling Riverine Plains Bioregions. Mainly in the Dubbo-Narromine-Parkes-Forbes area.	This EEC is not known from any conservation reserves in the region.	The Project Disturbance Area provides potential habitat for this TEC however, it has not been recorded in the Project Disturbance Area. There is no potential for a significant impact on this TEC.	No.
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	EEC (TSC) EEC (EPBC)	This community is a temperate woodland community with grassy understory found on lower slopes and plains. This community often occurs on productive alluvial or colluvial soils.	Lower slopes and plains of mainland eastern Australia, inland of the Great Dividing Range from southern Queensland through to eastern SA.	This EEC is not known from any conservation reserves in the region.	This EEC was recorded within the Referral area and is sensitive to the development.	Yes.
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes Bioregions	EEC (TSC)	This community is dominated by white cypress pine (*Callitris glaucophylla*) and is characterised by an open tree stratum. Trees within this community may be reduced to isolated individuals or absent due to past land clearing.	Far south-western portion of the NSW South Western Slopes bioregion near Urana, extending through the Riverina bioregion, into the southern part of the Murray-Darling Depression bioregion, as far west as the SA border.	This EEC is not known from any conservation reserves in the region.	The Project Disturbance Area provides potential habitat for this TEC however, it has not been recorded in the Project Disturbance Area. There is no potential for a significant impact on this TEC.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Weeping Myall Woodland	EEC (EPBC)	The Weeping Myall Woodlands consist of a canopy dominated by weeping myall (*Acacia pendula*) trees that range from 4 – 12 metres in height. It is common for the woodland to comprise monotypic stands of weeping myall. Where other plant species occur, they do not form a dominant species. This community has a natural lifecycle of periods of senescence and regeneration. The trees are also prone to defoliation by bag-shelter moth (*Ochrogaster lunifer*) caterpillars and are also commonly lopped for domestic stock fodder. For these reasons, the Listing Advice for this ecological community can be dominated by weeping myall trees that are in a living, defoliated or dead state.	Occurs on flat areas, shallow depressions or gilgais on raised (relict) alluvial plains. These areas are not associated with active drainage channels and are rarely if ever flooded. Occurs on black, brown, red-brown or grey clay or clay loam soils. Occurs on all inland alluvial plains west of the Great Divide in NSW, including the Riverina, NSW South Western Slopes, Darling Rivering Plains, Brigalow Belt South, Brigalow Belt North, Murray-Darling Depression, Nandewar and Cobar Peneplain IBRA Bioregions.	This EEC is not known from any conservation reserves in the region.	The Project Disturbance Area provides potential habitat for this EEC however, it has not been recorded in the Project Disturbance Area. There is no potential for a significant impact on this EEC.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands	EEC (TSC) CEEC (EPBC)	This community can occur as either woodland or derived grassland (grassy woodland from which trees have been removed). The groundlayer consists of native tussock grasses and herbs, and a scattered shrub layer. White box (*Eucalyptus albens*), yellow box (*E. melliodora*), or Blakely's red gum (*E. blakelyi*), dominate, where trees remain. Sites dominated by other tree species that do not have white box, yellow box, or Blakely's red gum as co-dominants are not considered to be part of the community, except in the Nandewar bioregion. In the Nandewar Bioregion, grey box (*E. moluccana* or *E. microcarpa*) may also be dominant in the community.	This EEC occurs along the western slopes and tablelands of the Great Dividing Range from southern Queensland through NSW to central Victoria.	This EEC is not known from any conservation reserves in the region.	This EEC was recorded within the Project Disturbance Area and is sensitive to the development.	Yes.

Note:

C	In a conservation reserve
EEC	Endangered ecological community
CEEC	Critically endangered ecological community
EPBC	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
i	Inadequately reserved
K	Poorly known
LGA	Local Government Area
NP	National Park
NR	Nature Reserve
PD	Preliminary determination
ROTAP	Rare or Threatened Australian Plants
SF:	State Forest
TSC:	NSW *Threatened Species Conservation Act 1995*
V	Vulnerable
2	Found over < 100 km range
3	Found over > 100 km range

ROTAP listings are sourced from Briggs & Leigh (1996)

Table 2 – Likelihood of Occurrence Assessment of Endangered Fauna Species, Threatened Fauna Populations and Migratory and Marine Species That May Occur Within the Project Disturbance Area

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
AMPHIBIANS						
Sloanes froglet *Crinia sloanei*	V (TSC)	This frog is typically associated with grassland, woodland and disturbed woodlands that are periodically inundated.	Sloane's Froglet has been recorded from widely scattered sites in the floodplains of the Murray-Darling Basin, with the majority of records in the Darling Riverine Plains, NSW South Western Slopes and Riverina bioregions in New South Wales. No extant populations are known from the northern range of its distribution and are infrequently recorded in the southern extent of its distribution.	Goobang NP	This species occurs in the Wider Study Area however has not been recorded in the Project Disturbance Area. This species is potentially sensitive to the development.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
REPTILES						
Pink-tailed legless lizard *Aprasia parapulchella*	V (TSC) V (EPBC)	This species typically inhabits areas which are well-drained, sloping, rocky, and open woodland with a mostly native grassland understorey. These lizards can usually be found beneath partially embedded rocks and make their burrows in black ant and termite nests.	This species is only known to be distributed across the Central and Southern Tablelands and the South-western Slopes. The largest known concentration of this species is in the Canberra/Queanbeyan Region, however, other populations have been recorded in proximity to Cooma, Yass, Bathurst, Albury and West Wyalong.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area or the Wider Study Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
BIRDS						
Malleefowl *Leipoa ocellata*	E (TSC) V (EPBC)	The malleefowl is typically found in semi-arid and arid areas of temperate Australia, in shrubland and low woodlands dominated by dense but discontinuous mallee vegetation. They are usually on loamy or sandy soils with an annual average rainfall between 200 and 450 mm. The malleefowl has been known to forage in open grassland and farmland areas; and breeds in areas with plentiful leaf litter.	The malleefowl is distributed across southern Australia. Typically found west of the Great Dividing Range, from the Pilliga south-west through to the Griffith and Wentworth districts. A small number of records have been identified from east of the Great Dividing Range in the Goulburn River NP.	Woggoon NR	The Project Disturbance Area provides potential habitat for this species, however it has not been in the Project Disturbance Area or Wider Study Area. There is one record of this species within the local area. There is no potential for a significant impact on this species.	No.
Magpie goose *Anseranas semipalmata*	V (TSC)	Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land.	Rare in south-eastern Australia, with an increasing number of records in central and northern NSW. Vagrants can follow food sources to south-eastern NSW. This species is predicted to occur in the region based upon a search of the Liverpool Plains (Part B) CMA Sub-region (DECC 2009).	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. This species has been recorded in the local area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Freckled duck *Stictonetta naevosa*	V (TSC)	This species prefers permanent freshwater swamps and creeks with heavy growth of cumbungi, lignum or tea-tree. During drier times it moves from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. This species generally rests in dense cover during the day, usually in deep water. Their nests are usually located in dense vegetation at or near water level.	The freckled duck is found primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. This species may also occur as far as coastal NSW and Victoria during such times.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area. There is no potential for a significant impact on this species.	No.
Blue-billed duck *Oxyura australis*	V (TSC)	This species prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover.	Widespread in NSW, but most common in the southern Murray-Darling Basin area.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides potential marginal habitat for this species and it has not been recorded in the Project Disturbance Area. The species has been recorded in the local area, however there is no potential for a significant impact on this species.	No.

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Australasian bittern *Botaurus poiciloptilus*	E (TSC) E (EPBC)	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleoacharis* spp.).	This species may be found over most of NSW except for the far north-west.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides potential marginal habitat for this species and it has not been recorded in the Project Disturbance Area. The species has been recorded in the local area, however there is no potential for a significant impact on this species.	No.
Black-breasted buzzard *Hamirostra melanosternon*	V (TSC)	Lives in a range of inland habitats, especially along timbered watercourses (also the preferred breeding habitat). The black-breasted buzzard hunts over grasslands and sparsely timbered woodlands.	Found sparsely in areas of less than 500 mm rainfall, from north-western NSW and north-eastern South Australia to the east coast at about Rockhampton, then across northern Australia south almost to Perth, avoiding only the Western Australian deserts.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area or the local area. While this species is not known to occur in the local area it may still occur on a rare basis and is potentially sensitive to the development.	Yes

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Square-tailed kite *Lophoictinia isura*	V (TSC)	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	Scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area or the local area. While this species is not known to occur in the local area it may still occur on a rare basis and is potentially sensitive to the development.	Yes
Spotted harrier *Circus assimilis*	V (TSC)	Their habitat of choice is open grassy woodland, grassland, inland riparian woodland and shrub steppe. Although mostly associated with native grasslands it has also been identified in agricultural farmland. Their nest is made in a tree and composed of sticks.	The spotted harrier can be found throughout mainland Australia except for areas of dense forest on the coast, escarpments and ranges and rarely ever in Tasmania.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded in the local area. This species is potentially sensitive to the proposed development.	Yes.

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Little eagle *Heiraaetus morphnoides*	V (TSC)	This species is typically identified in open eucalypt forests, woodlands and open woodlands, and other areas where prey are plentiful. The nest in tall living trees within remnant patches.	The little eagle is distributed throughout mainland Australia except for the most densely forested parts of the Great Dividing Range escarpment.	Goobang NP Woggoon NR Blow Clear West SF Back Yamma SF Cookamidgera SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded in the local area. This species is potentially sensitive to the proposed development.	Yes.
Grey falcon *Falco hypoleucos*	E (TSC)	The grey falcon is typically identified in shrubland, grassland and wooded watercourses of arid and semi-arid regions; although it has occasionally been identified near the coast in open woodland. Also occurs near wetlands where surface water attracts prey. Like other falcons it utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse.	Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The breeding range has contracted since the 1950s with most breeding now confined to arid parts of the range.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded in the local area. This species is potentially sensitive to the proposed development.	Yes.

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Black falcon *Falco subniger*	PD-V (TSC)	The black falcon is typically identified in woodlands, open country and terrestrial wetlands of tropical and temperate Australia; the species having a stronghold in the arid and semi-arid zones. Generally nests in trees in proximity to watercourses or waterholes on lightly timbered plains.	Widely but sparsely spread across NSW generally west of the Great Dividing Range. In NSW, breeding is generally recorded within the Murray-Darling Basin.	West Cookeys Plains SF Goobang NP	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded in the Wider Study Area and the local area. This species is potentially sensitive to the proposed development.	Yes.
Brolga *Grus rubicunda*	V (TSC)	Often feed in dry grassland or ploughed paddocks or even desert clay pans, but they are dependent on wetlands too, especially shallow swamps.	Abundant in the northern tropics, but very sparse across the southern part of its range.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded in the Wider Study Area and the local area. This species is potentially sensitive to the proposed development.	Yes.

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Bush stone-curlew *Burhinus grallarius*	E (TSC)	This species inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. The bush stone curlew is largely nocturnal, being especially active on moonlit nights. It nests on the ground in a scrape or small bare patch laying two eggs in spring and early summer.	The bush stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however, and in the south-east it is either rare or extinct throughout its former range.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded in the Wider Study Area and the local area. This species is potentially sensitive to the proposed development.	Yes.
Curlew sandpiper *Calidris ferruginea*	E (TSC)	Forages in or at edges of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach cast seagrass or seaweed. Roosts on shingle, shell or sand beaches, spits or islets on the coast or in wetlands, sometimes in salt marsh, beach cast seaweed or on rocky shores.	Generally occupies littoral and estuarine habitats, also occurring in non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area. There is no potential for a significant impact on this species.	No.

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Black-tailed godwit *Limosa limosa*	V (TSC)	Primarily a coastal species. Usually found in sheltered bays, estuaries and lagoons with large inter-tidal mudflats and/or sand-flats. When it occurs inland, it can be found on mudflats around muddy lakes and swamps in water less than 10 cm deep. Individuals have also been recorded in wet fields and sewerage treatment works.	This species is migratory, flying to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the north and south coast, and inland. This species has been recorded within the Murray-Darling Basin, on the western slopes of the Northern Tablelands and in the far north-western corner of the state.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area. There is no potential for a significant impact on this species.	No.
Australian painted snipe, painted Snipe *Rostratula australis, Rostratula benghalensis* s. *lat*	E (TSC) V (EPBC)	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowal, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin.	This species is not known to occur in any reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been in the Project Disturbance Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.

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Glossy black-cockatoo *Calyptorhynchus lathami*	V (TSC)	Habitat for this species includes forests on low-nutrient soils, specifically those containing key *Allocasuarina* feed species. It will also eat seeds from eucalypts, angophoras, acacias, cypress pine and hakeas, as well as eating insect larvae. Breeding occurs in autumn and winter, with large hollows required.	The glossy black-cockatoo has a sparse distribution along the east coast and adjacent inland areas from western Victoria to Rockhampton in Queensland. In NSW, it has been recorded as far inland as Cobar and Griffith.	Goobang NP	The Project Disturbance Area provides marginal habitat for this species, however it has not been recorded in the Project Disturbance Area. It has not been recorded in the Wider Study Area or the local area. There is no potential for a significant impact on this species.	No.
Major Mitchells cockatoo *Cacatua leadbeateri*	V (TSC)	This species inhabits areas within easy reach of water; these areas can be treed or treeless. The Major Mitchell cockatoo generally forages on the ground and is mostly found in couples or small groups, although flocks of hundreds can be found where food supplies are abundant. This cockatoo nests in tree hollows.	This species is distributed from south-west Queensland through to north-west Victoria, as well as most of SA, the south-west NT, between Shark Bay and Jurien. In NSW it is located as far east as Bourke and Griffith and sporadically in locations east of this.	Woggoon NR	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has not been recorded in the Wider Study Area or the local area. There is no potential for a significant impact on this species.	No.

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Little lorikeet *Glossopsitta pusilla*	V (TSC)	This species can be found in dry-open eucalypt forests and woodlands, and have been identified in remnant vegetation, old growth vegetation, logged forests, and roadside vegetation. The little lorikeet usually forages in small flocks, not always with birds of their own species. They nest in hollows, mostly in living smooth-barked apples.	This species is distributed from just north of Cairns, around the east coast of Australia down to Adelaide. In NSW this species is found from the coast to the western slopes of the Great Dividing Range, extending as far west as Albury, Dubbo, Parkes and Narrabri.	Goobang NP Nangar NP Back Yamma SF Cookamidgera SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Wider Study Area or the Project Disturbance Area. It has not been recorded in the local area. There is no potential for a significant impact on this species.	No.
Superb parrot *Polytelis swainsonii*	V (TSC) V (EPBC)	This species inhabits areas of Box-Gum, Box-Cypress-pine and bore Woodlands and River Red Gum Forest. These birds nest in the hollows of large trees, often in small colonies with frequently more than one nest in a single tree.	This parrot is found throughout eastern inland NSW. The core breeding area for this species on the South-western slopes is in the area bounded by Cowra and Yass in the East, and Grenfell, Cootamundra and Coolac in the west. During the winter months the birds from these areas migrate north to the upper Namoi and Gwydir Rivers. Birds are present all-year-round in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers.	Goobang NP Woggoon NR	This species occurs in the Project Disturbance Area and is potentially sensitive to the development.	Yes.

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Swift parrot *Lathamus discolor*	E (TSC) E (EPBC)	This species often visits box-ironbark forests, feeding on nectar and lerps. In NSW, typical tree species in which this species forages include mugga ironbark (*Eucalyptus sideroxylon*), grey box (*E. moluccana*), swamp mahogany (*E. robusta*), spotted gum (*Corymbia maculata*), red bloodwood (*C. gummifera*), narrow-leaved red ironbark (*E. crebra*), forest red gum (*E. tereticornis*) and yellow box (*E. melliodora*). This species is a migratory species that breeds in Tasmania during the spring and summer, and migrates to the mainland during the cooler months of the year.	In NSW this species has been recorded from the western slopes region along the inland slopes of the Great Dividing Range, as well as forests along the coastal plains from southern to northern NSW. The Project Disturbance Area is within the known distribution of this species.	Back Yamma SF Cookamidgera SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded in the Wider Study Area and the local area. This species is potentially sensitive to the proposed development.	Yes.

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Turquoise parrot *Neophema pulchella*	V (TSC)	This species lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. It nests in tree hollows, logs or posts, from August to December.	The turquoise parrots range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range.	Goobang NP Nangar NP Back Yamma SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has not been recorded in the Wider Study Area or the local area. There is no potential for a significant impact on this species.	No.
Barking owl *Ninox connivens*	V (TSC)	Habitat for this species includes dry forests and woodlands, often in association with hydrological features such as rivers and swamps.	The barking owl is distributed sparsely throughout temperate and semi-arid areas of mainland Australia; however it is most abundant in the tropical north. Most records for this species occur west of the Great Dividing Range.	Goobang NP Nangar NP Blow Clear West SF Back Yamma SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area or the Wider Study Area. It has been recorded in the local area. This species is potentially sensitive to the proposed development.	Yes.

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Masked owl *Tyto novaehollandiae*	V (TSC)	This species is generally recorded from open forest habitat with sparse mid-storey but patches of dense, low ground cover. It is also recorded from ecotones between wet and dry eucalypt forest, along minor drainage lines and near boundaries between forest and cleared land.	The masked owl occurs sparsely throughout the continent and nearby islands, including Tasmania and New Guinea.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded in the Wider Study Area and the local area. This species is potentially sensitive to the proposed development.	Yes.
Brown treecreeper (eastern form) *Climacteris picumnus victoriae*	V (TSC)	Typical habitat for this species includes drier forests, woodlands and scrubs with fallen branches; river red gums on watercourses and around lake-shores; paddocks with standing dead timber; and margins of denser wooded areas. This species prefers areas without a dense understorey.	This species occurs over central NSW, west of the Great Dividing Range and sparsely scattered to the east of the divide in drier areas such as the Cumberland Plain of Western Sydney, and in parts of the Hunter, Clarence, Richmond and Snowy River valleys.	Goobang NP Nangar NP Woggoon NR Blow Clear West SF Coradgery SF Back Yamma SF Cookamidgera SF Wombin SF West Cookeys SF Gunningbland SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded in the Wider Study Area and the local area. This species is potentially sensitive to the proposed development.	Yes.

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Speckled warbler *Chthonicola sagittata*	V (TSC)	The speckled warbler occurs in eucalypt-dominated communities that have a grassy understorey, leaf litter and shrub cover, often on rocky ridges or in gullies.	Patchy distribution throughout south-eastern Queensland, eastern half of NSW and into Victoria, as far west as the Grampians.	Goobang NP Nangar NP Woggoon NR Coradgery SF Back Yamma SF Cookamidgera SF West Cookeys SF Gunningbland SF Monumea SF	The Project Disturbance Area provides limited suitable habitat for this species and it has not been recorded in the Project Disturbance Area or the Wider Study Area. It has been recorded in the local area with one record in the NSW Atlas of Wildlife from 1978 in the property immediately east of the Project Area. This species is potentially sensitive to the proposed development.	Yes.

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Pied honeyeater *Certhionyx variegatus*	V (TSC)	This species primarily inhabits areas of arid and semi-arid wattle shrub (usually mulga, *Acacia aneura*), mallee, spinifex, and eucalypt woodland. They are highly nomadic and tend to follow flowering shrub patterns. The pied honeyeater nests in tree or shrub forks approximately 5 m from the ground in cup-shaped nests made from grasses, twigs and spiders web.	This species is generally distributed throughout acacia, mallee and spinifex scrubs of arid and semi-arid Australia, however is known to occur further east on the Hunter Valley slopes and plains.	Back Yamma SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has not been recorded in the Wider Study Area or the local area. There is no potential for a significant impact on this species.	No.

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Regent honeyeater *Anthochaera phrygia*	CE (TSC) E (EPBC)	This species generally occurs in temperate eucalypt woodlands and open forests of south eastern Australia. It is commonly recorded from box-ironbark eucalypt associations, wet lowland coastal forests dominated by swamp mahogany, spotted gum and riverine *Casuarina* woodlands. An apparent preference exists for the wettest, most fertile sites within these associations, such as creek flats, river valleys and foothills.	Once recorded between Adelaide and the central coast of Queensland, this species range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland.	Back Yamma SF	The Project Disturbance Area provides suitable habitat for this species, although it has not been recorded there. This species has not been recorded in the Wider Study Area or the local area. There is no potential for a significant impact on this species.	No.

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White-fronted chat *Epthianura albifrons*	V (TSC)	This bird can mostly be found in temperate to arid climates (rarely ever sub-tropical areas). It is typically identified in lowlands and foothills below 1000m above sea level. They seem to prefer habitats near waterways and damp areas (particularly wetlands containing salt marsh that are bordered by grassland or lightly timbered woodland).	The white-fronted chat is distributed across the southern half of Australia from the southern end of Queensland to the southern areas of Tasmania and across to WA. In NSW this species is mostly known from the southern half of the state and is most densely recorded along the coast from Newcastle down to the Victorian border; although records of the species have been made from as far west as the NSW-SA border, the far north-west corner of the state and Inverell in the north-east. Records of this species are sparse in the Hunter Region (excluding Newcastle) as well as the North Coast Bioregion and the North Western Plains Bioregion.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area or Wider Study Area. There is no potential for a significant impact on this species.	No.

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Painted honeyeater *Grantiella picta*	V (TSC)	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. They construct a delicate hanging nest in the outer canopy of drooping eucalypts, she-oaks, paperbarks and mistletoes.	The greatest concentrations of this species of bird and almost all breeding occur on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution.	Goobang NP	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded in the Wider Study Area and the local area. This species is potentially sensitive to the proposed development.	Yes.
Black-chinned honeyeater (eastern subspecies) *Melithreptus gularis gularis*	V (TSC)	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially mugga ironbark, white box, grey box, yellow box and forest red gum. Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees.	The subspecies is widespread, from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond River district. It has also been recorded at a few scattered sites in the Hunter, Central Coast and Illawarra regions.	Goobang NP Nangar NP Blow Clear West SF Back Yamma SF Cookamidgera SF	The Project Disturbance Area provides potential marginal habitat for this species and it has not been recorded in the Project Disturbance Area. This species has been recorded in the local area however it is unlikely to occur within the Project Disturbance Area. This species has not been recorded in the Wider Study Area. There is no potential for a significant impact on this species.	No.

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Grey-crowned babbler (eastern subspecies) *Pomatostomus temporalis temporalis*	V (TSC)	The grey-crowned babbler is typically found in open box-gum woodlands on slopes. Or box-cypress-pine and open box woodlands on alluvial plains. Also found in acacia shrubland and adjoining areas. This species lives in large family groups which roost at night in conspicuous dome-shaped stick nests.	Occurs throughout northern and south-eastern Australia. In NSW, this species occurs on the western slopes of the Great Dividing Range and on the western plains reaching as far west as Louth and Hay. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW.	Goobang NP Woggoon NR Blow Clear West SF Coradgery SF Back Yamma SF Cookamidgera SF Wombin SF West Cookeys SF Monumea SF Strahorn SF	This species occurs in the Project Disturbance Area and is potentially sensitive to the development.	Yes.
Varied sittella *Daphoenositta chrysoptera*	V (TSC)	The varied sittella can typically be found in eucalypt forests and woodlands, especially of rough-barked species and mature smooth-barked gums with dead branches, it can also be identified in mallee and acacia woodlands. This species builds a cup shaped nest made of plant fibres and spiders webs which is placed at the canopy level in the fork of a living tree.	The varied sittella is a sedentary species that inhabits the majority of mainland Australia with the exception of the treeless deserts and open grasslands. Its NSW distribution is basically continuous from the coast to the far west.	Goobang NP Nangar NP Woggoon NR Coradgery SF Back Yamma SF Cookamidgera SF West Cookeys SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area or the Wider Study Area. It has been recorded in the local area. This species is potentially sensitive to the proposed development.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Gilberts whistler *Pachycephala inornata*	V (TSC)	Occurs in ranges, plains and foothills in arid and semi-arid timbered habitats. In NSW it occurs mostly in mallee shrubland, but also in box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests. Within the mallee the species is often found in association with an understorey of spinifex and low shrubs including acacias, hakeas, sennas and grevilleas. In woodland habitats, the understorey comprises dense patches of shrubs.	There are now only three separate populations left in NSW. Most of the eastern population occurs in an area enclosed by a line joining Gilgandra to Cobar, then south to Narrandera, east to Wagga Wagga, north to Wellington and back to Gilgandra. The species is also recorded along the Murray River Valley between Mathoura and Wentworth. There is a restricted population in the Scotia mallee area north of Wentworth.	Woggoon NR Back Yamma SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has not been recorded in the Wider Study Area or the local area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Scarlet robin *Petroica boodang*	V (TSC)	This robin can be found in woodlands and open forests from the coast through to inland slopes. The birds can sometimes be found on the eastern fringe of the inland plains in the colder months of the year. Woody debris and logs are both important structural elements of its habitat. It forages from low perches on invertebrates either on the ground or in woody debris or tree trunks.	The scarlet robin can be found in south-eastern Australia, from Tasmania to the southern end of Queensland, to western Victoria and south SA.	Goobang NP Back Yamma SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has not been recorded in the Wider Study Area or the local area There is no potential for a significant impact on this species.	No.
Flame robin *Petroica phoenicea*	V (TSC)	This species is known to breed in moist eucalypt forests and woodlands. It can usually be seen on ridges and slopes in areas where there is an open understorey layer. This species migrates during the winter to more lowland areas such as grasslands where there are scattered trees, as well as open woodland of the inland slopes and plains.	This robin is located in south-eastern Australia from the Queensland border to Tasmania and into Victoria as well as south-east SA.	Nangar NP	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has not been recorded in the Wider Study Area or the local area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Hooded robin (south-eastern form) *Melanodryas cucullata cucullata*	V (TSC)	Hooded robins are found in lightly timbered woodland, mainly dominated by acacia and/or eucalypts. They nest in either a tree fork or crevice in a cup constructed of bark and cobweb at a height between 1 and 5 m.	Hooded robins are found all over mainland Australia, except Cape York and eastern Gulf of Carpentaria or inland around the Simpson Desert, on the Nullarbor Plain or south of the Kimberley Ranges. They are more commonly found in south-eastern Australia from Adelaide to Brisbane.	Goobang NP Nangar NP Woggoon NR Coradgery SF Back Yamma SF Gunningbland SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area or the Wider Study Area. It has been recorded in the local area with one record in the NSW Atlas of Wildlife from 1978 in the property immediately east of the Project Area. This species is potentially sensitive to the proposed development.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Diamond firetail *Stagonopleura guttata*	V (TSC)	Habitat includes a range of eucalypt dominated communities with a grassy understorey, including woodland, forest and mallee. Constant populations have not been identified in areas where there are no vegetated remnants larger than 200 ha.	The diamond firetail occurs through central and eastern NSW, north into southern and central Queensland and south through Victoria to South Australia. In NSW it mainly occurs west of the Great Dividing Range, although populations are known from drier coastal areas such as the Cumberland Plain and the Hunter, Clarence, Richmond and Snowy River valleys.	Goobang NP Nangar NP Woggoon NR Back Yamma SF Cookamidgera SF Gunningbland SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area or the Wider Study Area. It has been recorded in the local area with one record in the NSW Atlas of Wildlife from 1978 in the property immediately east of the Project Area. This species is potentially sensitive to the proposed development.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
MAMMALS						
Spotted-tailed quoll *Dasyurus maculatus*	V (TSC) E (EPBC)	Habitat for this species is highly varied, ranging from sclerophyll forest, woodlands, coastal heathlands and rainforests. Records exist from open country, grazing lands and rocky outcrops. Suitable den sites include hollow logs, tree hollows, rocky outcrops or caves.	In NSW the spotted-tailed quoll occurs on both sides of the Great Dividing Range, with the highest densities occurring in the north east of the state. It occurs from the coast to the snowline and inland to the Murray River.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been in the Project Disturbance Area or the Wider Study Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Koala (combined populations of Queensland, NSW and ACT) *Phascolarctos cinereus*	V (TSC) V (EPBC)	This species inhabits eucalypt forest and woodland, with suitability influenced by tree species and age, soil fertility, climate, rainfall and fragmentation patterns. The species is known to feed on a large number of eucalypt and non-eucalypt species; however it tends to specialise on a small number in different areas. *Eucalyptus tereticornis, E. punctata, E. cypellocarpa, E. viminalis, E. microcorys, E. robusta, E. albens, E. camaldulensis* and *E. populnea* are some preferred species.	The koala has a fragmented distribution throughout eastern Australia, with the majority of records from NSW occurring on the central and north coasts, as well as some areas further west. It is known to occur along inland rivers on the western side of the Great Dividing Range.	Goobang NP	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded in the Wider Study Area and the local area. This species is potentially sensitive to the proposed development.	Yes.

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Squirrel glider *Petaurus norfolcensis*	V (TSC)	Inhabits a variety of mature or old growth habitats, including box, box-ironbark woodlands, river red gum forest, and blackbutt-bloodwood forest with heath understorey. It prefers mixed species stands with a shrub or acacia mid-storey, and requires abundant tree hollows for refuge and nest sites.	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria.	Goobang NP	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been precautionarily identified in the Wider Study Area (GHD 2009a). It has been recorded in the local area. This species is potentially sensitive to the proposed development.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Brush-tailed rock-wallaby *Petrogale penicillata*	E (TSC) V (EPBC)	This species occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north. This species browses on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. This species shelters or bask during the day in rock crevices, caves and overhangs and is most active at night.	The brush-tailed rock-wallaby was once abundant and ubiquitous throughout the mountainous country of south-eastern Australia. This species distribution roughly followed the Great Dividing Range for 2500 kilometres from the Grampians in West Victoria to Nanango in south-east Queensland, with outlying populations in coastal valleys and ranges to the east of the divide, and the slopes and plains as far west as Cobar in NSW and Injune (500 km north-west of Brisbane) in Queensland.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area or the Wider Study Area. There is no potential for a significant impact on this species.	No.
New Holland mouse *Pseudomys novaehollandiae*	V (EPBC)	This species inhabits a range of habitats from open heathlands, open woodlands with a heath understorey, as well as vegetated dunes. This species lives in a burrow which is shared with other individuals.	This species has a disjunct distribution across Tasmania, Victoria, Queensland and NSW.	Goobang NP	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area or the Wider Study Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Yellow-bellied sheathtail bat *Saccolaimus flaviventris*	V (TSC)	This species forages for insects, flying high and fast over the forest canopy, but lower in more open country. It forages in most habitats across its very wide range, with and without trees; and appears to defend an aerial territory. It roosts singularly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to use mammal burrows.	The yellow-bellied sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes.	Blow Clear West SF Strahorn SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area or the Wider Study Area. It has been recorded in the local area. This species is potentially sensitive to the proposed development.	Yes.
Eastern bentwing-bat *Miniopterus schreibersii oceanensis*	V (TSC)	This species hunts in forested areas and uses caves as the primary roosting habitat, but also uses derelict mines, storm-water tunnels, buildings and other man-made structures. It forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	Eastern bentwing bats occur along the east and north-west coasts of Australia.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species and it has been recorded in the Wider Study Area. This species is potentially sensitive to the proposed development.	Yes.

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Corbens long-eared bat *Nyctophilus corbeni*	V (TSC) V (EPBC)	This species inhabits a variety of vegetation types, including mallee, bulloak (*Allocasuarina luehmannii*) and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. This species roosts in tree hollows, crevices, and under loose bark.	The distribution of the south eastern form of this species coincides approximately with the Murray Darling Basin with the Pilliga Scrub region a distinct stronghold for this species. This species has been recorded throughout NSW with the exception of the extreme north-west of the state, and most areas east of the Great Dividing Range (with the exception of the areas around Sydney).	Goobang NP Nangar NP Woggoon NR	The Project Disturbance Area provides suitable habitat for this species, although it has not been recorded there. It has not been recorded in the Wider Study Area or the local area. There is no potential for a significant impact on this species.	No.
Little pied bat *Chalinolobus picatus*	V (TSC)	These species inhabits dry-open forest open woodland, mulga woodlands, chenopod shrublands, cypress-pine forest, mallee, bimbil box (*Eucalyptus populnea* subsp. *bimbil*). It can be located in hot, dry areas but only if in proximity to a water source. The little pied bat roosts in a range of situations from caves, mineshafts and tunnels, through to tree hollows and buildings.	This bat species is distributed from inland Queensland to NSW (inclusive of the Western Plains and slopes) to small areas of Victoria and SA.	Woggoon NR Blow Clear West SF Strahorn SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded in the Wider Study Area and the local area. This species is potentially sensitive to the proposed development.	Yes.

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FISH						
Silver perch *Bidyanus bidyanus*	V (FM Act)	Silver perch are found in similar habitats to Murray cod and Golden perch, i.e. lowland, turbid and slow-flowing rivers.	Formerly widespread over much of the Murray-Darling Basin excluding the most upper reaches. The species is still patchily abundant in the mid-Murray.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No.
Murray cod *Maccullochella peelii peelii*	V (EPBC)	This species is typically found in warm water habitats ranging from clear water to cloudy, and rocky to sandy bottomed. The waters are usually sheltered by rock or timber overhangs, with the fish strongly dependent on woody debris in the water column. Generally found in waters up to 5 m in depth.	This species is distributed throughout the warmer waters of the Murray-Darling Basin.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No.
Macquarie perch *Macquaria australasica*	E (EPBC) E (FM)	This species lives in schools, typically in rocky holes with lots of protective cover over the surface of the water.	This fish is distributed throughout the Murray-Darling Basin (in Victoria, NSW and ACT), Shoalhaven River, Hawkesbury River and some of the water supply dams in Sydney.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No.

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Murray-Darling Population of the Eel-tailed catfish *Tandanus tandanus*	EP (FM)	This species inhabits a range of habitats including rivers, creeks, lakes, billabongs and lagoons. It can be found in both flowing and sluggish or still clear to turbid waters. Substrates range from mud, to gravel and rock.	This species is distributed throughout the Murray-Darling Basin and in the Eastern drainages NSW north of Newcastle.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species. There is no potential for a significant impact on this species.	No.
MIGRATORY SPECIES						
Malleefowl *Leipoa ocellata*	MIG (EPBC) JAMBA	The malleefowl is typically found in semi-arid and arid areas of temperate Australia, in shrubland and low woodlands dominated by dense but discontinuous mallee vegetation. They are usually on loamy or sandy soils with an annual average rainfall between 200 and 450 mm. The malleefowl has been known to forage in open grassland and farmland areas; and breeds in areas with plentiful leaf litter.	The malleefowl is distributed across southern Australia. Typically found west of the Great Dividing Range, from the Pilliga south-west through to the Griffith and Wentworth districts. A small number of records have been identified from east of the Great Dividing Range in the Goulburn River NP.	Woggoon NR	The Project Disturbance Area provides potential habitat for this species, however it has not been in the Project Disturbance Area or the Wider Study Area. There is one record of this species in the local area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
White-throated needletail *Hirundapus caudacutus*	MIG (EPBC) CAMBA JAMBA ROKAMBA	This species is only in Australia approximately between the months of October and May. They forage upon flying insects and drink whilst in flight. Feeding is typically associated with rising thermal currents typical with storm fronts and bushfires.	This species is distributed over eastern and northern Australia.	Goobang NP	The Project Disturbance Area provides suitable habitat for this species, although it has not been recorded there. It has not been recorded in the Wider Study Area or the local area. While this species is not known to occur in the local area it may still occur on a rare basis and is potentially sensitive to the development.	Yes.
Fork-tailed swift *Apus pacificus*	MIG (EPBC) CAMBA JAMBA ROKAMBA	The fork-tailed swift is mostly found in Australia through the months of October through to April. This swift spends most of its time when in flight ahead of storm fronts and up-draughts.	The fork-tailed swift can be found throughout Australia during migration. In Australia it is most common west of the Great Dividing Range. This species is uncommon in Tasmania.	Back Yamma SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area or the Wider Study Area. While this species is not known to occur in the local area it may still occur on a rare basis and is potentially sensitive to the development.	Yes.

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Great egret *Ardea alba*	MIG (EPBC) CAMBA JAMBA	The great egret typically inhabits areas of shallow, flowing waters, but also uses damp grasslands and other watered areas. They can be observed both in flocks and on their own, and roost during the night in groups.	The great egret is distributed throughout the world, and is common throughout most areas of Australia, with exception to extremely arid areas.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area or the Wider Study Area. It has been recorded in the local area. This species is potentially sensitive to the proposed development.	Yes.
Cattle egret *Ardea ibis*	MIG (EPBC) CAMBA JAMBA	The cattle egret can be found in grasslands, wetlands and woodlands and has never been identified in arid areas. These birds are commonly sighted at garbage dumps, pastures and croplands (especially where poor drainage is present) are common.	The cattle egret is distributed throughout Asia, Africa, Europe and Australia. It is most commonly found in north-eastern WA, the NT and in south-eastern Australia from Bundaberg Queensland through to Port Augusta SA. It has also been identified in Tasmania.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area or the Wider Study Area. It has not been recorded in the local area. There is no potential for a significant impact on this species.	No.

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Glossy ibis *Plegadis falcinellus*	MIG (EPBC) Bonn CAMBA	Freshwater marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. In Australia, the largest areas of prime habitat are the inland and northern floodplains.	Breeding locations in the Murray Darling Basin in northern NSW, and the western Riverina of NSW/Victoria.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area or the Wider Study Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.
White-bellied sea-eagle *Haliaeetus leucogaster*	MIG (EPBC) CAMBA	These birds are typically sighted perched in tall trees and soaring above bodies of water and land. They are territorial and form permanent breeding pairs.	This species is distributed across Australia, China, India, Indonesia, New Guinea, and south-east Asia. Within Australia it is distributed along and near the coast.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has not been recorded in the Wider Study Area or the local area. There is no potential for a significant impact on this species.	No.

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Lathams snipe Japanese snipe *Gallinago hardwikii*	MIG (EPBC) Bonn CAMBA JAMBA ROKAMBA	Lathams snipe can be found in permanent and ephemeral wetlands up to 2000 m above sea level. These water bodies are usually freshwater with low, dense vegetation. They forage in areas of mud with some vegetation cover and roost nearby to these areas. Latham's snipe does not breed in Australia, only passing through for migration.	This species has been recorded from Cape York through to south-east SA. The range of this species extends from inland of the eastern tablelands in south-east Queensland to west of the Great Dividing Range in NSW. Richmond River, NSW is a favourite area for non-breeding birds.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area or the Wider Study Area. It has been recorded in the local area. This species is potentially sensitive to the proposed development.	Yes.
Common greenshank *Tringa nebularia*	MIG (EPBC) Bonn CAMBA JAMBA ROKAMBA	Found in a wide variety of inland wetlands and sheltered coastal habitats.	Widespread west of the Great Dividing Range, especially between the Lachlan and Murray rivers and the Darling river drainage basin including the Macquarie Marshes, and north-west regions.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area or the Wider Study Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.

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Marsh sandpiper *Tringa stagnatilis*	MIG (EPBC) Bonn CAMBA JAMBA ROKAMBA	This species generally occurs in brackish or freshwater wetlands, estuaries and tidal mudflats.	Regular summer migrant (August – May) to mainly coastal Australia from breeding grounds in Austria and Mongolia. Widespread but scattered inland.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area or the Wider Study Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.
Sharp-tailed sandpiper *Calidris acuminata*	MIG (EPBC) Bonn CAMBA JAMBA ROKAMBA	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. Found in lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore-drains and bore swamps, saltpans and hypersaline lakes inland.	Widespread in most regions of NSW but sparse in the south-central western plain and east lower western regions of NSW.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area or the Wider Study Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.

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Curlew sandpiper *Calidris ferruginea*	MIG (EPBC) Bonn CAMBA JAMBA ROKAMBA	Forages in or at edges of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach cast seagrass or seaweed. Roosts on shingle, shell or sand beaches, spits or islets on the coast or in wetlands, sometimes in salt marsh, beach cast seaweed or on rocky shores.	Generally occupies littoral and estuarine habitats, also occurring in non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area or the Wider Study Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.
Black-tailed godwit *Limosa limosa*	MIG (EPBC) Bonn CAMBA JAMBA ROKAMBA	Primarily a coastal species. Usually found in sheltered bays, estuaries and lagoons with large inter-tidal mudflats and/or sand-flats. When it occurs inland, it can be found on mudflats around muddy lakes and swamps in water less than 10 cm deep. Individuals have also been recorded in wet fields and sewerage treatment works.	This species is migratory, flying to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the north and south coast, and inland. This species has been recorded within the Murray-Darling Basin, on the western slopes of the Northern Tablelands and in the far north-western corner of the state.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area or the Wider Study Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.

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Australian painted snipe *Rostratula australis*	MIG (EPBC) CAMBA	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowal, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area provides suitable habitat for this species, however it has not been in the Project Disturbance Area or the Wider Study Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.
White-winged black tern *Childonias leucopterus*	MIG (EPBC) CAMBA JAMBA ROKAMBA	Non-breeding migrant to Australia. Mostly inhabits fresh, brackish or saline, and coastal or subcoastal wetlands. Rarely occur on inland wetlands in Australia.	Scattered records from inland wetlands west of the Great Divide, for example Lake Cowal, Narran Lake and as far west as Menindee Lakes.	This species is not known to occur in any conservation reserves in the region.	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area or the Wider Study Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Satin flycatcher *Myiagra cyanoleuca*	MIG (EPBC) Bonn	This species typically inhabits wet areas of tall forests, particularly in gullies. The satin flycatcher moves north in the winter and is seldom seen in NSW, Tasmania, Victoria or SA during these times. This bird nests in loose colonies in broad-based cup-shaped nests on a bare horizontal branch. These nests are constructed from bark, grass, lichen and cobwebs (Australian Museum Online 2005).	The satin flycatcher can be found in both Australia and New Guinea. In Australia it is distributed along the east coast from Cape York through to Tasmania, also covering parts of south-eastern SA.	Goobang NP	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area or the Wider Study Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.
Rufous fantail *Riphidura rufifrons*	MIG (EPBC) Bonn	This species typically inhabits areas of dense wet forest, mangrove, rainforest or swamp woodlands. This species prefers areas where there is intense shade available and is often seen close to ground. In winter it is seldom found in NSW or Victoria.	This species is distributed across the north and eastern coast of Australia, but is also found in Guam, New Guinea, the Solomon Islands and Sulawesi.	Back Yamma SF Cookamidgera SF	The Project Disturbance Area does not provide suitable habitat for this species and it has not been recorded in the Project Disturbance Area or the Wider Study Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Project Disturbance Area	Reservation in the Region	Occurrence in Project Disturbance Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Rainbow bee-eater *Merops ornatus*	MIG (EPBC) JAMBA	The preferred habitat of the rainbow bee-eater is open forests and woodlands, shrublands, and cleared or semi-cleared areas (commonly farmland). These areas are usually in close proximity to permanent water, however, during migration this bird may fly over areas of non-preferential habitat.	This species is distributed throughout most of mainland Australia as well as several near-shore islands. It is not found in Tasmania and has only been identified in a thin strip in the most arid regions of central WA.	Goobang NP Nangar NP Woggoon NR Back Yamma SF Cookamidgera SF Gunningbland SF Strahorn SF	The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded in the Wider Study Area and the local area. This species is potentially sensitive to the proposed development.	Yes.
Regent honeyeater *Anthochaera phrygia*	MIG (EPBC) JAMBA	This species generally occurs in temperate eucalypt woodlands and open forests of south eastern Australia. It is commonly recorded from box-ironbark eucalypt associations, wet lowland coastal forests dominated by swamp mahogany, spotted gum and riverine *Casuarina* woodlands. An apparent preference exists for the wettest, most fertile sites within these associations, such as creek flats, river valleys and foothills.	Once recorded between Adelaide and the central coast of Queensland, this species range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland.	Back Yamma SF	The Project Disturbance Area provides suitable habitat for this species, although it has not been recorded there. This species has not been recorded in the Wider Study Area or the local area. There is no potential for a significant impact on this species.	No.

Note:

Bonn	Bonn Convention
CAMBA	China-Australia Migratory Bird Agreement
E	Endangered
EPBC	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM	NSW Fisheries Management Act 1994
JAMBA	Japan-Australia Migratory Bird Agreement
MAR	marine
MIG	migratory
NP	National Park
NR	Nature Reserve
ROKAMBA	Republic of Korea Migratory Bird Agreement
SCA	State Conservation Area
SF	State Forest
TSC	NSW Threatened Species Conservation Act 1999
V	Vulnerable

Table 3 – Likelihood of Occurrence Assessment of Threatened Flora Species and Threatened Ecological Communities Known or Predicted to Occur Within the Referral Area

Species	Legal Status	Specific Habitat	Distribution in Relation to the Referral Area	Reservation Within the Region[1] (NSW Government 2012)	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
THREATENED FLORA SPECIES						
Austrostipa metatoris	V (EPBC) V (TSC) 3V (ROTAP)	This perennial speargrass grows in tussocks to 1 m in height. They are known to occur on sand hills, sand ridges, undulating plains and mallee country. It is usually found growing in red to red-brown clay-loam to sandy-loam soils. It is known to grow in association with *Eucalyptus populnea, E. intertexta, Callitris glaucophylla, Casuarina cristata, Santalum acuminatum* and *Dodonaea viscosa*.	This species is known from NSW and SA. In NSW it mostly occurs in the Murray Valley, as well as scattered records in Central NSW inclusive of Lake Cargelligo, east of Goolgowi, Condobolin and South-west of Nymagee.	This species is not known to occur in any conservation reserves in the region.	The Referral Area provides suitable habitat for this species, however it has not been recorded in the Referral Area.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to the Referral Area	Reservation Within the Region[1] (NSW Government 2012)	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Austrostipa wakoolica	E (EPBC) E (TSC) 2E (ROTAP)	This is a densely tufted spear-grass that grows on the floodplains of the Murray River and its tributaries, in open woodland on grey, silty clay or sandy loam soils. Known habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open cypress pine forest on low sandy range; and a low, rocky rise. Austrostipa wakoolica is associated with the following species: *Callitris glaucophylla, Eucalyptus microcarpa, E. populnea, Austrostipa eremophila, A. drummondii, Austrodanthonia eriantha* and *Einadia nutans*.	This species is restricted in distribution to the floodplains of the Murray River tributaries of central-western and south-western NSW. Known locations are inclusive of Manna State Forest, Matong, Lake Tooim, Merran Creek, Tulla, Cunninyeuk and Mairjimmy State Forest.	Back Yamma SF	The Referral Area provides suitable habitat for this species, however it has not been recorded in the Referral Area.	Yes.
Swainsona murrayana Slender Darling-pea, Slender Swainson, Murray Swainson-pea	V (EPBC) V (TSC) 3VCi (ROTAP)	Slender darling pea grows in clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. Often in areas with a degree of grazing or cultivation. It is known to occur in a variety of vegetation types including, bladder saltbush, black box and grassland communities on level plains, floodplains and depressions. It is typically associated with *Maireana* spp.	Slender darling pea occurs throughout NSW and is known from the locations of Jerilderie and Deniliquin areas of the southern riverine plain, the Hay Plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. It is also known from Queensland, Victoria and SA.	This species is not known to occur in any conservation reserves in the region.	The Referral Area provides suitable habitat for this species, however it has not been recorded in the Referral Area.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to the Referral Area	Reservation Within the Region[1] (NSW Government 2012)	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Tylophora linearis	E (EPBC) V (TSC) 3E (ROTAP)	This species has only been recorded in low abundances and flowers in spring. *Tylophora linearis* grows at low altitudes upon sedimentary flats in both dry scrub and dry open forests. Typical plant associations are inclusive of hakea wattle (*Acacia hakeoides*), streaked wattle (*Acacia lineata*), black cypress pine (*Callitris endlicheri*), white cypress pine (*Callitris glaucophylla*), *Casuarina* spp., red ironbark (*Eucalyptus fibrosa*), mugga ironbark (*Eucalyptus sideroxylon*), white box (*Eucalyptus albens*), bulloak (*Allocasuarina luehmannii*), and *Myoporum* spp.	*Tylophora linearis* is known from the northern and central western slopes of NSW, and from the western Darling Downs in Queensland. In NSW it is known to occur in the districts of Barraba, Mendooran, Temora and West Wyalong, but is believed to occur elsewhere.	Goobang NP	The Referral Area does not provide suitable habitat for this species and this species has not been recorded in the Referral Area.	No.
THREATENED ECOLOGICAL COMMUNITIES						
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	EEC (EPBC)	This community is a temperate woodland community with grassy understory found on lower slopes and plains. This community often occurs on productive alluvial or colluvial soils.	Lower slopes and plains of mainland eastern Australia, inland of the Great Dividing Range from southern Queensland through to eastern SA.	This TEC is not known from any conservation reserves in the region.	This TEC was recorded within the Referral Area and is sensitive to the development.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to the Referral Area	Reservation Within the Region[1] (NSW Government 2012)	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Weeping Myall Woodland	EEC (EPBC)	This community comprises a dense to open tree canopy up to 15 m tall, depending on disturbance and regrowth history. The most common tree is weeping myall (*Acacia pendula*), which may occur with narrow-leaved ironbark (*Eucalyptus crebra*), cooba (*Acacia salacina*) and/or trees within the *Acacia homalophylla – Acacia melvillei* complex. Understorey shrubs may include stiff canthium (*Canthium buxifolium*), sticky hopbush (*Dodonaea viscosa*), wilga (*Geijera parviflora*), native olive (*Notelaea microphylla* var. *microphylla*) and silver cassia (*Senna zygophylla*). The shrub stratum is absent from some stands. The groundcover varies from dense to sparse, and is comprised of grasses such as a wallaby grass (*Austrodanthonia fulva*) and kangaroo grass (*Themeda australis*), and low shrubs and herbs such as common everlasting (*Chrysocephalum apiculatum*), climbing saltbush (*Einadia nutans* subsp. *nutans*), ruby saltbush (*Enchyleana tomentosa*), eastern cotton bush (*Maireana microphylla*) and *Ptilotus semilanatus*.	Occurs on flat areas, shallow depressions or gilgais on raised (relict) alluvial plains. These areas are not associated with active drainage channels and are rarely if ever flooded. Occurs on black, brown, red-brown or grey clay or clay loam soils. Occurs on all inland alluvial plains west of the Great Divide in NSW, including the Riverina, NSW South Western Slopes, Darling Riverine Plains, Brigalow Belt South, Brigalow Belt North, Murray-Darling Depression, Nandewar and Cobar Peneplain IBRA Bioregions.	This EEC is not known from any conservation reserves in the region.	This EEC was not recorded within the Referral Area and therefore no impact is predicted.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to the Referral Area	Reservation Within the Region[1] (NSW Government 2012)	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands	CEEC (EPBC)	This CEEC can occur as either woodland or derived grassland (grassy woodland from which trees have been removed). The groundlayer consists of native tussock grasses and herbs, and a sparse, scattered shrub layer. White box (*Eucalyptus albens*), yellow box (*E. melliodora*), or Blakely's red gum (*E. blakelyi*), dominate, where trees remain. Sites dominated by other tree species that do not have white box, yellow box, or Blakely's red gum as co-dominants are not considered to be part of the community, except in the Nandewar bioregion. In the Nandewar Bioregion, grey box (*E. moluccana* or *E. microcarpa*) may also be dominant in the community.	This CEEC occurs along the western slopes and tablelands of the Great Dividing Range from southern Queensland through NSW to central Victoria.	This CEEC is not known from any conservation reserves in the region.	This CEEC was recorded within the Referral Area and is sensitive to the development.	Yes.

Notes:

CEEC	Critically endangered ecological community
E	Endangered
EEC	Endangered ecological community
EPBC	*Environment Protection and Biodiversity Conservation Act 1999*
NP	National Park
ROTAP	Rare or Threatened Australian Plants
SF:	State Forest
TSC:	*Threatened Species Conservation Act 1995*
V	Vulnerable
1	The following conservation areas were searched for records of each species, population or community: Bimbi SF, Blow Clear West SF, Conimbla NP, Euglo South SF, Manna SF, Mt Nobby SF, Mulyandry SF, Taratta SF, Tollingo NR, Tomanbil SF, Warraderry SF, Weddin Mountains NP, Weelah SF, West Cookeys Plains SF, Goobang NP, Back Yamma SF, Woggoon NR, Cookamidgera SF, Nangar NP, Gunningbland SF and Strahorn SF.

ROTAP Codes:

C	In a conservation reserve
E	Endangered
i	Inadequately reserved
V	Vulnerable
2	Found over < 100 kilometres
3	Found over > 100 kilometres

Table 4 – Threatened Fauna Species and Migratory Species Known or Predicted to Occur Within the Referral Area

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
THREATENED FAUNA SPECIES						
BIRDS						
Australasian bittern *Botaurus poiciloptilus*	E (TSC) E (EPBC)	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleoacharis* spp.).	This species may be found over most of NSW except for the far north-west.	This species is not known to occur in any conservation reserves in the region.	The Referral Area does not provide suitable habitat for this species and it has not been recorded in the Referral Area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Malleefowl *Leipoa ocellata*	E (TSC) V (EPBC) MIG (EPBC)	The malleefowl is typically found in semi-arid and arid areas of temperate Australia, in shrubland and low woodlands dominated by dense but discontinuous mallee vegetation. They are usually on loamy or sandy soils with an annual average rainfall between 200 and 450 millimetres. The malleefowl has been known to forage in open grassland and farmland areas; and breeds in areas with plentiful leaf litter.	The malleefowl is distributed across southern Australia. Typically found west of the Great Dividing Range, from the Pilliga south-west through to the Griffith and Wentworth districts. A small number of records have been identified from east of the Great Dividing Range in the Goulburn River NP.	Woggoon NR	The Referral Area does not provide suitable habitat for this species, and it has not been recorded in the Referral Area. This species has been recorded in the local area (within a 20 kilometre radius of the Referral Area). There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Australian painted snipe, painted Snipe *Rostratula australis, Rostratula benghalensis* s. lat	E (TSC) V (EPBC) MIG (EPBC)	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowal, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin.	This species is not known to occur in any reserves in the region.	The Referral Area does not provide suitable habitat for this species and it has not been recorded in the Referral Area. This species has been recorded in the local area (within a 20 kilometre radius of the boundary of the Referral Area). There is no potential for a significant impact on this species.	No.
Superb parrot *Polytelis swainsonii*	V (TSC) V (EPBC)	This species inhabits areas of Box-Gum, Box-Cypress-pine and bore Woodlands and River Red Gum Forest. These birds nest in the hollows of large trees, often in small colonies with frequently more than one nest in a single tree.	This parrot is found throughout eastern inland NSW. The core breeding area for this species on the South-western slopes is in the area bounded by Cowra and Yass in the East, and Grenfell, Cootamundra and Coolac in the west. During the winter months the birds from these areas migrate north to the upper Namoi and Gwydir Rivers. Birds are present all-year-round in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers.	Goobang NP Woggoon NR	This species has been recorded in the Referral Area and is potentially sensitive to the development.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Swift parrot *Lathamus discolor*	E (TSC) E (EPBC)	This species often visits box-ironbark forests, feeding on nectar and lerps. In NSW, typical tree species in which this species forages include mugga ironbark (*Eucalyptus sideroxylon*), grey box (*E. moluccana*), swamp mahogany (*E. robusta*), spotted gum (*Corymbia maculata*), red bloodwood (*C. gummifera*), narrow-leaved red ironbark (*E. crebra*), forest red gum (*E. tereticornis*) and yellow box (*E. melliodora*). This species is a migratory species that breeds in Tasmania during the spring and summer, and migrates to the mainland during the cooler months of the year.	In NSW this species has been recorded from the western slopes region along the inland slopes of the Great Dividing Range, as well as forests along the coastal plains from southern to northern NSW. The Referral Area is within the known distribution of this species.	Back Yamma SF Cookamidgera SF	This species was recorded within 1.4 kilometres of the Referral Area and is potentially sensitive to the development due to the presence of suitable habitat for the species.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Regent honeyeater *Anthochaera phrygia*	CE (TSC) E (EPBC) MIG (EPBC)	This species generally occurs in temperate eucalypt woodlands and open forests of south eastern Australia. It is commonly recorded from box-ironbark eucalypt associations, wet lowland coastal forests dominated by swamp mahogany, spotted gum and riverine *Casuarina* woodlands. An apparent preference exists for the wettest, most fertile sites within these associations, such as creek flats, river valleys and foothills.	Once recorded between Adelaide and the central coast of Queensland, this species range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland.	Back Yamma SF	The Referral Area provides suitable habitat for this species, however it has not been recorded in the Referral Area or local area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
MAMMALS						
Spotted-tailed quoll *Dasyurus maculatus*	V (TSC) E (EPBC)	Habitat for this species is highly varied, ranging from sclerophyll forest, woodlands, coastal heathlands and rainforests. Records exist from open country, grazing lands and rocky outcrops. Suitable den sites include hollow logs, tree hollows, rocky outcrops or caves.	In NSW the spotted-tailed quoll occurs on both sides of the Great Dividing Range, with the highest densities occurring in the north east of the state. It occurs from the coast to the snowline and inland to the Murray River.	This species is not known to occur in any conservation reserves in the region.	The Referral Area provides potential marginal habitat for this species and it has not been recorded in the Referral Area. The species has been recorded in the local area, however there is no potential for a significant impact on this species.	No.
Brush-tailed rock-wallaby *Petrogale penicillata*	E (TSC) V (EPBC)	This species occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north. This species browses on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. This species shelters or bask during the day in rock crevices, caves and overhangs and is most active at night.	The brush-tailed rock-wallaby was once abundant and ubiquitous throughout the mountainous country of south-eastern Australia. This species distribution roughly followed the Great Dividing Range for 2500 kilometres from the Grampians in West Victoria to Nanango in south-east Queensland, with outlying populations in coastal valleys and ranges to the east of the divide, and the slopes and plains as far west as Cobar in NSW and Injune (500 kilometres NW of Brisbane) in Queensland.	This species is not known to occur in any conservation reserves in the region.	The Referral Area does not provide suitable habitat for this species and it has not been recorded in the Referral Area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Koala (combined populations of Queensland, NSW and ACT) *Phascolarctos cinerus*	V (TSC) V (EPBC)	This species inhabits eucalypt forest and woodland, with suitability influenced by tree species and age, soil fertility, climate, rainfall and fragmentation patterns. The species is known to feed on a large number of eucalypt and non-eucalypt species; however it tends to specialise on a small number in different areas. *Eucalyptus tereticornis, E. punctata, E. cypellocarpa, E. viminalis, E. microcorys, E. robusta, E. albens, E. camaldulensis* and *E. populnea* are some preferred species.	The koala has a fragmented distribution throughout eastern Australia, with the majority of records from NSW occurring on the central and north coasts, as well as some areas further west. It is known to occur along inland rivers on the western side of the Great Dividing Range.	Goobang NP	The Referral Area provides suitable habitat for this species, although it has not been recorded within the Referral Area. This species has been recorded in the local area. This species is potentially sensitive to the proposed development.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
South-eastern long-eared bat *Nyctophilus corbeni*	V (TSC) V (EPBC)	This species inhabits a variety of vegetation types, including mallee, bulloak (*Allocasuarina luehmanni*) and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. This species roosts in tree hollows, crevices, and under loose bark.	The distribution of the south eastern form of this species coincides approximately with the Murray Darling Basin, with the Pilliga Scrub region being a distinct stronghold for this species. This species has been recorded throughout NSW with the exception of the extreme north-west of the state, and most areas east of the Great Dividing Range (with the exception of the areas around Sydney).	Goobang NP Nangar NP Woggoon NR	The Referral Area provides suitable habitat for this species, however it has not been recorded in the Referral Area or local area. There is no potential for a significant impact on this species.	No.
New Holland mouse *Pseudomys novaehollandiae*	V (EPBC)	This species inhabits a range of habitats from open heathlands, open woodlands with a heath understorey, as well as vegetated dunes. This species lives in a burrow which is shared with other individuals.	This species has a disjunct distribution across Tasmania, Victoria, Queensland and NSW.	Goobang NP.	The Referral Area does not provide suitable habitat for this species and it has not been recorded in the Referral Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
REPTILES						
Pink-tailed legless lizard *Aprasia parapulchella*	V (TSC) V (EPBC)	This species typically inhabits areas which are well-drained, sloping, rocky, and open woodland with a mostly native grassland understorey. These lizards can usually be found beneath partially embedded rocks and make their burrows in black ant and termite nests.	This species is only known to be distributed across the Central and Southern Tablelands and the South-western Slopes. The strongest known concentration of this species is in the Canberra/Queanbeyan Region, however, other populations have been recorded in proximity to Cooma, Yass, Bathurst, Albury and West Wyalong.	This species is not known to occur in any conservation reserves in the region.	The Referral Area does not provide suitable habitat for this species and it has not been recorded in the Referral Area or the local area. There is no potential for a significant impact on this species.	No.
FISH						
Murray cod *Maccullochella peelii peelii*	V (EPBC)	This species is typically found in warm water habitats ranging from clear water to cloudy, and rocky to sandy bottomed. The waters are usually sheltered by rock or timber overhangs, with the fish strongly dependent on woody debris in the water column. Generally found in waters up to 5 metres in depth.	This species is distributed throughout the warmer waters of the Murray-Darling basin.	This species is not known to occur in any conservation reserves in the region.	The Referral Area does not provide suitable habitat for this species and it has not been recorded in the Referral Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Macquarie perch *Macquaria australasica*	E (EPBC) E (FM)	This species lives in schools, typically in rocky holes with lots of protective cover over the surface of the water.	This fish is distributed throughout the Murray-Darling Basin (in Victoria, NSW and ACT), Shoalhaven River, Hawkesbury River and some of the water supply dams in Sydney.	This species is not known to occur in any conservation reserves in the region.	The Referral Area does not provide suitable habitat for this species and it has not been recorded in the Referral Area. There is no potential for a significant impact on this species.	No
MIGRATORY SPECIES						
Satin flycatcher *Myiagra cyanoleuca*	MIG (EPBC)	This species typically inhabits wet areas of tall forests, particularly in gullies. The satin flycatcher moves north in the winter and is seldom seen in NSW, Tasmania, Victoria or SA during these times. This bird nests in loose colonies in broad-based cup-shaped nests on a bare horizontal branch. These nests are constructed from bark, grass, lichen and cobwebs (Australian Museum Online 2005).	The satin flycatcher can be found in both Australia and New Guinea. In Australia it is distributed along the east coast from Cape York through to Tasmania, also covering parts of south-eastern SA.	Goobang NP	The Referral Area does not provide suitable habitat for this species, and it has not been recorded in the Referral Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
White-throated needletail *Hirundapus caudacutus*	MIG (EPBC)	This species is only in Australia approximately between the months of October and May. They forage upon flying insects and drink whilst in flight. Feeding is typically associated with rising thermal currents typical with storm fronts and bushfires.	This species is distributed over eastern and northern Australia	Goobang NP	The Referral Area provides suitable habitat for this species, however it has not been recorded in the Referral Area. It has been recorded in the local area. There is no potential for a significant impact on this species.	No.
Fork-tailed swift *Apus pacificus*	MIG (EPBC)	The fork-tailed swift is mostly found in Australia through the months of October through to April. This swift spends most of its time when in flight ahead of storm fronts and up-draughts.	The fork-tailed swift can be found throughout Australia during migration. In Australia it is most common west of the Great Dividing Range. This species is uncommon in Tasmania.	Back Yamma SF	The Referral Area provides suitable habitat for this species, however it has not been recorded in the Referral Area. It has been recorded in the local area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Great egret *Ardea alba*	MIG (EPBC)	The great egret typically inhabits areas of shallow, flowing waters, but also uses damp grasslands and other watered areas. They can be observed both in flocks and on their own, and roost during the night in groups.	The great egret is distributed throughout the world, and is common throughout most areas of Australia, with exception to extremely arid areas.	This species is not known to occur in any conservation reserves in the region.	The Referral Area provides suitable habitat for this species, however it has not been recorded in the Referral Area. It has been recorded in the local area. This species is potentially sensitive to the proposed development.	Yes.
Cattle egret *Ardea ibis*	MIG (EPBC)	The cattle egret can be found in grasslands, wetlands and woodlands and has never been identified in arid areas. These birds are commonly sighted at garbage dumps, pastures and croplands (especially where poor drainage is present) are common.	The cattle egret is distributed throughout Asia, Africa, Europe and Australia. It is most commonly found in north-eastern WA, the NT and in south-eastern Australia from Bundaberg Queensland through to Port Augusta SA. It has also been identified in Tasmania.	This species is not known to occur in any conservation reserves in the region.	The Referral Area provides suitable habitat for this species, however it has not been recorded in the Referral Area. It has been recorded in the local area. There is no potential for a significant impact on this species.	No.

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
White-bellied sea-eagle *Haliaeetus leucogaster*	MIG (EPBC)	These birds are typically sighted perched in tall trees and soaring above bodies of water and land. They are territorial and form permanent breeding pairs.	This species is distributed across Australia, China, India, Indonesia, New Guinea, and south-east Asia. Within Australia it is distributed along and near the coast.	This species is not known to occur in any conservation reserves in the region.	The Referral Area provides suitable habitat for this species, however it has not been recorded in the Referral Area. This species has been recorded in the local area. There is no potential for a significant impact on this species.	No.
Latham's snipe Japanese snipe *Gallinago hardwikii*	MIG (EPBC)	Latham's snipe can be found in permanent and ephemeral wetlands up to 2000 m ASL. These water bodies are usually freshwater with low, dense vegetation. They forage in areas of mud with some vegetation cover and roost nearby to these areas. The Japanese snipe does not breed in Australia, only passing through for migration.	This species has been recorded from Cape York through to south-east SA. The range of this species extends from inland of the eastern tablelands in south-east Queensland to west of the Great Dividing Range in NSW. Richmond River, NSW is a favourite area for non-breeding birds.	This species is not known to occur in any conservation reserves in the region.	The Referral Area provides suitable habitat for this species, although it has not been recorded there. This species has been recorded in the local area. This species is potentially sensitive to the proposed development.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Rufous fantail *Riphidura rufifrons*	MIG (EPBC)	This species typically inhabits areas of dense wet forest, mangrove, rainforest or swamp woodlands. This species prefers areas where there is intense shade available and is often seen close to ground. In winter it is seldom found in NSW or Victoria.	This species is distributed across the north and eastern coast of Australia, but is also found in Guam, New Guinea, the Solomon Islands and Sulawesi.	Back Yamma SF Cookamidgera SF	The Referral Area does not provide suitable habitat for this species and it has not been recorded in the Referral Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.
Rainbow bee-eater *Merops ornatus*	MIG (EPBC)	The preferred habitat of the rainbow bee-eater is open forests and woodlands, shrublands, and cleared or semi-cleared areas (commonly farmland). These areas are usually in close proximity to permanent water, however, during migration this bird may fly over areas of non-preferential habitat.	This species is distributed throughout most of mainland Australia as well as several near-shore islands. It is not found in Tasmania and has only been identified in a thin strip in the most arid regions of central WA.	Goobang NP Nangar NP Woggoon NR Back Yamma SF Cookamidgera SF Gunningbland SF Strahorn SF	This species occurs in the Referral Area and is potentially sensitive to the development.	Yes.

Species	Legal Status	Specific Habitat	Distribution in Relation to Referral Area	Reservation in the Region (NSW Government 2012	Occurrence in Referral Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Marsh sandpiper *Tringa stagnatilis*	MIG (EPBC)	This species generally occurs in brackish or freshwater wetlands, estuaries and tidal mudflats.	Regular summer migrant (August – May) to mainly coastal Australia from breeding grounds in Austria and Mongolia. Widespread but scattered inland.	This species is not known to occur in any conservation reserves in the region.	The Referral Area does not provide suitable habitat for this species and it has not been recorded in the Referral Area. This species has not been recorded in the local area. There is no potential for a significant impact on this species.	No.

Notes:
E: Endangered
EPBC: *Environment Protection and Biodiversity Conservation Act 1999*
CE Critically Endangered
FM *Fisheries Management Act 1994*
MIG: Migratory
NP: National Park
NR: Nature Reserve
SF: State Forest
TSC: *Threatened Species Conservation Act 1995*
V: Vulnerable

APPENDIX F

Test for Ecological Significance –
Environmental Planning and Assessment Act 1979

Appendix F – Test for Ecological Significance – *Environmental Planning and Assessment Act 1979*

Part 3A of the *Environmental Protection & Assessment Act 1979* (EP&A Act) requires a test for ecological significance relating to the potential impacts of the Project on listed threatened species, Endangered Populations (EPs) or Threatened Ecological Communities (TECs). As requested in the Director-General's Requirements (DGRs) for the Project, an assessment of potential impact on species, EPs and TECs listed under the *Threatened Species Conservation Act 1995* (TSC Act) as a result of the Project will be undertaken in accordance with Section 5A of the EP&A Act.

A Test for Ecological Significance is provided below for those threatened species, EPs and TECs considered (within Tables 1 and 2 in Appendix E) to have the potential to be impacted by the Project. The following species, endangered populations and TECs are assessed:

- *Austrostipa metatoris*;
- *Austrostipa wakoolica*;
- *Diuris tricolor*;
- *Swainsona murrayana*;
- *Swainsona sericea*;
- *Tylophora linearis*;
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions;
- White Box Yellow Box Blakely's Red Gum Woodland;
- Sloanes froglet (*Crinia sloanei*);
- Spotted harrier (*Circus assimilis*);
- Little eagle (*Heiraaetus morphnoides*);
- Grey falcon (*Falco hypoleucos*);
- Black falcon (*Falco subniger*);
- Bush stone-curlew (*Burhinus grallarius*);
- Superb parrot (*Polytelis swainsonii*);
- Swift parrot *(Lathamus discolor*);
- Barking owl (*Ninox connivens*);
- Masked owl (*Tyto novaehollandiae*);
- Brown treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*);
- Speckled warbler (*Chthonicola sagittata*);
- Painted honeyeater (*Grantiella picta*);
- Grey-crowned babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*);
- Varied sittella (*Daphoenositta chrysoptera*);

- Hooded robin (south-eastern form) (*Melanodryas cucullata cucullata*);
- Diamond firetail (*Stagonopleura guttata*);
- Koala (*Phascolarctos cinereus*);
- Squirrel glider (*Petaurus norfolcensis*);
- Yellow-bellied sheathtail bat (*Saccolaimus flaviventris*);
- Eastern bentwing-bat (*Miniopterus schreibersii oceanensis*)*;* and
- Little pied bat (*Chalinolobus picatus*).

Key threatening processes (KTPs) and critical habitat listed under the *NSW Threatened Species Conservation Act* 1995 (TSC Act) and the *NSW Fisheries Management Act* 1994 (FM Act) are addressed in the latter parts of this Appendix.

A conclusion regarding the potential significance of the impacts for the Project on threatened species, EPs and TECs according to the following tests of ecological significance is provided at the end of this Appendix.

All assessments are undertaken without any consideration of impact mitigation or offsetting opportunities or commitments. The affect of mitigation and offsetting is assessed in Sections 6.0 and 7.0 of the main report.

Test for Ecological Significance under EP&A Act

Threatened Flora Species

Austrostipa metatoris – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;

Austrostipa metatoris has not been recorded in the Project Disturbance Area. There are no known records of the species within 20 kilometres of the boundary of the Project Area, with the closest record known from Condobolin, approximately 100 kilometres west of Parkes. The species has mostly been recorded in the Swan Hill area of New South Wales near the Victorian border.

The Project Disturbance Area is considered to provide potential habitat for *Austrostipa metatoris* as it is an inconspicuous flora species, similar to other *Austrostipa* species and there is a potential lack of survey effort in the region. The species is considered to have a low likelihood of occurring in the Project Disturbance Area as six *Austrostipa* samples were collected from the Wider Study Area and were sent to the Royal Botanic Gardens Sydney for formal identification. None of the specimens were identified as *Austrostipa metatoris*, suggesting that the species may not occur in the Project Disturbance Area.

The Project is unlikely to have an adverse effect on the life cycle of *Austrostipa metatoris*, such that a viable local population of the species would be likely to be placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;

Not applicable.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;

Not applicable.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed; and

The Project will result in the removal of up to 15 hectares of suitable native grassland habitat within the Project Disturbance Area. Of the vegetation types present in the Project Disturbance Area, Grey Box Grassy Woodland – DNG is considered to have the highest potential to support Austrostipa metatoris. Therefore up to 15 hectares of potentially suitable habitat for Austrostipa metatoris would be removed as a result of the Project.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

Native vegetation in the Project Disturbance Area has been heavily fragmented as a result of intensive agricultural and mining land use that surrounds the area. The existing patches of woodland and derived native grassland are generally small in size and are surrounded either by exotic grassland, disturbed land and/or cleared land. There are no known records of Austrostipa metatoris within 20 kilometres of the Project Disturbance Area. The Project would likely result in the further fragmentation and isolation of suitable habitat areas for the species. However, given the already fragmented and isolated distribution of habitat in the wider study area, the rate of increase in fragmentation and isolation due to the project is likely to be negligible.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;

Austrostipa metatoris is not known to occur in the Project Disturbance Area, however, it is considered to have the potential to occur based on the presence of suitable habitat for the species. There are no known records of Austrostipa metatoris within 20 kilometres of the Project Disturbance Area. The potential; habitat present within the Project Disturbance Area is unlikely to be habitat important to the long-term survival of the species in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);

The Project Disturbance Area is not located in proximity to any areas of declared or recommended critical habitat areas. The Project is not likely to have an adverse effect on any critical habitat.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;

A recovery plan has not been prepared for Austrostipa metatoris. There are no threat abatement plans of relevance to the species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- Clearing of native vegetation.

Conclusion: *Austrostipa metatoris* is unlikely to be significantly impacted by the Project.

Austrostipa wakoolica – Endangered TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;

Austrostipa wakoolica has not been recorded in the Project Disturbance Area. There are no known records of the species within 20 kilometres of the Project Area.

The Project Disturbance Area is considered to provide potential habitat for *Austrostipa wakoolica* as it is an inconspicuous flora species, similar to other Austrostipa species and there is a potential lack of survey effort in the region. The species is considered to have a low likelihood of occurring in the Project Disturbance Area as six *Austrostipa* samples were collected from the Wider Study Area and were sent to the Royal Botanic Gardens Sydney for formal identification. None of the specimens were identified as *Austrostipa wakoolica*, suggesting that the species may not occur in the Project Disturbance Area.

The Project is unlikely to have an adverse effect on the life cycle of *Austrostipa wakoolica*, such that a viable local population of the species would be likely to be placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;

Not applicable.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;

Not applicable.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed; and

The Project will result in the removal of up to 15 hectares of suitable native grassland habitat within the Project Disturbance Area. Of the vegetation types present in the Project Disturbance Area, Grey Box Grassy Woodland – DNG is considered to have the highest potential to support the *Austrostipa wakoolica*. Therefore up to 15 hectares of potentially suitable habitat for *Austrostipa wakoolica* would be removed as a result of the Project.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

Native vegetation in the Project Disturbance Area has been heavily fragmented as a result of intensive agricultural and mining land use that surrounds the area. The existing patches of woodland and derived native grassland are generally small in size and are surrounded either by exotic grassland, disturbed land and/or cleared land. There are no known records of *Austrostipa wakoolica* within 20 kilometres of the Project Disturbance Area. The Project would likely result in the further fragmentation and isolation of suitable habitat areas for the species. However, given the already fragmented and isolated distribution of habitat in the wider study area, the rate of increase in fragmentation and isolation due to the project is likely to be negligible.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;

Austrostipa wakoolica is not known to occur in the Project Disturbance Area, however, it is considered to have the potential, albeit low, to occur based on the presence of suitable habitat for the species. There are no known records of *Austrostipa wakoolica* within 20 kilometres of the Project Disturbance Area and most of the species known records occur along a north-eastern corridor from Swan Hill, Victoria to Forbes, New South Wales. The potential habitat present within the Project Disturbance Area is unlikely to be important to the long-term survival of the species in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);

The Project Disturbance Area is not located in proximity to any areas of declared or recommended critical habitat areas. The Project is not likely to have an adverse effect on any critical habitat.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;

A recovery plan has not been prepared for *Austrostipa wakoolica*. There are no threat abatement plans of relevance to the species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- Clearing of native vegetation.

Conclusion: *Austrostipa wakoolica* is unlikely to be significantly impacted by the Project.

Pine donkey orchid (*Diuris tricolor*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Pine donkey orchid (*Diuris tricolor*) has not been recorded in the Project Disturbance Area, however it has been recorded in the Wider Study Area. The Project Disturbance Area contains suitable habitat for the species and there is potential for it to occur.

A population of pine donkey orchid (*Diuris tricolor*) containing at least 234 plants was recorded approximately 2 kilometres to the north of the Project Disturbance Area, occurring in an area of White Cypress Pine Woodland. The species could potentially occur in the Project Disturbance Area particularly in areas of Grey Box Woodland where white cypress pine (*Callitris glaucophylla*) is locally dominant. In the absence of targeted surveys within the Project Disturbance Area, the precautionary principle has been applied and it is considered that the Project Disturbance Area could potentially support the species. If the species occurs in the Project Disturbance Area it may be present as an individual population. The nearest known population occurs 2 kilometres to the north and it is unknown if pollination vectors would be able to travel the approximate 2 kilometre straight line distance between the known and potential occurrences of the species. Additionally two existing tailings dams occur between the known and potential occurrences of the species and likely provide a barrier around which vectors would have to travel. The species or insect groups that pollinate *Diuris tricolor* are unknown but may be native bees or flies that could be attracted to the sweet smelling flowers.

As the pollination vectors and movement abilities of such vectors are unknown for *Diuris tricolor*, if a population of the species occurs in the Project Disturbance Area it may form a viable local population and have an adverse effect on the life cycle of the species such that a viable local population (if present) could be placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

There is potential habitat for pine donkey orchid (*Diuris tricolor*) in the Project Disturbance Area. This species was found to the north of the Project Disturbance Area occurring in White Cypress Pine Woodland vegetation similar to that occurring within the Project Disturbance Area. Within the Project Disturbance Area two woodland communities, Grey Box Grassy Woodland and Bimble Box – White Cypress Woodland, typically contain areas of white cypress pine and provide potential habitat for the species. Up to 37 hectares of Grey Box Grassy Woodland and Bimble Box – White Cypress Woodland occur within the Project Disturbance Area, however potentially suitable habitat for this species is likely to be restricted to areas of each community dominated by white cypress pine. Such areas likely total considerably less than 37 hectares, but cannot be quantified at this time. Up to 37 hectares of potential habitat will be removed as a result of the Project.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

There is potential habitat for pine donkey orchid (*Diuris tricolor*) within the Project Disturbance Area in areas of Grey Box Woodland and Bimble Box – White Cypress Woodland where white cypress pine is locally dominant. The Project would likely result in the further fragmentation and isolation of suitable habitat areas for the species. However, given the already fragmented and isolated distribution of habitat in the wider study area, the rate of increase in fragmentation and isolation due to the project is likely to be negligible.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The Project Disturbance Area provides potential habitat areas for the species. If the species is present, the habitat to be removed may be very important to the long-term survival of the species in the locality, with only one other occurrence of the species known in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

The Project Disturbance Area is not located in proximity to any areas of declared or recommended critical habitat areas. The Project is not likely to have an adverse effect on any critical habitat.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A recovery plan has not been prepared for this species. There are no threat abatement plans of relevance to the species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- Clearing of native vegetation.

Conclusion: If present, the pine donkey orchid (*Diuris tricolor*) may potentially be significantly impacted by the Project.

Slender-Darling pea (*Swainsona murrayana*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Slender-Darling pea (*Swainsona murrayana*) was not recorded in the Project Disturbance Area and has not been recorded within 20 kilometres of the Project Disturbance Area. The Project Disturbance Area contains potentially suitable habitat for the species but would be located at the eastern extent of the species range. Therefore the species is considered to have a low likelihood of occurring and the Project is unlikely to have an adverse effect on the life cycle of the species such that a viable local population will be placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

There is potential habitat for slender-Darling pea (*Swainsona murrayana*) in the Project Disturbance Area. This species could occur in the grassland and grassy woodland communities recorded within the Project Disturbance Area. Up to 52 hectares of potentially suitable habitat would be removed as a result of the Project.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

There is potential habitat for slender-Darling pea (*Swainsona murrayana*) in all five native vegetation communities within the Project Disturbance Area. The Project would likely result in the further fragmentation and isolation of suitable habitat areas for the species. However, given the already fragmented and isolated distribution of habitat in the wider study area, the rate of increase in fragmentation and isolation due to the project is likely to be negligible.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The Project Disturbance Area is not known to contain slender-Darling pea (*Swainsona murrayana*) and there is a low likelihood for it to occur. Therefore the Project Disturbance Area is not likely to be important to the long-term survival of the species in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

There are currently no areas of declared or recommended critical habitat for slender-Darling pea (*Swainsona murrayana*). The Project is not likely to have an adverse effect on any critical habitat.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A recovery plan has not been prepared for slender-Darling pea (*Swainsona murrayana*). There are no threat abatement plans of relevance to this species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- Clearing of native vegetation.

Conclusion: Slender-Darling pea (*Swainsona murrayana*) is unlikely to be significantly impacted by the Project.

Silky Swainson-pea (*Swainsona sericea*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Silky Swainson-pea (*Swainsona sericea*) was not recorded in the Project Disturbance Area and has not been recorded within 20 kilometres of the Project Disturbance Area. The Project Disturbance Area contains potentially suitable habitat for the species in the form of native box-gum woodlands and native grasslands. Silky Swainson-pea (*Swainsona sericea*) may be associated with white cypress pine (*Callitris glaucophylla*) within these vegetation types. The species is considered to have a low likelihood of occurring and the Project is unlikely to have an adverse effect on the life cycle of the species such that a viable local population would be placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

There is potential habitat for silky Swainson-pea (*Swainsona sericea*) in the Project Disturbance Area. This species could occur in the derived native grasslands and eucalypt woodlands containing *Callitris* trees that were recorded within the Project Disturbance Area. Up to 52 hectares of potentially suitable habitat would be removed as a result of the Project.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

There is potential habitat for silky Swainson-pea (*Swainsona sericea*) in the Project Disturbance Area in areas of box-gum woodland and native grasslands, particularly areas of white cypress pine (*Callitris glaucophylla*). The Project would likely result in the further fragmentation and isolation of suitable habitat areas for the species. However, given the already fragmented and isolated distribution of habitat in the wider study area, the rate of increase in fragmentation and isolation due to the project is likely to be negligible.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The Project Disturbance Area is not known to contain the silky Swainson-pea (*Swainsona sericea*) and there is a low likelihood for it to occur. Therefore the Project Disturbance Area is not likely to be important to the long-term survival of the species in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

There are currently no areas of declared or recommended critical habitat in proximity to the Project Area. The Project is unlikely to have an adverse effect on any critical habitat.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A recovery plan has not been prepared for this species. There are no threat abatement plans of relevance to this species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- Clearing of native vegetation.

Conclusion: Silky Swainson-pea (*Swainsona sericea*) is unlikely to be significantly impacted by the Project.

Tylophora linearis – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Tylophora linearis was not recorded in the Project Disturbance Area and has not been recorded within 20 kilometres of the Project Disturbance Area. The Project Disturbance Area contains potentially suitable habitat for the species in the form of eucalypt woodlands with white cypress pine (*Callitris glaucophylla*) present. The species is considered to have a low likelihood of occurring and the Project is unlikely to have an adverse effect on the life cycle of the species such that a viable local population would be placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

There is potential habitat for *Tylophora linearis* in the Project Disturbance Area in the form of eucalypt woodlands with white cypress pine (*Callitris glaucophylla*) that was recorded in the Project Disturbance Area. Up to 14 hectares of potentially suitable habitat will be removed as a result of the Project.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

There is potential habitat for *Tylophora linearis* within the Project Disturbance Area in areas of eucalypt woodlands with white cypress pine (*Callitris glaucophylla*). The Project would likely result in the further fragmentation and isolation of suitable habitat areas for the species. However, given the already fragmented and isolated distribution of habitat in the wider study area, the rate of increase in fragmentation and isolation due to the project is likely to be negligible.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The Project Disturbance Area is not known to contain *Tylophora linearis* and there is a low likelihood for it to occur. The Project Disturbance Area is unlikely to be important to the long-term survival of the species in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

There are no areas currently declared or recommended as critical habitat areas for this species. The Project is not likely to have an adverse effect on any critical habitat.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A recovery plan has not been prepared for this species. There are no threat abatement plans of relevance to this species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- Clearing of native vegetation.

Conclusion: *Tylophora linearis* is unlikely to be significantly impacted by the Project.

Threatened Ecological Communities

Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions – Endangered Ecological Community TSC Act

The Project will result in the removal of approximately 38 hectares of Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions EEC comprising 23 hectares of the woodland form of the community and 15 hectares of derived native grassland. This is a prominent vegetation community throughout the Wider Study Area. It occurs along road easements, in TSRs and isolated pockets surrounded by derived native grasslands and/or cultivated fields.

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;

Not applicable.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;

Not applicable.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

The Project will result in the loss of approximately 38 hectares of this EEC. The Inland Grey Box Woodland EEC is known to occur beyond the Project Disturbance Area to the north and west. The 38 hectares of this community proposed to be removed is connected to a larger stand of the community occurring along Bogan Road (beyond the Project Area). The loss of approximately 38 hectares of this community is not likely to have an adverse effect on the extent of the community such that its local occurrence is likely to be placed at risk of extinction.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;

The Project will result in the loss of 38 hectares of the EEC (23 hectares of woodland and 15 hectares of DNG). In the Wider Study Area, this EEC is one of the prominent native vegetation communities occurring along road easements, in TSRs and isolated pockets surrounded by derived native grasslands and/or cultivated fields. The ecological impacts of the Project on this community will be limited to the Project Disturbance Area and therefore the Project is unlikely to substantially and adversely modify the composition of the ecological community such that its local occurrence would be placed at risk of extinction.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed; and

The Project will result in the loss of approximately 38 hectares (23 hectares of woodland and 15 hectares of DNG) of this EEC. In the Wider Study Area, this EEC is one of the prominent native vegetation communities occurring along road easements, in TSRs and isolated pockets surrounded by derived native grasslands and/or cultivated fields. The area of the community to be removed for the Project is therefore not considered to constitute a significant area of the community in the local area.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

Through the loss of 38 hectares of this community in the Project Disturbance Area, the Project will result in an increase in fragmentation and isolation of this community. However, given the already fragmented and isolated distribution of this community in the Wider Study Area, the rate of increase in fragmentation and isolation due to the project is likely to be negligible.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;

The Project will result in the removal of approximately 38 hectares of Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions in the Project Disturbance Area. This EEC is a prominent vegetation community within the Wider Study Area. It occurs along many road easements, in TSRs and isolated pockets on private land that were surrounded by derived native grasslands and/or cultivated fields. The 38 hectares of habitat for the community to be removed from the Project Disturbance Area is not considered to be important to the long-term survival of the community in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);

There are currently no areas of declared or recommended critical habitat in the Project Area. The Project is not likely to have an adverse effect on any critical habitat.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;

A recovery plan has not been prepared for this community. There are no threat abatement plans of relevance to this community.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- Bushrock removal;
- Clearing of native vegetation;
- Loss of hollow-bearing trees; and
- Removal of dead wood and dead trees.

Conclusion: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions EEC is unlikely to be significantly impacted by the Project.

White box yellow box Blakely's red gum woodland – Endangered Ecological Community TSC Act

The Project will result in the removal of approximately 0.28 hectare of White Box – Yellow Box – Blakely's Red Gum Woodland EEC. An additional 403 hectares of this community also occurs throughout the Wider Study Area occurring mainly as isolated pockets of vegetation surrounded by cultivated fields. The majority of this community occurs within subsidence area E48 which contains four large patches, the largest of which adjoins Limestone State Forest.

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;

Not applicable.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;

Not applicable.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

The Project will result in the loss of approximately 0.28 hectare of White Box - Yellow Box - Blakely's Red Gum Woodland. The community is known to occur beyond the Project Disturbance Area, with the Wider Study Area supporting a total of 133 hectares of the community. The majority of this occurs within subsidence site E48. The 0.28 hectare of this community proposed to be removed within the Proposed Disturbance Area is part of a larger patch (8.3 hectares in size) of the community that occurs on the eastern boundary of subsidence site E48. It is bounded by exotic grassland to the north and Bimble Box – White Cypress Pine Woodland to the south. A large stand of White Box - Yellow Box - Blakely's Red Gum Woodland occurs approximately 1 kilometre to the west of the stand within the Proposed Disturbance Area, but there is no linkage between the two remnants. The loss of approximately 0.28 hectare of this community is not likely to have an adverse effect on the extent of the community such that its local occurrence is likely to be placed at risk of extinction.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

The Project will result in the loss of 0.28 hectare of this EEC. This small patch occurs as an isolated stand in a largely disturbed landscape in proximity to the Active Operational Area. A large stand of this community occurs approximately 1 kilometre to the west, but there is no linkage between the two remnants. Additional stands of this community also occur within the Wider Study Area, the majority of which is restricted to within the subsidence site E48. Four large patches of the community occur within this area. The ecological impacts of the Project on this community will be limited to the Project Disturbance Area and therefore the Project is not likely to substantially and adversely modify the composition of the ecological community such that its local occurrence will be placed at risk of extinction.

d) **in relation to the habitat of a threatened species, population or ecological community:**

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed; and

The Project will result in the loss of approximately 0.28 hectare of this EEC. The community is known to occur beyond the Project Disturbance Area, with the Wider Study Area supporting a total of 133 hectares of the community. The majority of this occurs within subsidence site E48 which contains four large patches, the largest of which adjoins Limestone State Forest. The area of the community to be removed for the Project is not considered to constitute a significant area of the community in the local area.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

Through the loss of 0.28 hectare of this community in the Project Disturbance Area, the Project will result in an increase in fragmentation and isolation of this community. However, given the already fragmented and isolated distribution of this community in the wider study area, the rate of increase in fragmentation and isolation due to the project is likely to be negligible.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;

The Project will result in the removal of approximately 0.28 hectare of White Box - Yellow Box - Blakely's Red Gum woodland in the Project Disturbance Area. The Wider Study Area supports a total of 133 hectares of this community. The majority of this occurs within subsidence site E48 of which one large patch adjoins Limestone State Forest. The 0.28 hectare of habitat for the community to be removed from the Project Disturbance Area constitutes less than 1 per cent of the total community in the Wider Study Area and is not considered to be important to the long-term survival of the community in the locality and the region.

e) **whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);**

There are currently no areas of declared or recommended critical habitat in the wider study area. The Project is not likely to have an adverse effect on critical habitat.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;

A recovery plan has not been prepared for this community. There are no threat abatement plans for this community.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- Bushrock removal;
- Clearing of native vegetation;
- Loss of hollow-bearing trees; and
- Removal of dead wood and dead trees.

Conclusion: White Box – Yellow Box – Blakely's Red Gum Woodland EEC is unlikely to be significantly impacted by the Project.

Threatened Fauna Species

Sloanes froglet (*Crinia sloanei*) – Vulnerable TSC Act

Sloanes froglet is a small ground-dwelling frog that is typically associated with periodically inundated areas in grasslands, woodland and disturbed habitats (OEH 2013). Sloane's froglet shelters under logs and other debris, usually in moist depressions or near water (Frogs of Australia 2013). Littlejohn (1958) suggests that the species is generally restricted to temporary ponds in river valleys and up to five miles on either side of large rivers. This species was identified within the Wider Study Area during opportunistic surveys following heavy rainfall in February 2012.

This species was first identified by call whilst undertaking opportunistic surveys along the inundated areas of farmland on either side of McClintocks Lane. This species is noted to be particularly difficult to distinguish from other species of the *Crinia* genus by appearance but noted to be distinguishable by call (Robinson 1998, Cogger 2000). The calls of all potentially occurring *Crinia* species were listened to during the field survey on a portable media device using the known calls sourced form the Australian Frog Calls: Subtropical East CD (Stewart 1998). The call of *C. sloanei* was not on the recording but was sourced at the time of survey from the Frogs of Australia Website (Amphibian Research Centre 2012). *Crinia sloanei* was believed to be the best fit for the unknown call in terms of pitch (compared to *C. signifera*) and frequency (compared to *C. parinsignifera*).

An individual frog was briefly captured during the survey which fit the appearance description of *Crinia sloanei* as described by Robinson (1998). The individual that was captured had a light coloured belly (dirty white), even light brown on the dorsal surface and darker striations on the rear legs. The belly colour is the only identifiable difference noted in the key to identification in Robinson (1998) to distinguish between the three *Crinia* species with the potential to occur in the area. The frog escaped before the palm could be checked for the presence of tubercules which is another distinguishing feature that separates Sloanes froglet from the similar sounding *C. parinsignifera.*

The weather during the survey was cold and wet with a maximum daily temperature of 17.1 degrees Celsius and a total of 22.6 millimetres of rain falling between 9.00 am on the day of survey to 9.00 am on the following day (BOM 2012). The days leading up to the survey had been warm and wet with a total of 32.4 millimetres of rain falling in the four days preceding the survey (BOM 2012). McClintocks Lane and the surrounding low-lying paddocks were covered in approximately 30 centimetres of water from approximately the south-eastern corner of the Project Area through to the first bend in the road approximately 2.5 kilometres to the west. The paddocks to the south of McClintocks Lane appeared to contain larger areas of inundation than those to the north. In higher areas to the west of this large area of inundation, large pools of water were formed in the drainage swales on either side of the road.

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides some areas of suitable habitat for this species, and the species was recorded in the Wider Study Area during a heavy summer rainfall event in 2012.

There are no known NSW Wildlife Atlas records of this species within 20 kilometres of the boundary of the Project Disturbance Area, and there is one NSW Wildlife Atlas records across the mapsheet search area (refer to Table 4.2 of the main report) recorded in 1998. The species has been recorded in Goobang National Park, approximately 28 kilometres to the east of the Project Disturbance Area. The Project Disturbance Area is considered to provide some areas of potential habitat for this species, where it may occur in grassland, woodland and disturbed habitats that are associated with nearby water sources, and that become inundated during rainfall events.

As the species was recorded following a heavy summer rainfall event calling from inundated areas in the Wider Study Area, areas of the Wider Study Area that become inundated may also support breeding sites of this species. Due to the timing of the Project refinement process, the Project Disturbance Area was not searched during the heavy summer rainfall event (ideal conditions) in 2012 and the species could occur during such rainfall events in the Project Disturbance Area. This species is small species of frog that appears in areas of inundation in grassland, woodland and disturbed habitats that are associated with nearby water sources. Home ranges of this species are likely to be small (due to an assumed poor movement ability related to the species small size and brief periods of suitable conditions [inundated periods] for movements to occur) and where inundated areas occur in an isolated pattern in the landscape, individual inundated areas (or small nearby groups) may represent local populations.

This species may occur in the Project Disturbance Area and if so may represent a viable local population which could be placed at risk of extinction by the Project. As the species has been recorded in the Wider Study Area (outside the Project Disturbance Area) the species is unlikely to be placed at risk of extinction in the Wider Study Area by the Project.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 127 hectares of potential habitat (grassland, woodland and disturbed habitats [excluding cultivated land] that are associated with nearby water sources, and that become inundated during rainfall events) for the species throughout the Project Disturbance Area, especially in low lying areas which may become inundated during rainfall events. The precise area of potentially suitable habitat for the species would be restricted to areas prone to inundation during moderate to heavy rainfall events, within the 127 hectares. The mapping of inundation prone areas was beyond the scope of this assessment. Up to 127 hectares of potentially suitable habitat for this species would be removed as part of the Project.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

This ground-dwelling frog species is predominately restricted to inundation prone areas which are likely distributed along drainage lines, along roadsides or scattered throughout the Project Area. As the Project may result in the loss of inundation prone potential habitat areas for this species, the Project may result in an increased level of fragmentation and isolation of habitat areas for the species.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As discussed above, this species was recorded in the Wider Study Area but not within the Project Disturbance Area. The Project Disturbance Area contains some areas of potential habitat for this species however potentially suitable habitat for this species also occurs in the surrounding area, including farmland and the Bogan River watercourse, as well as Goobang National Park and nearby State Forests such as Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests. The removal of the potential habitat for this species from the Project Disturbance Area is considered unlikely to impact the long-term survival of this species in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species.

The 'Threat Abatement Plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis' (AGDEH 2006) is pertinent to this threatened species. The Project does not contravene with any of the objectives or actions listed within the Threat Abatement Plan as it is more focused on creating guidelines and further understanding the distribution of the chytrid fungus.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- clearing of native vegetation, and;
- removal of dead wood and dead trees.

Conclusion: If present within the Project Area, Sloane's froglet may potentially be significantly impacted by the Project.

Spotted harrier (*Circus assimilis*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable habitat for this species. Eight individuals were recorded during surveys in 2011 and 2012 across the Wider Study Area. There are five NSW Wildlife Atlas records of this species within 20 kilometres of the boundary of the Project Disturbance Area recorded between 1978 and 1990, and a further 12 NSW Wildlife Atlas records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1978 and 2009. There are 28 Birdlife Australia Atlas records of the species within 25 kilometres of the centre of the Project Disturbance Area, recorded between 1998 and 2010 (refer to Table 4.3 of the main report). The species is not known to occur in any reserves in the region. The Project Disturbance Area provides foraging habitat for this species, comprising grasslands and disturbed areas. The Project Disturbance Area is also considered to provide marginal breeding habitat for the species.

This species is likely to be a regular or occasional visitor to the Project Disturbance Area. The species is recognised as consisting of a single population in NSW (OEH 2012b), is highly mobile and is likely to utilise habitats surrounding the Project Disturbance Area. The Project is therefore unlikely to have an adverse effect on the life cycle of the species such that a local viable population would be placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 166 hectares of potential habitat for this species, comprising grassland, open woodland and disturbed habitats. A total of 166 hectares of potentially suitable habitat for this species would be removed as part of the Project. Substantial areas of potential habitat exist within the surrounding area including surrounding farmland, as well as grasslands and open woodland associated with Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat will be removed, the level of fragmentation and isolation will increase for this species. However, given the extensive area of suitable habitat in the surrounding area and the high mobility of this species, the level of fragmentation and isolation increase is unlikely to impact on this species.

The Project will not introduce significant barriers for this highly mobile species such that it will prevent movement of individuals between proximate areas of habitat. Consequently, in relation to the regional distribution of the habitat of this species, a significant area of known habitat will not be fragmented or isolated from currently interconnecting or proximate areas as a result of the Project.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As discussed above, this species is likely to be a regular or occasional visitor to the Project Disturbance Area. However, due to the high mobility of the species and the extensive areas of suitable habitat in the surrounding area, the removal of potential habitat for this species from the Project Disturbance Area is unlikely to impact the long-term survival of this species in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. There are no threat abatement plans pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation, and;
- removal of dead wood and dead trees.

Conclusion: The spotted harrier is unlikely to be significantly impacted by the Project.

Little eagle (*Heiraaetus morphnoides*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable habitat for this species. This species was recorded in the Wider Study Area to the north of the Project Disturbance Area on one occasion during surveys in 2012. There are five NSW Wildlife Atlas records of this species within 20 kilometres of the boundary of the Project Disturbance Area recorded between 1978 and 2010, and a further 22 NSW Wildlife Atlas records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1978 and 2010. There are 33 BirdLife Australia Atlas records within 25 kilometres of the centre of the Project Disturbance Area, recorded between 1999 and 2012 (refer to Table 4.3 of the main report).

The species has been recorded in Goobang National Park, Woggoon Nature Reserve, Blow Clear West State Forest, Back Yamma State Forest and Cookamidgera State Forest. The Project Disturbance Area is considered to provide marginal foraging and nesting/roosting habitat for this species, comprising woodlands, adjacent grasslands and disturbed areas.

This species may be an occasional or rare visitor to the Project Disturbance Area and the Project is unlikely to have an adverse effect on the life cycle of the species such that a local viable population would be placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 116 hectares of potential habitat for this species, comprising grassland, woodland and disturbed habitats. A total of 116 hectares of potentially suitable habitat for this species would be removed as part of the Project. Substantial areas of potential habitat exist within the surrounding area including farmland, the Bogan River watercourse, as well as within Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The Project will not introduce significant barriers for this highly mobile species such that it would prevent movement of individuals between proximate areas of habitat.

As some potential habitat would be removed, the level of fragmentation and isolation would increase for this species. However, given the extensive area of suitable habitat in the surrounding area and the high mobility of this species, the level of fragmentation and isolation increase would be unlikely to significantly impact on this species.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As discussed in above, this species is likely only to be an occasional or rare visitor to the Project Disturbance Area. The removal of potential habitat for this species from the Project Disturbance Area is unlikely to impact the long-term survival of this species in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. There are no threat abatement plans pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- Clearing of native vegetation; and
- Removal of dead wood and dead trees.

Conclusion: The little eagle is unlikely to be significantly impacted by the Project.

Grey falcon (*Falco hypoleucos*) – Endangered TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded once during surveys in 2010 (Eco Logical 2011) within the Wider Study Area to the North of the Project Disturbance Area. There are no NSW Wildlife Atlas records of this species within 20 kilometres of the boundary of the Project Disturbance Area, however 49 NSW Wildlife Atlas records exist within across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1982 and 2005. There are 2 BirdLife Australia Atlas records within 25 kilometres of the centre of the Project Disturbance Area, recorded between 1999 and 2000 (refer to Table 4.3 of the main report). The species is not known to occur in any reserves in the region. The Project Disturbance Area is considered to provide foraging and potential nesting/roosting habitat for this species, comprising woodlands, adjacent grasslands and disturbed areas.

This species may be an occasional or rare visitor to the Project Disturbance Area and the Project is unlikely to have an adverse effect on the life cycle of the species such that a local viable population would be placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 116 hectares of potential habitat for this species, comprising grassland, woodland and disturbed habitats. A total of 116 hectares of potentially suitable habitat for this species would be removed as part of the Project. Substantial areas of potential habitat exist within the surrounding area including farmland, the Bogan River watercourse, as well as within Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The Project would not introduce significant barriers for this highly mobile species such that it will prevent movement of individuals between proximate areas of habitat.

As some potential habitat will be removed, the level of fragmentation and isolation might increase for this species. However, given the extensive area of suitable habitat in the surrounding area and the high mobility of this species, the level of fragmentation and isolation increase is unlikely to impact on this species.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As discussed in above, this species is likely to be an occasional or rare visitor to the Project Disturbance Area. The removal of potential habitat for this species from the Project Disturbance Area is unlikely to impact the long-term survival of this species in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. There are no threat abatement plans pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- Clearing of native vegetation; and
- Removal of dead wood and dead trees.

Conclusion: The grey falcon is unlikely to be significantly impacted by the Project.

Black Falcon (*Falco subniger*) – Proposed Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. It has been recorded once during surveys in 2012 within the Wider Study Area to the south-west of the Project Disturbance Area. There are no NSW Wildlife Atlas records of this species within 20 kilometres of the boundary of the Project Disturbance Area, however 19 NSW Wildlife Atlas records exist within across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1978 and 2005.There are 4 BirdLife Australia Atlas records within 25 kilometres of the centre of the Project Disturbance Area, recorded between 1999 and 2000 (refer to Table 4.3 of the main report). The species is known to occur in Goobang National Park and West Cookeys Plains State Forest. The Project Disturbance Area is considered to provide potential foraging and nesting/roosting habitat for this species, comprising woodlands, adjacent grasslands and disturbed areas.

This species may be an occasional or rare visitor to the Project Disturbance Area and the Project is unlikely to have an adverse effect on the life cycle of the species such that a local viable population would be placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 116 hectares of potential habitat for this species, comprising grassland, woodland and disturbed habitats. A total of 116 hectares of potentially suitable habitat for this species would be removed as part of the Project. Substantial areas of potential habitat exist within the surrounding area including farmland, the Bogan River watercourse, as well as within Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The Project would not introduce significant barriers for this highly mobile species such that it would prevent movement of individuals between proximate areas of habitat.

As some potential habitat would be removed, the level of fragmentation and isolation might increase for this species. However, given the extensive area of suitable habitat in the surrounding area and the high mobility of this species, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As discussed in a) above, this species is likely only to be an occasional or rare visitor to the Project Disturbance Area. The removal of potential habitat for this species from the Project Disturbance Area is unlikely to significantly impact the long-term survival of this species in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. There are no threat abatement plans pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- Clearing of native vegetation; and
- Removal of dead wood and dead trees.

Conclusion: The black falcon is unlikely to be significantly impacted by the Project.

Bush stone-curlew (*Burhinus grallarius*) – Endangered TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable foraging and breeding habitat for this species however this species was not detected during surveys in the Project Disturbance Area. This species was identified in the Wider Study Area, occurring to the north and south of the Project Disturbance Area on six occasions (refer to Figure 4.5). There are no NSW Atlas of Wildlife records for this species within 20 kilometres of the boundary of the Project Disturbance Area and 10 NSW Wildlife Atlas records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1991 and 2008. There is one BirdLife Australia Atlas record of the species within 25 kilometres of the centre of the Project Disturbance Area, recorded in 2000 (refer to Table 4.3 of the main report). The species is not known to occur in any reserves in the region. The Project Disturbance Area is considered to provide foraging and breeding habitat for this species in woodland patches, particularly those with sparse grassy groundcover and fallen timber.

The species is likely to be a resident in the Wider Study Area and it likely occurs in the Project Disturbance Area on a regular or occasional basis. This species is sedentary with family groups generally occurring within 1 kilometre of a nest site but sometimes up to 3 kilometres (HANZAB 1993).

Although this species has not been recorded in the Project Disturbance Area, the Project Disturbance Area is large enough to provide foraging or breeding habitat for a single or small number of pairs. However it is unlikely that the Project Disturbance Area would exclusively provide foraging or breeding habitat for a local population of this species and therefore it is considered the Project is unlikely to have an adverse effect on the life cycle of this species such that a viable local population would be likely to be placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 52 hectares of potential foraging and breeding habitat (grassy woodlands and derived native grasslands) for this species. It is unlikely that the species depends exclusively on the Project Disturbance Area for foraging and breeding but rather the Project Disturbance Area may form part of a larger home range for one or a few individuals/pairs.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential grassy woodland and derived native grassland habitat will be removed, fragmentation and isolation could increase for this species. However, given the already fragmented and isolated distribution of habitat in the Wider Study Area, the extent of increase in fragmentation and isolation due to the project is likely to be negligible.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As discussed above, this species is unlikely to be a resident of the Project Disturbance Area and may occur on a regular or occasional basis as part of a large home range area for one or a few individuals/pairs. The removal of habitat for this species from the Project Disturbance Area is unlikely to significantly impact the long-term survival of a local viable population of the species.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species.

The NSW Threat Abatement Plan 'Predation by the red fox (*Vulpes vulpes*)' (OEH 2010) is pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation; and
- removal of dead wood and dead trees.

Conclusion: The bush stone-curlew is unlikely to be significantly impacted by the Project.

Superb parrot (*Polytelis swainsonii*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable foraging and breeding habitat for this species and it has been recorded in the Project Disturbance Area on one occasion. This species was recorded in the Wider Study Area on a further 22 occasions during surveys in 2009, 2010, 2011 and 2012. There are 17 NSW Atlas of Wildlife records for this species within 20 kilometres of the boundary of the Project Disturbance Area, recorded between 1970 and 2009, and a further 129 NSW Atlas of Wildlife records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1970 and 2009. There are 49 BirdLife Australia Atlas records of the species within 25 kilometres of the centre of the Project Disturbance Area recorded between 1998 and 2011. The species has been recorded in Goobang National Park and Woggoon Nature Reserve.

This species requires tree hollows in large alive or dead trees for breeding, of which shape, position and structure are important. The Project Disturbance Area provides potentially suitable tree hollows however these occur within box woodland habitats which are not favoured by this species. Juveniles were observed during surveys in summer 2012 in the Wider Study Area however it is considered unlikely that the Project Disturbance Area would provide breeding habitat when preferred habitat is located to the west, in large river red gums (*Eucalyptus camaldulensis*) along the Bogan River. It is not likely that the species depends exclusively upon the Project Disturbance Area as foraging or breeding habitat, given suitable habitat exists elsewhere in the locality and as such it is considered unlikely that the Project would have adverse effects on the life cycle of this species such that a viable population would be likely to be placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 52 hectares of potential habitat for this species. Due to this species' highly mobile nature it is unlikely that the species depends exclusively on the Project Disturbance Area for foraging or breeding. Substantial foraging habitat for this species occurs in the surrounding area including farmland and the Bogan River watercourse as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat will be removed, fragmentation and isolation might increase for this species. However, given the extensive area of suitable habitat in the surrounding area and the high mobility of the species, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

The Project will not introduce significant barriers for this highly mobile species such that it will prevent movement of individuals between proximate areas of habitat. Consequently, in relation to the regional distribution of the habitat of this species, a significant area of known habitat will not be fragmented or isolated from currently interconnecting or proximate areas as a result of the Project.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

Potentially suitable habitat exists within the Project Disturbance Area for this species. Due to the availability of suitable habitat in the surrounding area including the Wider Study Area and beyond and the species' highly mobile nature, it is unlikely that the habitat to be removed for the Project would be important to the long-term survival of the superb parrot. Potential foraging and breeding habitat exists in the surrounding area, including farmland and the Bogan River watercourse as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species.

The 'Threat Abatement Plan for Beak and Feather Disease Affecting Endangered Psittacine Species' (DEH 2005) is pertinent to this threatened species. The Project does not contravene with any of the objectives or actions listed within this recovery plan.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation; and
- loss of hollow-bearing trees.

Conclusion: The superb parrot is unlikely to be significantly impacted by the Project.

Swift parrot (*Lathamus discolor*) – Endangered TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable habitat for this species however it has not been recorded during surveys. This species has been recorded within the Wider Study Area twice during surveys in 2010 and 2012. There are no known NSW Atlas of Wildlife records for this species within 20 kilometres of the boundary of the Project Disturbance Area, and there are 11 NSW Atlas of Wildlife records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1978 and 2009. There are three BirdLife Australia Atlas records of the species within 25 kilometres of the centre of the Project Disturbance Area recorded between 2000 and 2009. The species has been recorded in Back Yamma State Forest and Cookamidgera State Forest. The Project Disturbance Area is considered to provide winter foraging habitat for this species. As this species breeds in Tasmania, the Project Disturbance Area does not provide breeding habitat. The Project is not likely to have an adverse effect on the life cycle of this species or place it at risk of extinction because it is not likely that the species depends exclusively upon the Project Disturbance Area as winter foraging habitat, given suitable habitat exists elsewhere in the locality.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 37 hectares of potential foraging habitat for this species in eucalypt woodlands and plantations, although it is unlikely that the species depends exclusively on the Project Disturbance Area for foraging habitat. Substantial foraging habitat for this mobile species occurs in the surrounding area, including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat will be removed, fragmentation and isolation might increase for this species. However, given the extensive area of suitable habitat in the surrounding area and the high mobility of the species, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

The Project will not introduce significant barriers for this highly mobile species such that it will prevent movement of individuals between proximate areas of habitat. Consequently, in relation to the regional distribution of the habitat of this species, a significant area of known habitat will not be fragmented or isolated from currently interconnecting or proximate areas as a result of the Project.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The Project Disturbance Area contains foraging habitat due to the presence of winter flowering eucalypts. Due to this species highly mobile nature and the availability of suitable habitat in the region, habitat areas within the Project Disturbance Area are unlikely to be important to the long-term survival of the species. Substantial foraging habitat for this mobile species occurs in the surrounding area, including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species.

The 'Threat Abatement Plan for Beak and Feather Disease Affecting Endangered Psittacine Species' (DEH 2005) is pertinent to this threatened species. The Project does not contravene with any of the objectives or actions listed within this recovery plan.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation.

Conclusion: The swift parrot is unlikely to be significantly impacted by the Project.

Barking owl (*Ninox connivens*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides potential habitat for this species although it was not recorded in the Project Disturbance Area during surveys. There are four NSW Atlas of Wildlife records for this species within 20 kilometres of the boundary of the Project Disturbance Area recorded between 1993 and 2008, and a further 12 NSW Atlas of Wildlife records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1978 and 2008. There is one BirdLife Australia Atlas record of the species within 25 kilometres of the centre of the Project Disturbance Area recorded in 2000. The species has been recorded in Goobang National Park, Nangar National Park, Blow Clear West State Forest and Back Yamma State Forest. This species requires hollows for breeding, of which shape, position and structure are important. The Project Disturbance Area provides limited suitable breeding habitat for the species. This species may be a rare visitor to the Project Disturbance Area. The Project is not likely to have an adverse effect on the life cycle of this species or place it at risk of extinction because it is not likely that the species depends exclusively upon the Project Disturbance Area as foraging or breeding habitat, given suitable habitat exists elsewhere in the locality.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 116 hectares of potential habitat for this species. If present, it is likely that the Project Disturbance Area comprises only a small part of a much larger foraging range for the barking owl, and this highly mobile species is unlikely to depend exclusively on the Project Disturbance Area. Substantial habitat occurs in the surrounding area, including farmland and the Bogan River watercourse as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat will be removed, fragmentation and isolation might increase for this species. However, given the extensive area of suitable habitat in the surrounding area and the high mobility of the species, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

The Project will not introduce significant barriers for this highly mobile species such that it will prevent movement of individuals between proximate areas of habitat. Consequently, in relation to the regional distribution of the habitat of this species, a significant area of known habitat will not be fragmented or isolated from currently interconnecting or proximate areas as a result of the Project.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The Project Disturbance Area contains few large, hollow-bearing eucalypts which this species depends upon for nesting sites. This is not expected to affect the long-term survival of the species in the locality as substantial foraging, roosting and breeding habitat for this species occurs in the surrounding area, including farmland and the Bogan River watercourse as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

The 'NSW Recovery Plan for the Large Forest Owls' (DEC 2006) is relevant to this species. The Project contravenes with the following objective of the recovery plan: 'Manage and protect habitat off reserves and state forest'. The Project will slightly increase the level of fragmentation of habitat for this species. However, given the disturbed nature of the habitats to be cleared, the limited nature of suitable breeding habitat, and the high mobility of this species, the Project is not likely to significantly impact this threatened species.

No threat abatement plans are pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation; and
- loss of hollow-bearing trees.

Conclusion: The barking owl is unlikely to be significantly impacted by the Project.

Masked owl (*Tyto novaehollandiae*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

This species was recorded during surveys of the Wider Study Area to the south of the Project Disturbance Area. The Project Disturbance Area provides suitable habitat for this species. There are no known NSW Wildlife Atlas records of this species within 20 kilometres of the boundary of the Project Disturbance Area, and no NSW Wildlife Atlas record across the mapsheet search area. There are no BirdLife Australia atlas records of this species within 25 kilometres of the centre of the Project Disturbance Area. The species is not known to occur in any reserves in the region. The Project Disturbance Area is considered to provide marginal foraging habitat for this species, comprising open woodlands, and grasslands and farmland adjacent to this vegetation type. This species depends upon large hollow-bearing eucalypts for nest sites, which are limited within the Project Disturbance Area. Therefore, it is unlikely the Project would disrupt the life cycle of the species such that a local viable population would placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 116 hectares of potential habitat for this species Substantial habitat occurs in the surrounding area, including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat will be removed, the level of fragmentation and isolation might increase for this species. However, given the extensive area of suitable habitat in the surrounding area and the high mobility of this species, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

The Project will not introduce significant barriers for this highly mobile species such that it will prevent movement of individuals between proximate areas of habitat. Consequently, in relation to the regional distribution of the habitat of this species, a significant area of known habitat will not be fragmented or isolated from currently interconnecting or proximate areas as a result of the Project.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As the Project Disturbance Area is likely to form only a portion of any home range area of the species it is unlikely that the habitat to be removed is important to the long-term survival of the species.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

The 'NSW Recovery Plan for the Large Forest Owls' (DEC 2006) is relevant to this species. The Project contravenes with the following objective of the recovery plan: 'Manage and protect habitat off reserves and state forest'. The Project will slightly increase the level of fragmentation of habitat for this species. However, given the disturbed nature of the habitats to be cleared, and the high mobility of this species, the proposed Project is not likely to significantly impact this threatened species.

No threat abatement plan is pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation; and
- loss of hollow-bearing trees.

Conclusion: The masked owl is unlikely to be significantly impacted by the Project.

Brown treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

This species has been recorded on 10 occasions across the Wider Study Area. The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded in the Project Disturbance Area. There are 15 NSW Wildlife Atlas records of this species within 20 kilometres of the boundary of the Project Disturbance Area recorded between 1970 and 2008, and a further 256 NSW Wildlife Atlas records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1969 and 2008. There are 240 BirdLife Australia Atlas records of the species within 25 kilometres of the centre of the Project Disturbance Area, recorded between 1998 and 2012. The species has been recorded in Goobang and Nangar national parks; Woggoon Nature Reserve; and Blow Clear West, Coragery, Back Yamma, Cookamidgera, Wombin, West Cookeys and Gunningbland state forests. The Project Disturbance Area is considered to provide potential foraging and breeding habitat for this species within woodland and grassy woodland habitats, particularly

where fallen logs and stumps occur. This species depends upon tree hollows in standing dead or live trees for nest sites.

This species has not been recorded within the Project Disturbance Area and it is unlikely to occur given the species' generally conspicuous and sedentary nature the Project would be unlikely to have an adverse effect on the life cycle of this species such that a viable local population would be likely to be placed at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 37 hectares of potential foraging and breeding habitat for this species, however this generally conspicuous and sedentary species has not been recorded in the Project Disturbance Area.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat will be removed, fragmentation and isolation might increase for this species. However, given the already fragmented and isolated distribution of habitat in the Wider Study Area, the rate of increase in fragmentation and isolation due to the project is likely to be negligible.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As this generally conspicuous and sedentary species has not been recorded in the Project Disturbance Area it is unlikely to use the habitats of the Project Disturbance Area on a regular or frequent basis. This species is unlikely to rely upon the habitats of the Project Disturbance Area for its long term survival in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. No threat abatement plans are pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation;
- loss of hollow-bearing trees; and
- removal of dead wood and dead trees.

Conclusion: The brown treecreeper is unlikely to be significantly impacted by the Project.

Speckled warbler (*Chthonicola sagittata*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

This species has not been recorded in the Wider Study Area. The Project Disturbance Area provides suitable habitat for this species although it has not been recorded there. There are five NSW Atlas of Wildlife records of this species within 20 kilometres of the boundary of the Project Disturbance Area recorded between 1970 and 2006, and a further 192 NSW Wildlife Atlas records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1970 and 2009. There are 104 BirdLife Australia Atlas records of the species within 25 kilometres of the centre of the Project Disturbance Area, recorded between 1998 and 2012. The species has been recorded in Goobang and Nangar national parks; Woggoon Nature Reserve; and Coragery, Back Yamma, Cookamidgera, Wombin, West Cookeys, Gunningbland and Monumea state forests. Due to the highly disturbed nature of its habitats, the Project Disturbance Area is considered to provide marginal potential habitat for this species, comprising woodlands and open grassy woodlands. The Project is unlikely to have an adverse effect on the life cycle of this species or place it at risk of extinction because it is not likely that the species depends exclusively upon the Project Disturbance Area, given suitable habitat exists elsewhere in the locality.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 62 hectares of potential habitat for this species, comprising woodlands and grassy woodlands. A total of 62 hectares of potentially suitable habitat for this species would be removed as part of the Project.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat will be removed, the level of fragmentation and isolation might increase for this species. However, given the extensive area of suitable habitat in the surrounding locality, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

The Project is unlikely to introduce significant barriers for this species such that it will prevent movement of individuals between proximate areas of habitat. Consequently, in relation to the regional distribution of the habitat of this species, a significant area of known habitat will not be fragmented or isolated from currently interconnecting or proximate areas as a result of the Project.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As discussed above, the Project Disturbance Area contains marginal habitat for this species due to the highly disturbed nature of the habitats. The removal of potential habitat for this species from the Project Disturbance Area is unlikely to significantly impact the long-term survival of this species. Suitable habitat for this species occurs in the surrounding area, including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. No threat abatement plans are pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation.

Conclusion: The speckled warbler is unlikely to be significantly impacted by the Project.

Painted honeyeater (*Grantiella picta*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

This species was recorded in the Wider Study Area on one occasion in 2012. The Project Disturbance Area provides suitable habitat for this species however it hasn't been recorded there. There is one NSW Atlas of Wildlife record of this species within 20 kilometres of the boundary of the Project Disturbance Area recorded in 1990, and a further one NSW Wildlife Atlas records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1998. There are two BirdLife Australia Atlas records of the species within 25 kilometres of the centre of the Project Disturbance Area recorded between 1999 and 2011. The species has been recorded in Goobang National Park. The Project Disturbance Area is considered to provide habitat for this species in the form of eucalypts with mistletoe. As this species specialises in feeding on the fruits of mistletoes, which are uncommon within the Project Disturbance Area, it is unlikely that the species depends exclusively on habitat provided by the Project Disturbance Area. It is likely that the species is an occasional visitor to the Project Disturbance Area. The Project is unlikely to have an adverse effect on the life cycle of this species or place it at risk of extinction given that suitable habitat exists elsewhere in the locality.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 37 hectares of potential habitat for this species within woodland and grassy woodland habitats, although it is unlikely that the species depends exclusively on the Project Disturbance Area for habitat. Substantial habitat for this mobile species occurs in the surrounding area, including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat will be removed, fragmentation and isolation might increase for this species. However, given the extensive area of suitable habitat in the surrounding area and the high mobility of the species, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As discussed above, the Project Disturbance Area contains marginal habitat for this species due to the low density of mistletoes as well as the disturbed nature of the habitats. Suitable habitat occurs in the locality. The removal of potential habitat for this species from the Project Disturbance Area is unlikely to significantly impact the long-term survival of this species.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. No threat abatement plans are pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation.

Conclusion: The painted honeyeater is unlikely to be significantly impacted by the Project.

Grey-crowned babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable habitat for this species and it has been recorded in the Project Disturbance Area on one occasion. It has been recorded widely across the Wider Study Area during surveys on 104 occasions in 2008, 2009, 2010, 2011 and 2012. There are 19 NSW Atlas of Wildlife records of this species within 20 kilometres of the boundary of the Project Disturbance Area recorded between 1969 and 2010, and a further 82 NSW Atlas of Wildlife records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1969 and 2010. There are 280 BirdLife Australia Atlas records of the species within 25 kilometres of the centre of the Project Disturbance Area, recorded between 1997 and 2012. The species has been recorded in Goobang National Park; Woggoon Nature Reserve; and Blow Clear West, Coragery, Back Yamma, Cookamidgera, Wombin, West Cookeys Monumea and Stahorn state forests. Woodland areas within the Project Disturbance Area provide foraging and breeding habitat for this species. One or more resident groups of this species may occur within the Project Disturbance Area or may have home range areas that extend beyond the Project Disturbance Area. While the Project may result in the

displacement of one or a small number of grey-crowned babbler groups from the Project Area, the species is unlikely to be placed at the risk of extinction due to the common occurrence of the species in the Wider Study Area.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 62 hectares of habitat for this species, comprising woodlands, grassy woodlands and plantations. A total of 62 hectares of suitable habitat for this species would be removed as part of the Project.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat will be removed, the level of fragmentation and isolation might increase for this species. However, given the extensive area of suitable habitat in the surrounding locality and the mobility of this species, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

The Project is unlikely to introduce significant barriers for this species such that it will prevent movement of individuals between proximate areas of habitat. Consequently, in relation to the regional distribution of the habitat of this species, a significant area of known habitat will not be fragmented or isolated from currently interconnecting or proximate areas as a result of the Project.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The habitat to be removed provides habitat for one or a small number of grey-crowned babbler groups. The species also commonly occurs in the Wider Study Area, adjacent to the Project Disturbance Area. While some individuals of the species would likely be displaced, the Project is unlikely to result in the removal of habitat that would affect the long-term survival of the species in the locality. Suitable habitat for this species occurs in the surrounding area, including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. No threat abatement plans are pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation; and
- removal of dead wood and dead trees.

Conclusion: The grey-crowned babbler is unlikely to be significantly impacted by the proposed Project.

Varied sittella (*Daphoenositta chrysoptera*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

This species has not been recorded in the Wider Study Area or Project Disturbance Area during the surveys. The Project Disturbance Area provides suitable habitat for this species although it has not been recorded during surveys. There are four NSW Atlas of Wildlife records for this species within 20 kilometres of the boundary of the Project Disturbance Area recorded between 1978 and 2006, and a further 18 NSW Atlas of Wildlife records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1978 and 2006. There are 43 BirdLife Australia Atlas records of the species within 25 kilometres of the centre of the Project Disturbance Area recorded between 1998 and 2011. The species has been recorded in Goobang and Nangar national parks; Woggoon Nature Reserve; and Coragery, Back Yamma, Cookamidgera, and West Cookeys state forests. Due to the highly disturbed nature of the habitats, the Project Disturbance Area is considered to provide marginal potential habitat for this species, comprising woodland vegetation. The Project is not likely to have an adverse effect on the life cycle of this species or place it at risk of extinction because it is not likely that the species depends exclusively upon the Project Disturbance Area for breeding or foraging, given suitable habitat exists elsewhere in the locality.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 37 hectares of potential foraging habitat for this species within woodlands and plantations, although it is unlikely that the species depends exclusively on the Project Disturbance Area for foraging or breeding habitat. Substantial foraging and breeding habitat occurs in the surrounding area, including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat will be removed, the level of fragmentation and isolation might increase for this species. However, given the extensive area of suitable habitat in the surrounding locality and the mobility of this species, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

The Project is unlikely to introduce significant barriers for this species such that it will prevent movement of individuals between proximate areas of habitat. Consequently, in relation to the regional distribution of the habitat of this species, a significant area of known habitat will not be fragmented or isolated from currently interconnecting or proximate areas as a result of the Project.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As discussed in a) above, the Project Disturbance Area contains marginal habitat for this species due to the highly disturbed nature of the habitats. The removal of potential habitat for this species from the Project Disturbance Area is unlikely to significantly impact the long-term survival of this species. Suitable habitat for this species occurs in the surrounding area, including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. No threat abatement plans are pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation;

- loss of hollow-bearing trees; and
- removal of dead wood and dead trees.

Conclusion: The varied sittella is unlikely to be significantly impacted by the Project.

Hooded robin (south-eastern form) (*Melanodryas cucullata cucullata*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable habitat for this species although it has not been recorded during surveys. There are four NSW Atlas of Wildlife records for this species within 20 kilometres of the boundary of the Project Disturbance Area recorded between 1970 and 1992, and a further 31 NSW Atlas of Wildlife records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1969 and 2008. There are 20 BirdLife Australia Atlas records of the species within 25 kilometres of the centre of the Project Disturbance Area, recorded between 1998 and 2009. The species has been recorded in Goobang and Nangar national parks; Woggoon Nature Reserve; and Coradgery, Back Yamma and Gunningbland state forests. The Project Disturbance Area provides potential foraging and breeding habitat for the species. The Project is not likely to have an adverse effect on the life cycle of this species or place it at risk of extinction because it is not likely that the species depends exclusively upon the Project Disturbance Area as foraging or breeding habitat, given suitable habitat exists elsewhere in the locality.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 52 hectares of potential habitat for this species. However, it is unlikely that the species depends exclusively on the Project Disturbance Area for habitat. Substantial habitat for this species occurs in the surrounding area including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat will be removed, fragmentation and isolation might increase for this species. However, given the extensive area of suitable habitat in the surrounding area and the high mobility of the species, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As discussed above, the Project Disturbance Area is likely to comprise only a small component of a much larger habitat range for the species in the locality. The removal of potential habitat for this species from the Project Disturbance Area is unlikely to significantly impact the long-term survival of this species. Suitable habitat for this species occurs in the surrounding area, including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. There are no threat abatement plans pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation; and
- removal of dead wood and dead trees.

Conclusion: The hooded robin is unlikely to be significantly impacted by the Project.

Diamond firetail (*Stagonopleura guttata*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable habitat for this species although it has not been recorded during surveys. There are six NSW Atlas of Wildlife records for this species within 20 kilometres of the boundary of the Project Disturbance Area recorded between 1978 and 1990, and a further 77 NSW Atlas of Wildlife records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1971 and 2008. There are 44 BirdLife Australia Atlas records of the species within 25 kilometres of the centre of the Project Disturbance Area, recorded between 1998 and 2012. The species has been recorded in Goobang and Nangar national parks; Woggoon Nature Reserve; and Back Yamma, Cookamidgera and Gunningbland state forests. The Project Disturbance

Area provides potential foraging and breeding habitat for the species. The Project is not likely to have an adverse effect on the life cycle of this species or a population of the species, or place it at risk of extinction because it is not likely that the species depends exclusively upon the Project Disturbance Area as foraging or breeding habitat. Suitable habitat exists elsewhere in the locality.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 91 hectares of potential habitat for this species. However, it is unlikely that the species depends exclusively on the Project Disturbance Area for habitat. Substantial habitat for this species occurs in the surrounding area including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The Project will not introduce significant barriers for this highly mobile species such that it would prevent movement of individuals between proximate areas of habitat.

As some potential habitat will be removed, fragmentation and isolation might increase for this species. However, given the extensive area of suitable habitat in the surrounding area and the high mobility of the species, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As discussed above, it is unlikely that the species depends exclusively on the Project Disturbance Area for breeding or foraging habitat. The removal of potential habitat for this species from the Project Disturbance Area is unlikely to significantly impact the long-term survival of this species. Suitable habitat for this species occurs in the surrounding area, including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. There are no threat abatement plans pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation; and
- removal of dead wood and dead trees.

Conclusion: The diamond firetail is unlikely to be significantly impacted by the Project.

Koala (*Phascolarctos cinereus*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable habitat for this species, although it has not been recorded there during surveys. There are two NSW Wildlife Atlas records of this species within 20 kilometres of the boundary of the Project Disturbance Area recorded between 1992 and 2006, and a further 12 NSW Atlas of Wildlife records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1972 and 2006. The species has been recorded in Goobang National Park. The Project Disturbance Area is considered to provide potential foraging habitat for this species, comprising woodland habitat. These habitats contains bimble box (*Eucalyptus populnea*) which is an important feed tree for this species. Given the koala has not been recorded in the Project Disturbance Area, it is not likely that the species depends exclusively upon the Project Disturbance Area for habitat due to the presence of suitable habitat elsewhere in the locality, the Project is not likely to have an adverse effect on the life cycle of this species or place it at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 37 hectares of potential foraging habitat for this species, comprising woodland areas. A total of up to 37 hectares of potentially suitable foraging habitat for this species will be removed as part of the Project. Substantial potential habitat for this species occurs in the surrounding area including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat will be removed, the level of fragmentation and isolation might increase for this species. However, given the relatively small amount of potential habitat to be removed, the extensive area of suitable habitat in the surrounding area and the mobility of this species, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

The Project is unlikely to introduce significant barriers for this species such that it will prevent movement of individuals between proximate areas of habitat. Consequently, in relation to the regional distribution of the habitat of this species, a significant area of known habitat will not be fragmented or isolated from currently interconnecting or proximate areas as a result of the Project.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The Project will involve the removal of up to 37 hectares of potentially suitable foraging habitat for this species. Given the relatively small amount of foraging habitat to be removed, the absence of any records of this species within the Project Disturbance Area, and the availability of suitable habitat in the locality, the removal of this vegetation is unlikely to significantly impact the long-term survival of this species. Suitable habitat for this species occurs in the surrounding area, including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

The 'Recovery plan for the koala (*Phascolarctos cinereus*)' (DECC 2008) is relevant to this species. The Project does not contravene with any of the objectives or actions listed within the recovery plan.

No threat abatement plans are pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the "clearing of native vegetation" key threatening process:

- clearing of native vegetation; and
- removal of dead wood and dead trees.

Conclusion: The koala is unlikely to be significantly impacted by the Project.

Squirrel glider (*Petaurus norfolcensis*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded during surveys. One unconfirmed record exists within the Wider Study Area, approximately 2 kilometres north-west of the Project Disturbance Area (GHD 2009a). This unconfirmed record was a result of a brief view of a *Petaurus* species during a spotlighting survey undertaken for the Estcourt Tailings Facility in October 2008. The species was not able to be confidently identified at the time of the survey so the precautionary principle was applied and it was considered to be a squirrel glider for the purpose of that assessment. There is no NSW Wildlife Atlas record of this species within 20 kilometres of the boundary of the Project Disturbance Area, and 8 NSW Atlas of Wildlife records across the mapsheet search area (refer to Table 4.2 of the main report) recorded between 1995 and 2002. In comparison, the species likely to be mistaken for a squirrel glider, the sugar glider (*Petaurus breviceps*), is known to be more common in the region (Schrader 1987) and has been recorded on 18 occasions across the same mapsheet searched area. The sugar glider was also recorded in the same location as the unconfirmed squirrel glider during subsequent pre-clearance surveys of the Estcourt Tailings Storage Facility by Eco Logical in June 2010 (Eco Logical 2011). It is considered likely that the unconfirmed glider species seen by GHD was a sugar glider.

The Project Disturbance Area is considered to provide potential foraging and refuge habitat for the squirrel glider in mature woodland habitat containing hollow-bearing trees. Due to the relatively low quality of habitat available for the species in the area, the existing fragmentation of habitat areas in the locality, and the scarcity of records of the species in the region, it is unlikely that the Project Disturbance Area would contain a viable local population if the species is present. Therefore, the Project is not likely to have an adverse effect on the life cycle of this species or a population of the species, or place it at risk of extinction because it is unlikely that the species would depend exclusively upon the Project Disturbance Area.

Suitable habitat for this species occurs in the surrounding area, including road reserves with mature eucalypts, as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 37 hectares of potential foraging and refuge habitat for this species, comprising woodland areas. A total of 37 hectares of potentially suitable foraging and refuge habitat for this species would be removed as part of the Project. Suitable habitat for this species occurs in the surrounding area, including road reserves with mature eucalypts, as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat would be removed, the level of fragmentation and isolation might increase for this species. However, given the relatively small amount of suitable habitat to be removed and the highly fragmented nature of this habitat at present, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The Project will involve the removal of up to 37 hectares of potentially suitable foraging and refuge habitat for this species. Given the relatively small amount of habitat to be removed and its relatively low quality to the species, the removal of this vegetation is unlikely to significantly impact the long-term survival of this species. Suitable habitat for this species occurs in the surrounding area, including road reserves with mature eucalypts, as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. No threat abatement plans are pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation;
- loss of hollow-bearing trees; and
- removal of dead wood and dead trees.

Conclusion: The squirrel glider is unlikely to be significantly impacted by the Project.

Yellow-bellied sheathtail bat (*Saccolaimus flaviventris*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable habitat for this species, although it has not been recorded during surveys. There are six NSW Wildlife Atlas record of this species within 20 kilometres of the boundary of the Project Disturbance Area recorded in 2008, and a further 12 NSW Atlas of Wildlife records across the mapsheet search area (refer to Table 4.2 of the main report). The species has been recorded in Blow Clear West and Strahorn State Forests. The Project Disturbance Area is considered to provide potential foraging habitat for this species, comprising all habitats present except disturbed land, and potential roosting habitat where large live and dead hollow-bearing trees occur. Given the species has not been recorded in the Project Disturbance Area and it is not likely that the species depends exclusively upon the Project Disturbance Area for breeding, foraging or roosting due to the presence of suitable habitat elsewhere in the locality, the Project is unlikely to have an adverse effect on the life cycle of this species or place it at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 228 hectares of potential foraging (comprising woodland, open woodland, grasslands, plantations and cultivated land) and up to 37 hectares of roosting habitat (comprising woodland and open woodland) for this species. Substantial habitat for this species occurs in the surrounding area including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat will be removed, the level of fragmentation and isolation might increase for this species. However, given the relatively small amount of suitable habitat to be removed, the extensive area of suitable habitat in the surrounding area and the mobility of this species, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

The Project is unlikely to introduce significant barriers for this species such that it will prevent movement of individuals between proximate areas of habitat. Consequently, in relation to the regional distribution of the habitat of this species, a significant area of known habitat will not be fragmented or isolated from currently interconnecting or proximate areas as a result of the Project.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The Project will involve the removal of up to 228 hectares of potentially suitable foraging and up to 37 hectares of potential roosting habitat for this species. Given the relatively small amount of habitat to be removed and the absence of any records of this species within the Project Disturbance Area, the removal of this habitat is unlikely to significantly impact the long-term survival of this species. Suitable habitat for this species occurs in the surrounding area, including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. No threat abatement plans are pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation;
- loss of hollow-bearing trees; and
- removal of dead wood and dead trees.

Conclusion: The yellow-bellied sheathtail bat is unlikely to be significantly impacted by the Project.

Eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded during surveys. This species has been recorded in the Wider Study Area on six occasions during surveys in 2010 (Eco Logical 2011) and by Umwelt in 2011. There are no known NSW Wildlife Atlas records of this species within 20 kilometres of the boundary of the Project Disturbance Area, and no further NSW Wildlife Atlas records of the species across the mapsheet search area (refer to Table 4.2 of the main report). The species is not known to occur in any reserves in the region. The Project Disturbance Area is considered to provide potential foraging habitat for this species comprising open woodlands, grasslands and farmland. This species requires caves, tunnels or road culverts for roosting, which are absent from the Project Disturbance Area. The Project is not likely to have an adverse effect on the life cycle of this species or place it at risk of extinction because it is not likely that the species depends exclusively upon the Project Disturbance Area for breeding or foraging, given suitable habitat exists elsewhere in the locality.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 228 hectares of potential foraging habitat for this species, comprising areas all habitat areas except disturbed land. Substantial habitat for this species occurs in the surrounding area including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat would be removed, the level of fragmentation and isolation might increase for this species. However, given the extensive area of suitable habitat in the surrounding locality and the mobility of this species, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

The Project is unlikely to introduce significant barriers for this species such that it would prevent movement of individuals between proximate areas of habitat. Consequently, in relation to the regional distribution of the habitat of this species, a significant area of known habitat would not be fragmented or isolated from currently interconnecting or proximate areas as a result of the Project.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As discussed above, the Project Disturbance Area does not contain caves, tunnels or road culverts which this species is dependent upon for roosting sites. Therefore, the removal of potential habitat for this species from the Project Disturbance Area is unlikely to significantly impact the long-term survival of this species. Suitable habitat for this species occurs in the surrounding area, including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. No threat abatement plans are pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the 'clearing of native vegetation"\' key threatening process:

Conclusion: The eastern bentwing-bat is unlikely to be significantly impacted by the Project.

Little pied bat (*Chalinolobus picatus*) – Vulnerable TSC Act

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The Project Disturbance Area provides suitable habitat for this species, however it has not been recorded during surveys. This species has been recorded in the Wider Study Area on two occasions during surveys in 2010 and 2011. There are 10 NSW Wildlife Atlas records of this species within 20 kilometres of the boundary of the Project Disturbance Area recorded between 2003 and 2012, and a further 10 NSW Wildlife Atlas records across the mapsheet search area (refer to Table 4.2 of the main report). The species has been recorded in Woggoon Nature Reserve, Blow Clear West State Forest and Strahorn State Forest. The Project Disturbance Area is considered to provide potential foraging habitat for this species, comprising woodland, grassland and farmland areas. This species requires tree hollows, as well as caves, rocky outcrops, tunnels and buildings for roosting. The Project is not likely to have an adverse effect on the life cycle of this species or place it at risk of extinction because it is not likely that the species depends exclusively upon the Project Disturbance Area for breeding or foraging, given suitable habitat exists elsewhere in the locality.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – this species does not constitute an ecological community.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – this species does not constitute an ecological community.

d) in relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The Project Disturbance Area provides up to 228 hectares of potential foraging and up to 37 hectares of potential roosting habitat for this species. Substantial habitat for this species occurs in the surrounding area including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

As some potential habitat would be removed, the level of fragmentation and isolation might increase for this species. However, given the extensive area of suitable habitat in the surrounding locality and the mobility of this species, the level of fragmentation and isolation increase is unlikely to significantly impact on this species.

The Project is unlikely to introduce significant barriers for this species such that it would prevent movement of individuals between proximate areas of habitat. Consequently, in relation to the regional distribution of the habitat of this species, a significant area of known habitat would not be fragmented or isolated from currently interconnecting or proximate areas as a result of the Project.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

As discussed above, the Project Disturbance Area contains suitable habitat for the species, however, this is likely to comprise only a small proportion of the available habitat for the species in the locality. Therefore, the removal of potential habitat for this species from the Project Disturbance Area is unlikely to significantly impact the long-term survival of this species. Suitable habitat for this species occurs in the surrounding area, including farmland as well as Goobang National Park and Blow Clear West, Coragery, Wombin, Trundle, East and West Cookeys Plains, Gunningbland, Monumea Gap, Back Yamma, Cookamidgera and Strahorn state forests.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been listed within or adjacent to the Project Disturbance Area for this threatened species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plans have been prepared for this species. No threat abatement plans are pertinent to this threatened species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The Project would contribute to the operation of the following key threatening processes:

- clearing of native vegetation;
- loss of hollow-bearing trees; and
- removal of dead wood and dead trees.

Conclusion: The little pied bat is unlikely to be significantly impacted by the Project.

Conclusion

The Project would result in the loss of habitat for a range of threatened flora and fauna species and TECs. The assessments above indicate that although there will be an impact on many species, the impacts are unlikely to be significant in most cases.

The TECs and species considered most at risk from the Project and which were assessed as sustaining potentially significant impacts include:

- Painted diuris (*Diuris tricolor*), and;
- Sloanes froglet (*Crinia sloanei*) (V – TSC Act).

APPENDIX G

Assessment of Significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

Appendix G – Assessment of Significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires the completion of an Assessment of Significance relating to the potential impacts of a Proposed Action on listed Matters of National Environmental Significance (MNES). A search of the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) Protected Matters Database (undertaken on 7 February 2013) identified threatened and migratory species (EPBC Act listed) known to occur or considered likely to occur, on the basis of habitat modelling, within 20 kilometres of the boundary of the Referral area. Note that the Referral Area is larger than the Project Disturbance Area and the calculations undertaken for this assessment are based on areas impacted within the Referral Area

A likelihood of occurrence assessment was undertaken for each TEC, threatened species and migratory species identified in the Protected Matters Database search (see Tables 3 and 4 in Appendix D).

An Assessment of Significance (according to the *Significant Impact Guidelines 1.1* (Department of the Environment, Water, Heritage and the Arts 2009) is provided below for those TECs, threatened species and migratory species identified within the Referral area and considered to be potentially impacted by the Proposed Action (as assessed within Table 3 and 4 in Appendix D).

Table 1 presents the threatened ecological communities and **Table 2** presents the threatened and migratory species considered in the following assessment.

Table 1 – Threatened Ecological Communities Considered in the Following Assessment

Threatened Ecological Communities
Critically Endangered Ecological Communities
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
Endangered Ecological Communities
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Table 2 – Threatened and Migratory Species Considered in the Following Assessment

Common Name	**Scientific Name**
Endangered Species	
Regent honeyeater	*Anthochaera phrygia*
Swift parrot	*Lathamus discolor*
Austrostipa wakoolica	*Austrostipa wakoolica*
Vulnerable Species	
Superb parrot	*Polytelis swainsonii*
Koala (combined populations)	*Phascolarctos cinereus*
Slender darling pea	*Swainsona murrayana*
Austrostipa metatoris	*Austrostipa metatoris*

Table 2 – Threatened and Migratory Species Considered in the Following Assessment (cont.)

Common Name	Scientific Name
Migratory Species	
Regent honeyeater	*Anthochaera phrygia*
Rainbow bee-eater	*Merops ornatus*
Great egret	*Ardea alba*
Latham's snipe	*Gallinago hardwickii*

Critically Endangered and Endangered Ecological Communities

The following EPBC Act listed critically endangered and endangered ecological communities are considered in this assessment:

- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (critically endangered).

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (endangered).

An assessment in accordance with the DEWHA (2009) *Significant Impact Guidelines 1.1* is provided below for these ecological communities.

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

- **Reduce the extent of an ecological community**

The Proposed Action would result in a reduction in extent of approximately 0.28 hectare (all woodland) of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland likely to be removed within the Referral Area.

The Proposed Action would result in a reduction in extent of approximately 46 hectares (comprising 25 hectares of woodland and 21 hectares of derived native grasslands) of Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia likely to be removed within the Referral Area.

- **Fragment or increase fragmentation of an ecological community**

As the Proposed Action will result in the removal of areas of both ecological communities from the Referral area, the Proposed Action will result in an increase in the level of fragmentation of both communities in the local area, as the total area of each ecological community decreases and the distance between remaining patches increases. While the Proposed Action will result in an increase in the level of fragmentation of both ecological communities at the local scale, the level of increase is considered negligible given the already highly fragmented nature of ecological communities (particularly woodland communities) across the Referral and wider study area.

- **Adversely affect habitat critical to the survival of an ecological community**

Due to a long history of farming and mining practices within the Referral area, the habitat of both communities exists in a disturbed and fragmented state. It is not considered to represent habitat critical to the survival of either community. Therefore the Proposed Action would be unlikely to adversely affect habitat critical to the survival of either of the threatened ecological communities.

- **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 alternation of surface water drainage patterns**

The Proposed Action would result in the modification of abiotic factors necessary for both ecological communities survival within the Referral area as both ecological communities will be removed from the Referral area. However the Proposed Action would be unlikely to adversely modify or destroy abiotic factors necessary for the survival of either ecological community in the local area.

- **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**

The Proposed Action would substantially change species compositions within occurrences of the TECs within the Referral area as it requires the complete removal of both communities from the Referral area. However the Proposed Action is unlikely to impact on the species composition (including causing a decline or loss of functionally important species) of either ecological community in the local area.

- **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**

The Proposed Action would result in the complete removal of approximately 0.28 hectare of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland and approximately 46 hectares of Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia from within the Referral area. However the Proposed Action is unlikely to cause a substantial reduction in the quality or integrity of either ecological community in the local area.

- **Interfere with the recovery of an ecological community.**

Approximately 0.28 hectare of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland and approximately 46 hectares of Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia would be removed as part of the Proposed Action. The removal of areas of each ecological community would interfere with the recovery of both ecological communities via a reduction in the extent of both of the ecological communities.

Conclusion

The Conservation Advice and Listing Advice for the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland threatened ecological community documents that in New South Wales alone, it has been cleared from approximately 93 per cent of its original distribution (Threatened Species Scientific Committee 2006). Along with grazing and weed invasion, land clearing is noted as a key threat to the survival of the ecological community. In NSW this community is estimated to currently comprise approximately 250,729 hectares (Threatened Species Scientific Committee 2006), with the removal of this community from the Referral area resulting in a further reduction of 0.0001 per cent within NSW.

Australia wide (including Queensland, NSW, ACT and Victoria) approximately 416,325 hectares of this community currently remains (Threatened Species Scientific Committee 2006). It is noted that this is likely to be an inaccurate estimate of the current extent as it does not include poorer condition forms which are not covered by the listing of this community (Threatened Species Scientific Committee 2006) and does not include the derived native grassland form of the community. Removal of this community within the Referral area will result in a further decline of this community Australia wide by approximately 0.00006 per cent. Due to the small percentage of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland community to be removed the Proposed Action is unlikely to result in a significant impact on the ecological community

Similarly, land clearing is recognised as a key threat to the survival of the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia threatened ecological community (Threatened Species Scientific Committee 2010). The ecological community has declined by approximately 83 per cent of its original distribution in New South Wales (DEWHA 2010d). In NSW between approximately 300,000 and 330,000 hectares of this community remains. Removal of this community within the Referral area equates to approximately 0.01 per cent reduction in the current known extent of this community in NSW (Threatened Species Scientific Committee 2010).

Overall the current extent of this community in Australia (including NSW, Victoria and South Australia) is estimated to be approximately 534,500 hectares (Threatened Species Scientific Committee 2010) however, the derived native grassland form of the community was not included in the estimation of the current extent. The removal of this community within the Referral area will result in approximately a 0.009 per cent reduction within Australia. The Proposed Action involves the complete removal of this community (approximately 46 hectares) from within the Referral area. Due to the small percentage of the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia community to be removed, the Proposed Action is unlikely to result in a significant impact on the ecological community.

Endangered Species

The following EPBC Act listed endangered species are considered in this assessment:

- Swift parrot (*Lathamus discolor*); and
- *Austrostipa wakoolica*.

An assessment in accordance with the DEWHA *Significant Impact Guidelines 1.1* is provided below for these species.

In this case, a '*population of a species' is* defined as an occurrence of the species in a particular area. Occurrences include but are not limited to:

- **A geographically distinct regional population, or collection of local populations, or**
- **A population, or collection of local populations, that occurs within a particular bioregion.**

The swift parrot has previously been recorded within approximately 6.7 kilometres of the Referral area. In May 2012 two birds were recorded approximately 6.5 kilometres to the west of the Referral area (Umwelt 2012) and a second pair of swift parrots have previously been recorded approximately 1.4 kilometres to the north-west of the Referral area in June 2010 (Eco Logical 2011). Potential habitat for the swift parrot occurs in all areas of eucalypt woodland within the Referral area during the winter months of each year. Small groups of flowering eucalypt trees and mass eucalypt flowering events provide potential habitat when flowering occurs during the winter months.

The individual swift parrots recorded close to the Referral area are considered to form part of the national migratory population (Saunders and Tzaros 2011) that forages in eastern Australia during the winter months and returns to Tasmania to breed during spring. Therefore the national migratory population is not a geographically distinct regional population or a population that occurs within a particular bioregion and does not form a 'population' as defined above.

Austrostipa wakoolica has not been recorded in the Referral area despite the presence of potentially suitable habitat. While it has not been recorded within the Referral area, if it did occur it may form a population as defined by the *Significant Impact Guidelines 1.1* of the EPBC Act.

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

- **lead to a long-term decrease in the size of a population, or;**

Previous estimates of the national swift parrot population size range from 1320 pairs in 1988 to 940 pairs in 1995 (Saunders and Tzaros 2011). Given the highly mobile nature of the species, and the availability of large areas of eucalypt woodland to the east in Goobang National Park, it is considered that suitable alternative likely foraging areas exist within the foraging range of the swift parrot. Therefore it is considered unlikely that the Proposed Action would lead to a long-term decrease in the size of the national swift parrot population.

While potentially suitable habitat exists within the Referral area for *Austrostipa wakoolica*, it is considered unlikely to occur given the extended survey period has not identified the species and the absence of other known occurrences of the species within a 20 kilometre radius of the boundary of the Referral area. The Proposed Action is therefore unlikely to lead to a long-term decrease of a population of *Austrostipa wakoolica*

- **reduce the area of occupancy of the species, or;**

The Proposed Action would result in a reduction in the area of potential occupancy for the swift parrot through the removal of ecological communities containing mature eucalypt trees from the Referral area.

As *Austrostipa wakoolica* has not been recorded within the Referral area, it is considered unlikely that the Proposed Action would reduce the area of occupancy of *Austrostipa wakoolica*.

- **fragment an existing population into two or more populations, or;**

As the individual swift parrots recorded close to the Referral area are considered to form part of the National migratory population (Saunders and Tzaros 2011) that forages in eastern Australia during the winter months and returns to Tasmania to breed during spring, and the swift parrot is highly mobile, the Proposed Action is unlikely to fragment an existing population into two or more populations.

As *Austrostipa wakoolica* has not been recorded within the Referral area, it is considered unlikely that the Proposed Action would fragment any existing populations of any of this species into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

Due to the highly mobile nature of the swift parrot and the presence of suitable habitat areas to the east in Goobang National Park (and further east), the habitat within the Referral area is not considered to be critical to the survival of the swift parrot. The Proposed Action is unlikely to adversely affect habitat critical to the survival of the swift parrot.

The habitat within the Referral area is not considered to be critical to the survival of *Austrostipa wakoolica* and therefore the Proposed Action is unlikely to adversely affect habitat critical to the survival of this species.

- **disrupt the breeding cycle of a population, or;**

The swift parrot breeds during summer in Tasmania. Although the swift parrot has been recorded close to the Referral area, these records were during the winter months when the swift parrots visit the mainland to feed on flowering Eucalypts. It is considered unlikely that the Proposed Action would disrupt the breeding cycle of the swift parrot.

While potentially suitable habitat exists within the Referral area for *Austrostipa wakoolica*, it is considered unlikely to occur given that the extended survey periods have not identified the species and that there are no known occurrences of the species within a 20 kilometre radius of the boundary of the Referral area. The Proposed Action is therefore unlikely to disrupt the breeding cycle of any population of *Austrostipa wakoolica*

- **modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

Although some potential habitat for the swift parrot (approximately 60 hectares) would be removed from the Referral area, the Proposed Action is considered unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for the swift parrot to the extent that the species would be likely to decline.

Although some potential habitat for *Austrostipa wakoolica* (approximately 77 hectares) would be removed within the Referral area, the Proposed Action is considered unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for this potentially occurring species to the extent that it would be likely to decline.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat, or;**

The Proposed Action is not likely to result in invasive species that are harmful to the swift parrot or *Austrostipa wakoolica* becoming established in their habitat.

- **introduce disease which may cause the species to decline, or;**

The Proposed Action is not likely to introduce a disease which may cause a decline in the swift parrot or *Austrostipa wakoolica*.

- **interfere with the recovery of the species.**

The Proposed Action is unlikely to interfere substantially with the recovery of the swift parrot or *Austrostipa wakoolica*.

Conclusion

The Proposed Action is unlikely to result in a significant impact on the swift parrot or *Austrostipa wakoolica*.

Vulnerable Species

The following EPBC Act listed vulnerable species are considered in this assessment:

- Superb parrot (*Polytelis swainsonii*);
- Koala (combined populations) (*Phascolartcos cinereus*);
- Slender darling pea (*Swainsona murrayana*); and
- *Austrostipa metatoris.*

An assessment in accordance with the DSEWPC *Significant Impact Guidelines 1.1* is provided below for these species.

In this case, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

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

The superb parrot has been recorded within the Referral area on numerous occasions and across all seasons indicating that breeding may be taking place in the locality. A total of approximately 80 individuals were recorded during surveys for this Referral. The superb parrot species breeds in tree hollows, usually along watercourses, and primarily in river red gums (*Eucalyptus camaldulensis*). Such potential breeding habitat exists adjacent to the Referral area along the Bogan River as well as a small area (0.01 hectare) within the Referral area itself.

The small area of potential breeding habitat within the Referral area is unlikely to support a large enough portion of the superb parrot population to be necessary for the maintenance of genetic diversity. Additionally the 0.01 hectare of potential breeding habitat and 81 hectares of foraging habitat within the Referral area is unlikely to form a key source population for either breeding or dispersal. The Referral area is not near the limit of the species range, with the eastern limit of the species range occurring to the east in the Orange area. It is considered unlikely that an *important population* of the superb parrot is present within the Referral area.

While the koala has not been recorded in the Referral area, a single record (on the Atlas of NSW Wildlife (OEH 2012)) of the koala exists approximately 7 kilometres to the south-west of the Referral area. The single Atlas of NSW Wildlife record of the koala is a postal survey result and has an associated accuracy of 10 kilometres. The koala was not recorded by Umwelt despite targeted searches within each habitat type. Furthermore, no signs of presence were observed during the course of all field surveys. The koala is unlikely to occur within the Referral area on a regular basis and therefore it is considered unlikely that an *important population* of the koala is present within the Referral area.

The slender darling pea has not been recorded in the Referral area. As the slender darling pea has not been recorded within the Referral area and is not likely to occur within the Referral area it is considered unlikely that an *important population* of the slender darling pea occurs within the Referral area.

Despite extensive survey efforts, *Austrostipa metatoris* has not been recorded within the Referral Area. Nor are there any known records of the species within a 20 kilometre radius from the boundary of the Referral area. Although there is appropriate habitat present and *Austrostipa metatoris* could potentially occur in the Referral area, it is unlikely that its presence would comprise part of an *important population*.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

The superb parrot and potentially occurring koala are considered unlikely to comprise *important populations*. It is unlikely that the Proposed Action would lead to a long-term decrease to any important populations of the superb parrot or koala.

The slender darling pea was not identified during field surveys of the Wider Study Area, including the Referral Area. The slender darling pea is considered unlikely to occur in the Referral area.

Austrostipa metatoris is unlikely to comprise an *important population* of the species.

It is therefore unlikely that the Proposed Action would lead to a long-term decrease in an important population of the slender darling pea or *Austrostipa metatoris*.

- **reduce the area of occupancy of an important population, or;**

The superb parrot and potentially occurring koala are considered unlikely to comprise *important populations*. Therefore, the Proposed Action is unlikely to reduce the area of occupancy of *important populations* of the superb parrot or koala.

The slender darling pea was not identified during field surveys of the Wider Study Area, including the Referral Area and therefore it is considered unlikely to occur in the Referral area.

Austrostipa metatoris is unlikely to comprise an *important population* of the species.

The Proposed Action is therefore unlikely to reduce the area of occupancy of an *important population* of the slender darling pea or *Austrostipa metatoris*.

- **fragment an existing important population into two or more populations, or;**

The superb parrot and potentially occurring koala are considered unlikely to comprise *important populations*. Therefore, the Proposed Action is unlikely to fragment *important populations* of these species.
The slender darling pea was not identified during field surveys of the Wider Study Area, including the Referral Area and therefore it is considered unlikely to occur in the Referral area. *Austrostipa metatoris* is unlikely to comprise an *important population* of the species.

The Proposed Action is therefore unlikely to fragment an existing *important population* of the slender darling pea or *Austrostipa metatoris* into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The superb parrot forages over broad areas and can travel considerable distances to breed and forage, therefore it is unlikely the Proposed Action would adversely affect habitat critical to the survival of this species.

As the potentially occurring koala has not been recorded in the Referral area and if present likely occurs on a rare or occasional basis, the Proposed Action is unlikely to adversely affect habitat critical to the survival of the koala.

As the slender darling pea and *Austrostipa metatoris* are unlikely to occur within the Referral area, the Proposed Action is unlikely to adversely affect habitat critical to the survival of either species.

- **disrupt the breeding cycle of an important population, or;**

The superb parrot and potentially occurring koala is considered unlikely to comprise *important populations*. Therefore, the Proposed Action is unlikely to disrupt the breeding cycle of an *important population* of these species.

The slender darling pea and *Austrostipa metatoris* are considered unlikely to occur and therefore unlikely to comprise *important populations*. The Proposed Action is unlikely to disrupt the breeding cycle of an *important population* of the slender darling pea or *Austrostipa metatoris*.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The Proposed Action would result in the removal of approximately 81 hectares of foraging habitat and 0.01 hectare of potential breeding habitat for the superb parrot. However, the Proposed Action is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for the superb parrot to the extent that the species would be likely to decline.

The potentially occurring koala is considered unlikely to comprise an *important population*. Although some potential habitat for the koala occurs within the Referral area, the Proposed Action is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for the koala, such that the koala would be likely to decline.

Although some potential habitat for *Austrostipa metatoris* (approximately 77 hectares) and slender darling pea (approximately 77 hectares) would be removed within the Referral area, the Proposed Action is considered unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for these potentially occurring species to the extent that either of the species would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The Proposed Action is unlikely to result in an invasive species that is harmful to the superb parrot, koala, slender darling pea or *Austrostipa metatoris* becoming established in their habitat.

- **interferes substantially with the recovery of the species.**

The Proposed Action is unlikely to interfere substantially with the recovery of the superb parrot, koala, slender darling pea or *Austrostipa metatoris*.

Conclusion

The Proposed Action is unlikely to result in a significant impact on an *important population* of the superb parrot, koala, slender darling pea or *Austrostipa metatoris*.

Migratory Species

The following EPBC Act listed migratory species are considered in this assessment:

- Rainbow bee-eater (*Merops ornatus*);
- Great egret (*Ardea alba*), and
- Lathams snipe (*Gallinago hardwickii*).

An assessment in accordance with the DSEWPC *Significant Impact Guidelines 1.1* is provided below for these species.

An area of *important habitat* 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; or**
- **habitat utilised by a migratory species which is at the limit of the species range; or**
- **habitat within an area where the species is declining.**

The Referral area is not considered to comprise *important habitat* for any of the occurring and potentially-occurring listed migratory species, based on the criteria described above.

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

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

The Referral area is not considered to comprise important habitat for any of the occurring and potentially-occurring listed migratory species, based on the criteria described above. Therefore the Proposed Action is unlikely to substantially modify, destroy or isolate an area of important habitat for the rainbow bee-eater, great egret or Lathams snipe.

- **Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;**

The Referral area is not considered to comprise important habitat for any of the occurring and potentially-occurring listed migratory species, based on the criteria described above. Therefore the Proposed Action is unlikely to result in an invasive species that is harmful to the rainbow bee-eater, great egret or Lathams snipe becoming established in an area of important habitat.

- **Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species;**

The Referral area is not considered to comprise an ecologically significant proportion of the population for any of the occurring and potentially-occurring listed migratory species. Therefore the Proposed Action is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of a population of the rainbow bee-eater, great egret or Lathams snipe.

Conclusion

The Proposed Action is unlikely to result in a significant impact on any EPBC Act listed migratory species.

APPENDIX H

Kokoda Methods

Appendix H – Kokoda Methods

This Appendix describes the flora and fauna survey methodology undertaken across the Kokoda Offset Site, comprising the proposed offset areas for the Northparkes Mines Step Change Project.

A detailed survey methodology was designed and completed in order to gain a thorough understanding of the ecological features of the Kokoda Offset Site. Details on each of the methods used in this assessment are provided in the following sections.

1.0 Literature Review

A review of all relevant and available literature was undertaken in order to gain a greater understanding of the known and potential ecological values of the Kokoda Offset Site and the broader locality. Documents reviewed included previous ecological studies relating vegetation in the local area. The literature review also included a search of relevant ecological databases to identify threatened flora and fauna species, endangered populations and migratory species that have been previously recorded or have potential to occur in, or with proximity to, the Kokoda Offset Site.

1.1 Vegetation Survey of Goobang National Park (Porteners 1997)

Goobang National Park is located north-east of Parkes, New South Wales approximately 8 kilometres north of the Kokoda Offset Site. It encompasses an area of 42,080 hectares and occurs within the Central West Slopes area.

This report was conducted on behalf of NSW National Parks and Wildlife Service, with the following objectives:

- Collect and map vegetation data for use in the development of management plans for the Goobang National Park;
- Conduct detailed botanical surveys of all vegetation communities in the Goobang National Park;
- Map vegetation communities present within Goobang National Park at a scale of 1:50,000;
- Collect and document species of conservation significance within the Goobang National Park; and
- Compile a representative collection of voucher plant specimens from Goobang National Park.

There were some similarities in vegetation communities present within Goobang National Park and the Kokoda Offset Site. This report was used to facilitate the identification, mapping and descriptions of vegetation communities within the Kokoda Offset Site.

1.2 Ecological Database Searches

In order to identify all potential threatened species, endangered populations and migratory species with the potential to occur in the local area, a detailed assessment of relevant ecological databases was completed. These database sources comprised:

- a 20 kilometre radius search from the centre of the Kokoda Offset Site from the Office of Environment and Heritage (OEH) Atlas of NSW Wildlife (undertaken in June 2013); and
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) EPBC Act Protected Matters Search Tool Results for a 20 kilometre radius search from the centre of the Kokoda Offset Site (June 2013).

Records from these database searches were combined with records from a number of other sources (including literature reviews, other records and professional opinion) to develop a list of potentially occurring threatened species. The list was used to assist in the development of the survey methods, particularly targeting potentially occurring threatened species, endangered populations and threatened ecological communities (TECs) during field surveys.

2.0 Flora Survey

The flora survey aimed to identify threatened flora species, endangered populations, TECs and species of local or regional significance occurring or considered to potentially occur within the Kokoda Offset Site. The steps involved in the vegetation survey included:

- aerial photograph interpretation (API);
- field survey site selection using stratification;
- systematic plot-based survey;
- eucalypt sampling;
- rapid vegetation assessments;
- field reconnaissance;
- plant identification;
- assessment of biases and limitations;
- vegetation mapping; and
- determination of threatened ecological communities.

The following sections provide details on each step in the methodology.

Two flora surveys were undertaken across the Kokoda Offset Site, the first being a rapid assessment on 22 November 2012. The rapid assessment consisted entirely of vehicle based observations of vegetation communities and was focused primarily in the open, northern areas. Less than one hour was spent on site and no detailed flora assessment was conducted by the team of two ecologists. This exercise was undertaken as part of a broader investigation of potential offset properties in the region, and was designed to provide an

overview of the property in order to ascertain its potential as a biodiversity offset for the Northparkes Mines Step Change Project.

The second flora survey of the Kokoda Offset Site was conducted from 27 to 31 May 2013. The survey utilised systematic plot-based sampling, as well as non-quantitative rapid vegetation assessments and field reconnaissance to assist in the delineation of vegetation communities. The field survey was also used to refine and develop preliminary vegetation mapping that had been created prior to the field survey, based on the rapid assessment identified above, aerial photography and topography.

2.1 Aerial Photograph Interpretation

Aerial photographs of the Kokoda Offset Site were viewed prior to and after vegetation survey to identify spatial patterns in vegetation, land use and landscape features. These informed field survey design and implementation, ecological assessment and vegetation community mapping in the Kokoda Offset Site. Aerial photography of the Kokoda Offset Site was sourced from Google Earth 2010.

The Manifold System 8.0 Enterprise Edition geographic information system (GIS) was used to view aerial photos on-screen, using a 32 bit mode. Use of GIS allowed zooming to a relatively large scale. Using this method, mapping was carried out at a scale of approximately 1:10,000. At higher magnification the gain in scale was outweighed by the loss of resolution.

2.2 Field Survey Site Selection and Stratification of the Project Area

Systematic survey sites were selected by considering a range of bio-physical attributes that were likely to influence or determine the type of vegetation communities present. Reference was made to the relevant OEH flora survey guidelines (DEC 2004), with appropriate survey methods selected that maximised the opportunities of identifying the full suite of flora species (and vegetation communities) that could occur within the Kokoda Offset Site. This stratification was done intuitively, but was also based on existing topographic mapping and aerial photography. Other factors considered included the spatial coverage of sites across the Kokoda Offset Site, as well as topographic position and aspect.

2.3 Systematic Plot-based Survey

The plot-based systematic vegetation survey was undertaken using methods that are relatively standard in most NSW government vegetation management agencies and elsewhere. This ensured that data from the current study could be analysed in an equivalent way to that collected by other recognised studies. A total of 17 plots were undertaken within the Kokoda Offset Site during the autumn 2013 survey, as shown in Figure 7.2 of the main report.

Systematic 400 m^2 plots were used to undertake semi-quantitative sampling of vegetation. The dimensions of the plots were 20 x 20 metres. This plot size is used widely, including by the Royal Botanic Gardens Sydney and OEH. These plots were extended to 20 x 50 metres in potential occurrences of EPBC Act listed *White Box – Yellow Box – Blakely's Red Gum Woodland and Derived Native Grassland* critically endangered ecological community (CEEC) (hereafter referred to as 'box gum woodlands') to meet EPBC Act assessment requirements (DEH 2006).

At each plot, two ecologists spent roughly 45 to 60 minutes searching for all vascular flora species present within the plot. Searches of each plot were generally undertaken through parallel transects from one side of the plot to another. Most effort was spent on examining the groundcover, which usually supported well over half of the species present, however the composition of the shrub, mid-understorey, canopy and emergent layers were also thoroughly examined. Effort was made to search the canopy and tree trunks for mistletoes, vines and epiphytes.

Species within the plot were assigned a cover-abundance value to reflect their relative cover and abundance in the plot. Species located outside the plot were marked as present but were not assigned a cover-abundance value. A modified Braun-Blanquet 6-point scale (Braun-Blanquet 1927, with selected modifications sourced from Poore 1955 and Austin *et al*. 2000) was used to estimate cover-abundances of all plant species within each plot. **Table 2.1** shows the cover-abundance categories used.

Table 2.1 - Modified Braun-Blanquet Crown Cover-abundance Scale

Class	Cover-abundance*	Notes
1	Few individuals (less than 5% cover)	Herbs, sedges and grasses: <5 individuals Shrubs and small trees: <5 individuals
2	Many individuals (less than 5% cover)	Herbs, sedges and grasses: 5 or more individuals Shrubs and small trees: 5 or more individuals Medium-large overhanging tree
3	5 – less than 20% cover	-
4	20 – less than 50% cover	-
5	50 – less than 75% cover	-
6	75 – 100% cover	-

Note: * Modified Braun-Blanquet scale (Poore 1955; Austin *et al*. 2000).

All flora species that were readily identified in the field were recorded on pro forma field survey datasheets. All flora species that could not be immediately identified and samples of all threatened flora species, were collected, dried and later identified. Where species could not be identified in-house they were sent to the National Herbarium of NSW for identification.

In addition, information was gathered on the condition of the vegetation at each of the survey sites, including fire history, the density of weeds and evidence of disturbance such as the presence of feral animals.

2.4 Eucalypt Sampling Methodology

Targeted collection of eucalypt species was carried out during the May 2013 survey to provide an additional level of confidence on common canopy species where species were difficult to tell apart in the field (e.g. red gums). Targeted sampling was undertaken where the percentage species composition of the canopy was required to determine if the area satisfied the requirements of the TSC Act listed *White Box – Yellow Box – Blakely's Red Gum Woodland* endangered ecological community (EEC) and the EPBC Act listed box gum woodland. Samples sent to the National Herbarium of NSW for identification included reproductive material, mature and juvenile leaves, and descriptions and photographs of each tree.

2.5 Rapid Vegetation Assessments

Rapid vegetation assessments were completed at 35 locations across the Kokoda Offset Site during the May 2013 survey, primarily to assist in the delineation and refinement of vegetation mapping. These assessment sites were located within each broadly mapped vegetation community to allow data collection for each community without confounding effects from adjacent communities. Dominant, common and some uncommon (but notable) plant taxa were recorded within each vegetation community. Rapid vegetation assessments were undertaken carried out on foot and by car whilst traversing the Kokoda Offset Site. The location of rapid vegetation assessments completed across the Kokoda Offset Site are provided in Figure 7.2 of the main report.

Rapid vegetation assessments did not utilise a quantitative sampling approach as this method was designed to allow rapid collection of non-quantitative species dominance data across the Kokoda Offset Site within limited timeframes. This technique involved documenting the vegetation with a number of photographs and also recording species characteristic of the vegetation community each point. Rapid vegetation assessments were selected instead of the plot-based method because it increased the amount of data that could be collected within the available survey time, thereby maximising the quality and coverage of vegetation description and mapping. This technique also facilitates the recording of general species richness, assists in the delineation of vegetation community boundaries and targets the presence of threatened and significant flora species, endangered populations and TECs.

2.6 Ground-truthing of Vegetation Mapping

Ground-truthing of the draft vegetation map was carried out during all field surveys and while travelling throughout the Kokoda Offset Site. This contributed to the understanding of vegetation community boundaries, refinement of community descriptions, and providing a more comprehensive understanding of the floristic features across the Kokoda Offset Site.

2.7 Plant Identification and Nomenclature Standards

All vascular plants recorded or collected within quadrats and along transects were identified using keys and nomenclature in Harden (1992, 1993, 2000 and 2002) and Wheeler *et al*. (2002). Where known, changes to nomenclature and classification have been incorporated into the results, as derived from *PlantNET* (Botanic Gardens Trust 2013), the online plant name database maintained by the National Herbarium of New South Wales.

Common names used follow Harden (1992, 1993, 2000 and 2002) where available, and draw on other sources such as local names where these references do not provide a common name. Where the identity of a specimen was unknown or uncertain, it was lodged with the National Herbarium of New South Wales at the Royal Botanic Gardens Sydney.

2.8 Biases and Limitations

The survey was influenced by seasonal factors as the survey was conducted during autumn alone, however spring and summer are the peak flowering periods for many cryptic species, such as orchids.

Local environmental conditions were also having noticeable impacts on the quality of vegetation across the Kokoda Offset Site. Prior extended periods of warm dry weather combined with low rainfall records had resulted in very dry soils and the condition of vascular plants in the understorey and midstorey was poor. In addition to the effects of such environmental factors, grazing pressure, primarily by macropods and domestic stock, appeared to be high. Stocking rates of cattle and sheep at the time of the survey were considered to be low given the size of the Kokoda Offset Site (approximately 10 cattle and 200 sheep) however, combined with large numbers of kangaroos and wallabies observed during the survey, grazing pressure had noticeably reduced the height, cover and potentially the diversity of native flora species within the understorey of vegetation communities across the Kokoda Offset Site.

For herbaceous and graminoid species, such as those belonging to the families Asteraceae, Orchidaceae, Cyperaceae and Poaceae, the allocation of specimens to sub-specific levels was affected by the availability of adequate flowering or fruiting material. Where specimens were considered to be of potential significance or importance they were forwarded to the National Herbarium of New South Wales for identification.

2.9 Vegetation Mapping

Vegetation mapping was undertaken using best-practice techniques to delineate vegetation communities across the Kokoda Offset Site. Vegetation mapping involved the following key steps:

- preparation of draft vegetation community map based on landform elements and preliminary delineation of vegetation community floristics via aerial photograph interpretation;
- ground-truthing of vegetation map based on survey results; and
- revision of vegetation community floristic delineations based on review of plot data.

Vegetation communities were delineated through the identification of repeating patterns of plant species assemblages in each of the identified strata. Communities were then compared to those vegetation communities identified in the Biometric Vegetation Types database of the BioBanking system (OEH 2012).

The vegetation community profiles provided by Porteners (1997, Vegetation Survey of Goobang National Park) were interrogated to identify communities that contained similar species and structural compositions to ensure that, where possible, the communities identified in the Kokoda Offset Site were aligned with similar communities known to occur elsewhere in the region.

2.10 Determination of Threatened Ecological Communities

Vegetation communities identified in the Kokoda Offset Site were compared to TECs listed under the TSC Act and EPBC Act. The assessment of similarity with TECs was made using the following approach:

- comparison with published species lists, including lists of ‘important species’, for listed TECs;

- comparison with habitat descriptions and distributions for listed TECs;
- assessment of relevant guidelines published by the Commonwealth DSEWPC and NSW OEH;
- comparison with other assessments of TECs in the region; and
- comparison against determinations, guidelines, listing advice, recovery plans and conservation advice provided for each TEC, particularly those from the NSW Scientific Committee and the Commonwealth Threatened species Scientific Committee.

3.0 Fauna Survey

The following sections document the methods undertaken during a 27 to 31 May 2013 fauna survey of the Kokoda Offset Site. Temperatures during the survey period ranged from 7.6^{o} C to 22.3^{o} C. No rain fell during the surveys however the month of May had a total of 34 milimetres of rain (BOM 2013). Fauna survey effort was undertaken in consideration of the OEH Draft Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC 2004) and Threatened species survey and assessment guidelines: field survey methods for fauna – Amphibians (DECC 2009).

3.1 Targeted 2013 Bird Surveys

Bird surveys were undertaken by two observers for a minimum of 30 minutes in a range of different habitat types, primarily in early to mid morning and mid to late afternoon. In particular, the bird surveys were conducted to target two threatened migratory bird species known to occur in the region, the regent honeyeater (*Anthochaera phrygia*) and the swift parrot (*Lathamus discolor*).

Opportunistic observations were also recorded during all other aspects of the field survey, particularly while checking cameras and baits and when travelling throughout the Kokoda Offset Site. Bird species were identified from characteristic calls and/or by observation using 10 × 42 binoculars.

A total of 10 person hours of bird surveys were undertaken across the Kokoda Offset Site during May 2013, targeting areas of flowering eucalypts. Figure 7.3 of the main report shows the locations of each bird survey. Areas of flowering eucalypts were targeted for opportunistic bird surveys, whenever encountered.

3.2 Remote Cameras

Baited remote sensing camera stations were placed at 10 locations for a total of four survey nights (refer to Figure 7.3 of the main report). Ten ScottGuard 550V cameras were fastened to tree trunks approximately 30 centimetres above the ground and 1.5 metres from a PVC tube baited with chicken necks or road kill (small road kill items such as rabbits and hares) and pegged to the ground. As an additional attractant, tuna oil was soaked into the soil in front of the bait tube. Cameras were programmed to operate continuously and to take 3 exposures every 60 seconds when the trigger was activated.

3.3 Spotlighting

Spotlighting searches were undertaken both on foot and from a moving vehicle (refer to Figure 7.3 of the main report). Walking spotlighting searches were undertaken by two observers for a period of at least 30 minutes (total of one person hour) on each occasion. Vehicle spotlighting searches were undertaken by the passenger from a slowly moving (first gear, low range) four wheel drive vehicle for a minimum of 1 kilometre. Opportunistic vehicle spotlighting was also undertaken whenever driving through the Kokoda Offset Site at night. Walking and vehicle spotlighting searches were undertaken using head torches and 30 watt handheld spotlights.

Spotlight searches specifically targeted: flying mammals such as flying foxes; arboreal mammals such as possums and gliders; terrestrial mammals such as kangaroos, wallabies, wombats, quolls, foxes and cats; nocturnal birds such as owls and nightjars; and nocturnal herpetofauna (amphibian and reptile species). Spotlighting also included opportunistic searches for nocturnal reptiles, amphibians and micro-bats.

A total of 4 person hours of walking spotlighting surveys and 7 kilometres of opportunistic driving spotlighting surveys were undertaken across the Kokoda Offset Site over two nights, during May 2013. Figure 7.3 of the main report shows the locations of all spotlighting surveys.

3.4 Targeted Nocturnal Water Body Survey

Nocturnal water body surveys were conducted at four farm dam locations and targeted Sloane's froglet (*Crinia sloanei*) (refer to Figure 7.3 of the main report). Call playback sessions were undertaken at each dam on one occasion for approximately 30 minutes followed by a listening period. Following call playback, the entire waters edge of each dam was searched for Sloanes froglet and reptile and amphibian species. Two spot-light walking circuits were made around each dam to visually identify species' presence. Two dams were surveyed on each of two nights. The first night (28 May 2013) the dam located in the forested habitat near the western boundary as well as the centrally located dam on the edge of the forest habitat were surveyed. The two dams in the north western extent of the Kokoda Offset Site (near the existing dwelling) were surveyed on the second night (30 May 2013).

3.5 Call Playback Surveys

Nocturnal call playback sessions were undertaken using a 15 watt directional loud hailer (refer to Figure 7.3 of the main report). Call playback sessions commenced with a quiet listening period of approximately five minutes. Each species' call was played for a minimum of 4 minutes followed by a listening period of 2 minutes before the beginning of the next species' call. Call playback sessions included the calls of the:

- bush stone curlew (*Burhinus grallarius*);
- squirrel glider (*Petaurus norfolcensis*);
- koala (*Phascolarctos cinereus*);
- masked owl (*Tyto novaehollandiae*);
- barking owl (*Ninox connivens*); and
- powerful owl (*Ninox strenua*).

A total of four sessions of call playback were undertaken across the Kokoda Offset Site during the May 2013 survey. Figure 7.3 of the main report shows the location of nocturnal call playback sessions.

3.6 Micro-bat Echolocation Recording

Passive recording of micro-bat echolocation calls was conducted during May 2013 (refer to Figure 7.3 of the main report). Passive recording involved setting an Anabat II detector and ZCAIM or Anabat SD1 device (hereafter both are referred to as an 'Anabat detector') in one position for two entire nights. The Anabat detector microphone was placed within a section of PVC pipe, approximately one metre of straight piping connected to an angled 'elbow joint', to protect the microphone from the weather. The Anabat detector itself was placed in a weatherproof box and was connected to the microphone by a 2 metre cable. The pipe was then angled up at approximately 45 degrees, positioned towards potential micro-bat flight paths or over water bodies. The Anabat detector was programmed to start recording from one hour before sunset to one hour after sunrise.

Recordings of micro-bat echolocation calls were analysed by Glenn Hoye of Fly By Night Bat Surveys Pty Ltd. The echolocation calls of species were identified to one of three levels of confidence:

- confident;
- probable; and
- possible.

All three levels of identification confidence were treated as positive identifications.

3.7 Signs of Presence Searches

Searches for signs of animal presence were conducted opportunistically during all survey activities. Due to the opportunistic nature of signs of presence surveys, the level of survey effort was not recorded. Evidence of presence included scats, feathers, nests, burrows, footprints, bones, tufts of hair and scratch marks on trees. All hair, scat and bone samples were sent to Barbara Triggs (an industry recognised expert) for expert analysis.

3.8 Survey Effort

The total survey effort undertaken across the Kokoda Offset Site is shown in **Table 3.1**.

Table 3.1 – Kokoda Offset Fauna Survey Effort

Survey Method	Total Effort
Targeted bird survey	10 person hours
Remote cameras	40 camera nights (10 cameras for 4 days and nights)
Walking spotlight survey	4 person hours
Driving spotlight survey	1.8 person hours (7 kilometres)
Nocturnal Water Body Survey	4 farm dams
Nocturnal call playback	4 sessions
Anabat echolocation	16 full nights (across eight sites)

APPENDIX I

Kokoda Offset Site Survey Results

Appendix I – Kokoda Offset Site Survey Results

This appendix describes the flora and fauna survey results from surveys undertaken across the Kokoda Offset Site.

1.0 Literature Review

A literature review of suitable database and literature sources was undertaken to generate a list of potentially occurring threatened flora and fauna species and migratory species. **Table 1.1** identifies four threatened flora species that have been recorded within (Atlas of NSW Wildlife database search), or are predicted to occur potential to occur (EPBC Protected Matters Database Search) within a 20 kilometre radius of the Kokoda Offset Site.

Table 1.1 – Threatened Flora Species Recorded or Predicted to Occur within a 20 Kilometre Radius of the Kokoda Offset Site

Common Name	Scientific Name	Status	
		TSC Act	EPBC Act
Wollemi mint-bush	*Prostanthera cryptandroides* subsp. *cryptandroides*	V	V
Silky Swainson-pea	*Swainsona sericea*	V	
	Tylophora linearis	V	E
Ingrams zieria	*Zieria ingramii*	E	E

E = Endangered Species
V = Vulnerable Species
TSC Act = *Threatened Species Conservation Act 1995*
EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*

Table 1.2 identifies 35 threatened fauna species that have been recorded within (Atlas of NSW Wildlife database search), or are predicted to occur potential to occur (EPBC Protected Matters Database Search) within a 20 kilometre radius of the Kokoda Offset Site.

Table 1.2 – Threatened Fauna Species Recorded or Predicted to Occur within a 20 Kilometre Radius of the Kokoda Offset Site

Common Name	Scientific Name	Status	
		TSC Act	EPBC Act
Pink-tailed worm-lizard	*Aprasia parapulchella*	V	V
Malleefowl	*Leipoa ocellata*	E	V, MIG
Australasian bittern	*Botaurus poiciloptilus*	E	E
Little eagle	*Heiraaetus morphnoides*	V	
Grey falcon	*Falco hypoleucos*	E	
Black falcon	*Falco subniger*	V	
Australian painted snipe	*Rostratula australis*	E	E, MIG
Glossy black-cockatoo	*Calyptorhynchus lathami*	V	
Turquoise parrot	*Neophema pulchella*	V	
Superb parrot	*Polytelis swainsonii*	V	V
Little lorikeet	*Glossopsitta pusilla*	V	
Swift parrot	*Lathamus discolor*	E	E
Barking owl	*Ninox connivens*	V	

Table 1.2 – Threatened Fauna Species Recorded or Predicted to Occur within a 20 Kilometre Radius of the Kokoda Offset Site (cont.)

Common Name	Scientific Name	Status	
		TSC Act	EPBC Act
Brown treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	
Speckled warbler	*Chthonicola saggitatus*	V	
White-fronted chat	*Epthianura albifrons*	V	
Regent honeyeater	*Anthochaera phrygia*	CE	E, MIG
Black-chinned honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V	
Hooded robin (south-eastern form)	*Melanodryas cucullata cucullata*	V	
Scarlet robin	*Petroica boodang*	V	
Flame robin	*Petroica phoenicea*	V	
Grey-crowned babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V	
Varied sittella	*Daphoenositta chrysoptera*	V	
Gilbert's whistler	*Pachycephala inornata*	V	
Diamond firetail	*Stagonopleura guttata*	V	
Spotted-tailed quoll	*Dasyurus maculatus*	V	E
Koala	*Phascolarctos cinereus*	V	V
Eastern pygmy-possum	*Cercartetus nanus*	V	
Boodie, burrowing bettong	*Bettongia lesueuri graii*	V	
Brush-tailed rock wallaby	*Petrogale penicillata*	E	V
New Holland mouse	*Pseudomys novaehollandiae*		V
Corben's long-eared bat	*Nyctophilus corbeni*	V	V
Little pied bat	*Chalinolobus picatus*	V	
Murray cod	*Maccullochella peelii*	V	
Macquarie perch	*Macquaria australasica*	E	

CE = Critically Endangered
E = Endangered Species
MIG = Migratory species
V = Vulnerable Species
TSC Act = *Threatened Species Conservation Act 1995*
EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*

Table 1.3 identifies 13 migratory species that have been recorded within (Atlas of NSW Wildlife database search), or are predicted to occur potential to occur (EPBC Protected Matters Database Search) within a 20 kilometre radius of the Kokoda Offset Site.

Table 1.3 – Migratory Species Recorded or Predicted to Occur within a 20 Kilometre Radius of the Kokoda Offset Site

Common Name	Scientific Name	Status	
		TSC Act	EPBC Act
Malleefowl	*Leipoa ocellata*	E	V, MIG
Great egret	*Ardea alba*		MIG
Cattle egret	*Ardea ibis*		MIG
Australian painted snipe	*Rostratula australis*	E	E, MIG
White-bellied sea-eagle	*Haliaeetus leucogaster*		MIG
White-throated needletail	*Hirundapus caudacutus*		MIG
Fork-tailed swift	*Apus pacificus*		MIG
Rainbow bee-eater	*Merops ornatus*		MIG
Regent honeyeater	*Anthochaera phrygia*	CE	E, MIG
Rufous fantail	*Rhipidura rufifrons*		MIG
Satin flycatcher	*Myiagra cyanoleuca*		MIG
Latham's snipe	*Gallinago hardwickii*		MIG

2.0 Flora Survey Results

A total of 103 plant species were identified across the Kokoda Offset Site during May 2013. Plants were recorded from three major vascular plant classes, comprising conifers, ferns and flowering plants (**Table 2.1**) and included trees, shrubs, forbs, grasses, sedges, rushes, ferns, mistletoes, and twiners. The full list of flora species recorded within the Kokoda Offset Site is provided in Appendix J.

Table 2.1 - Composition of Plant Classes and Families Recorded

Plant class	Sub-class	Number of Families	Number of Species
Filicopsida (ferns)	-	1	1
Coniferopsida (conifers)	-	1	2
Magnoliopsida (flowering plants)	Magnoliidae (dicots)	31	65
Magnoliopsida (flowering plants)	Liliidae (monocots)	5	35
Totals (all plants)		**38**	**103**

A total of 38 plant families were recorded (**Table 2.1**). Poaceae (grasses) was the most speciose family with 27 species recorded, followed by Asteraceae (daisies) with 14 species recorded, and Myrtaceae (eucalypts and paperbarks) with 9 species recorded.

Of the 103 species recorded, 18 (17 per cent) were introduced species. Introduced species recorded include Cape weed (*Arctotheca calendula*) and Patersons curse (*Echium plantagineum*). Blackberry (*Rubus fruticosus* sp. agg.) was the only species recorded that is declared noxious in the control area (Cabonne LGA).

Two introduced flora species were recorded in the Kokoda Offset Site that are considered environmental weeds, namely black-berry nightshade (*Solanum nigrum*) and blackberry (*Rubus fruticosus* sp. agg.). An environmental weed is a plant species which invades native vegetation and has the potential to impact on the regeneration and success of indigenous flora and fauna (Carr *et al*. 1992; Richardson *et al*. 2006).

2.1 Vegetation Communities

Twelve vegetation communities were delineated on the Kokoda Offset Site including three communities that conform to two TECs as shown in **Table 2.2**. Figure 7.4 (of the main report) shows the location of the vegetation communities recorded on the Kokoda Offset Site.

Table 2.2 – Vegetation Communities of the Kokoda Offset Site

Vegetation Community	TSC Act Status	EPBC Act Status	Vegetation within Kokoda Offset Site (ha[1])
Dwyer's Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Forest			151
Dwyer's Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine DNG			15
Dwyer's Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Woodland Low Quality			8.6
Dwyer's Red Gum Creekline Woodland			9.4
Farm Dam			1.2
Farm Track – Disturbed Land			1.3
Grey Box – Ironbark Woodland			27
Grey Box Grassy Woodland	EEC	EEC	10
Grey Box Grassy DNG	EEC	EEC	96
Mugga Ironbark Woodland			1.9
Rocky Rise Shrubby Woodland			26
White Box Grassy Woodland	EEC	CEEC	2.2
Total			**350**

1 = Rounding of totals applied (numbers less than 1 – 2 decimal places, numbers between 1 and 10 – 1 decimal place, and greater than 10 - no decimal places)

CEEC = Critically Endangered Ecological Community

EEC = Endangered Ecological Community

EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*

TSC Act = *Threatened Species Conservation Act 1995*

DNG = Derived Native Grassland

ha = Hectares

Detailed Descriptions are provided below for each of the vegetation communities identified across the Kokoda Offset Site.

2.1.1 White Box Grassy Woodland

A single patch of White Box Grassy Woodland occurred in the north eastern extent the Kokoda Offset Site, totalling 2.2 hectares in area (refer to Figure 7.4 of the main report).

The woodland consisted of a moderately tall open canopy to 17 to 20 metres in height and approximately 20 per cent cover, with white box (*Eucalyptus albens*) as the dominant canopy species. While Dwyers red gum (*E. dwyeri*) also occurred in the canopy layer, its distribution was very sparse. The community supported a sub-canopy of black cypress-pine (*Callitris endlicheri*) as well as recruiting eucalypt canopy species. The sub-canopy was approximately 8 to 12 metres in height and had a vegetative cover of 25 per cent.

A small shrub layer, approximately one metre in height, was recorded in the understorey and was typically sparse (10 per cent cover). Commonly recorded species included peach heath (*Lissanthe strigosa* subsp. *subulata*), hoary guinea flower (*Hibbertia obtusifolia*) and western silver wattle (*Acacia decora*).

The ground cover was typically moderately dense, with approximately 40 per cent cover. The ground cover vegetation generally comprised two layers, an upper and lower. The upper layer was dominated by native tussock grasses with a cover of approximately 30 per cent. Frequently recorded species included purple wiregrass (*Aristida ramosa*), speargrass (*Austrostipa scabra* subsp*. falcata*), *Elymus scaber* and *Rytidosperma* sp.

The secondary ground layer comprised a number of native forb species and was generally sparse with a cover of approximately 10 per cent. Dominant species included bears-ear (*Cymbonotus lawsonianus*), austral bugle (*Ajuga australis*), poison rock fern (*Cheilanthes sieberi* subsp. *sieberi*), *Solenogyne* sp. and *Goodenia* sp. The introduced flora species, flatweed (*Hypochaeris radicata*) was also relatively common.

White Box Grassy Woodland conforms to the TSC Act listed *White Box – Yellow Box – Blakely's Red Gum Woodland* endangered ecological community (EEC) and the EPBC Act listed *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* critically endangered ecological community (CEEC). The corresponding biometric vegetation type for this community is White Box - White Cypress Pine - Inland Grey Box Woodland on the Western Slopes of NSW (Benson 267) (LA218).

2.1.2 Dwyer's Red Gum – Grey Box - Mugga Ironbark – Black Cypress Pine Forest

Dwyer's Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Forest is the dominant vegetation community across the Kokoda Offset Site, totalling an area of 151 hectares (refer to Figure 7.4 of the main report). A majority of this community occurs in the large southern woodland block of the site. The community was found to occur in a mosaic of condition states across the site. The eucalypt canopy was at times very sparse (almost absent), in which case typical sub-canopy species increased in dominance. Alternatively, where the remnant eucalypt canopy was intact the sub-canopy was reduced to natural levels.

The community comprised a mixed eucalypt canopy ranging in height from 12 to 19 metres in height. An open canopy was common, ranging in cover from 15 to 30 per cent cover. Dominant canopy species included Dwyers red gum (*Eucalyptus dwyeri*), mugga ironbark (*E. sideroxylon*) and inland grey box (*E. microcarpa*), while red stringybark (*E. macrorhyncha*), yellow box (*E. melliodora*) and tumbledown red gum (*E. dealbata*) were also recorded in the community along the northern boundary.

Dwyer's Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Forest was characterised by a thick sub-canopy of black cypress-pine (*Callitris endlicheri*), with white cypress pine (*C. glaucophylla*) and currawang (*Acacia doratoxylon*) also recorded intermittently. The sub-canopy ranged in height from 7 to 13 metres in height and was typically comprised a cover between 10 and 40 per cent. Natural senescence of black cypress-pine (*Callitris endlicheri*) and currawang (*Acacia doratoxylon*) was observed throughout the community likely indicating that wild fire had not occurred for an extended period. Additionally extremely high levels of fallen timber were present in the understorey and suppressed the diversity and cover of understorey flora species in many areas.

A low shrub layer, 0.5 – 1.5 metres in height, was common but sparse within this forest community, ranging in cover from 5 to 15 per cent. Dominant shrub species included common fringe-myrtle (*Calytrix tetragona*), peach heath (*Lissanthe strigosa* subsp. *subulata*), hoary guinea flower (*Hibbertia obtusifolia*) and native cranberry (*Astroloma humifusum*).

A ground layer of native tussock grasses and forbs was typically open, ranging from 10 to 20 per cent in cover. Frequently recorded ground cover species included wiregrass (*Aristida* species), speargrass (*Austrostipa scabra* subsp. *falcata*), smallflower wallaby grass (*Rytidosperma setaceum*), speargrass (*Austrostipa scabra* subsp. *falcata*), *Juncus* sp., poison rock fern (*Cheilanthes sieberi* subsp. *sieberi*), *Goodenia* sp., climbing saltbush (*Einadia nutans* supsp. *nutans*). Introduced flora species were common but low in cover, frequently recorded species included flatweed (*Hypochaeris radicata*), Capeweed (*Arctotheca calendula*), scarlet pimpernel (*Anagallis arvensis*), shivery grass (*Briza minor*) and common chickweed (*Stellaria media*).

This community does not conform with any TECs listed under the TSC Act or EPBC Act. The corresponding biometric vegetation type for this community is Mugga Ironbark – Inland Grey Box – pine tall woodland of the NSW South Western Slopes Bioregion (Benson 217) (LA165).

2.1.3 Dwyers Red Gum – Grey Box – Mugga Ironbark – Black Cypress Woodland Low Quality

Dwyers Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Woodland – Low Quality occurred on the central foothill slopes of the Kokoda Offset Site that supported deeper and more fertile soils. It totalled an area of 8.6 hectares (refer to Figure 7.4 of the main report).

Rapid vegetation assessments identified that the condition of this area was significantly lower than that of remnant stands of the Dwyers Red Gum - Grey Box - Mugga Ironbark - Black Cypress Forest which surrounded it. The low quality woodland stand of this community was heavily grazed by sheep, occurring on the fertile lower slopes of the paddock where they were confined within the Kokoda Offset Site.

The open canopy (approximately 15 per cent cover) was dominated by Dwyers red gum (*Eucalyptus dwyeri*) that were in stunted almost mallee growth form (multi-stemmed), suggesting the area has been logged in the past. A sub-canopy was absent, but black cypress-pine (*Callitris endlicheri*) and kurrajong (*Brachychiton populneus* subsp. *populneus*) were lightly scattered throughout the community.

As previously mentioned, the ground stratum of this community had been heavily grazed. The ground layer consisted of stunted tussocks of native grasses, some pasture weeds and areas of bare soil. Common species include wiregrass (*Aristida* species), *Juncus* sp., spear grass (*Austrostipa scabra* subsp. *falcata*), Patersons curse (*Echium plantagineum*) and flatweed (*Hypochaeris radicata*).

This community did not conform with any TECs listed under the TSC Act or EPBC Act. The corresponding biometric vegetation type for this community is Mugga Ironbark – Inland Grey Box – Pine Tall Woodland of the NSW South Western Slopes Bioregion (Benson 217) (LA165).

2.1.4 Dwyers Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine DNG

Dwyers Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Derived Native Grassland (DNG) occurred on relatively shallow fertile soil in the north east extent of the Kokoda Offset Site, totalling an area of 15 hectares (refer to Figure 7.4 of the main report). It occurred on a slightly east facing slope in areas likely to have once been dominated by the Dwyers Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Forest community (refer to Figure 7.4 of the main report). The DNGs to the east occur on deeper and more alluvial soils and are likely to be derived from Grey Box Grassy Woodlands (see **Section 2.1.8**).

This community was mostly composed of native grasses and forbs and was largely devoid of mature and regenerating trees. Saplings recorded within the community were likely to be recruiting Dwyers red gum (*Eucalyptus dwyeri*), but occurred in very small numbers. Commonly recorded native species included purple wiregrass (*Aristida ramosa*), red grass (*Bothriochloa macra*), *Juncus* sp., poison rock fern (*Cheilanthes sieberi* subsp. *sieberi*), *Gonocarpus tetragynus*, open summer-grass (*Digitaria diffusa*), *Elymus scaber*, *Goodenia* sp., *Rytidoesperma* sp. and *Wahlenbergia* sp. Common introduced species included Patersons curse (*Echium plantagineum*), shivery grass (*Briza minor*), Capeweed (*Arctotheca calendula*) and spear thistle (*Cirsium vulgare*).

Dwyers Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine DNG is likely to have originated from the Dwyers Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Forest community that occurred on a range of slopes but were typically on shallower and rockier soils than other woody vegetation communities recorded across the Kokoda Offset Site (excluding Rocky Rise Shrubby Woodland). Dwyers Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine DNG may also have influences from Grey Box Grassy Woodlands (see **Section 2.1.7**).

Further surveys are to be undertaken during Spring 2013 to map the precise boundaries of the original communities which requires further analysis of floristic structure, topography and soil type.

This community did not conform with any TECs listed under the TSC Act or EPBC Act. The corresponding biometric vegetation type for this community is Mugga Ironbark – Inland Grey Box – Pine Tall Woodland of the NSW South Western Slopes Bioregion (Benson 217) (LA165).

2.1.5 Dwyers Red Gum Creekline Woodland

Dwyers Red Gum Creekline Woodland vegetation occurred along two semi permanent creeks in the western and eastern extent of the Kokoda Offset Site. Together, these creek lines totalled an area of 9.4 hectares (refer to Figure 7.4 of the main report). At the time of the May 2013 survey, both creeks were dry.

This creekline woodland was characterised by a mid-dense (approximately 30 per cent cover) eucalypt canopy ranging in height from 12 to 15 metres. Across the site, Dwyers red gum (*Eucalyptus dwyeri*) was the dominant canopy species. However, several other species were locally abundant within the community, including red stringybark (*E. macrorhyncha*) and mugga ironbark (*E. sideroxylon*).

An open sub-canopy (up to 20 per cent cover) between 7 and 11 metres in height occurred and comprised regenerating canopy species, black cypress-pine (*Callitris endlicheri*), drooping sheoak (*Allocasuarina verticillata*), kurrajong (*Brachychiton populneus* subsp. *populneus*) and *Acacia leucoclada* subsp. *leucoclada*.

A sparse, secondary shrub layer was also present (up to 10 per cent cover) that was shorter (between 1 and 2 metres in height). Commonly recorded species included kangaroo thorn (*Acacia paradoxa*), rice flower (*Ozothamnus diosmifolius*) and peach heath (*Lissanthe strigosa* subsp. *strigosa*).

The ground cover vegetation was moderately dense (up to 25 per cent cover) and was dominated by native grasses and forbs despite the moderate damage for grazing. Commonly recorded species included *Aristida leichhardtiana*, smallflower wallaby grass (*Rytidosperma setaceum*), *Juncus* sp., blue trumpet (*Brunoniella australis*). Introduced flora species were also common in the ground cover, namely spear thistle (*Cirsium vulgare*), Capeweed (*Arctotheca calendula*) and common chickweed (*Stellaria media*).

This community did not conform with any TECs listed under the TSC Act or EPBC Act. The corresponding biometric vegetation type for this community is Mugga Ironbark – Inland Grey Box – Pine Tall Woodland of the NSW South Western Slopes Bioregion (Benson 217) (LA165).

2.1.6 Grey Box – Ironbark Woodland

Grey Box – Ironbark Woodland occurred on shallow alluvial foothill soils in the centre of the Kokoda Offset Site where a steep rise to the south levels out. This woodland community totalled an area of 27 hectares (refer to Figure 7.4 of the main report). Inland grey box (*Eucalyptus microcarpa*) and mugga ironbark (*E. sideroxylon*) were the dominant canopy species present; however, Dwyer's red gum (*Eucalyptus dwyeri*) occurred occasionally. The canopy was generally between 8 and 14 metres in height with 20 to 25 per cent canopy cover.

A sparse sub-canopy layer (up to 10 per cent cover) up to 8 metres in height occurred and was dominated by black cypress-pine (*Callitris endlicheri*) and kurrajong (*Brachychiton populneus* subsp*. populneus*).

A secondary shorter (up to 1.5 metres in height) shrub layer (up to 5 per cent cover) was also recorded. Commonly recorded species included kangaroo thorn (*Acacia paradoxa*), peach heath (*Lissanthe strigosa* subsp. *subulata*), hoary guinea flower (*Hibbertia obtusifolia*), native cranberry (*Astroloma humifusum*) and cough bush (*Cassinialaevis*). The twining herb, twining fringe-lily (*Thysanotus patersonii*) also occurred throughout the low shrub layer in this community.

The ground cover vegetation was sparse to moderately sparse (between 15 and 30 per cent cover) and was dominated by native grasses and forbs. Commonly recorded species included purple wiregrass (*Aristida ramosa*), smallflower wallaby grass (*Rytidosperma setaceum*), speargrass (*Austrostipa scabra* subsp*. falcata*), open summer-grass (*Digitaria diffusa*), *Gonocarpus tetragynus* and poison rock fern (*Cheilanthes sieberi* subsp. *sieberi*).

This community did not conform with any TECs listed under the TSC Act or EPBC Act. The corresponding biometric vegetation type for this community is Inland Grey Box – Black Cypress Pine Shrubby Woodland on Stony Slopes of NSW South Western Slopes and Riverina Bioregions (Benson 110) (LA151).

2.1.7 Grey Box Grassy Woodland

Grey Box Grassy Woodland occurs on the deeper more fertile soils in the north of the Kokoda Offset Site, and totalled an area of 10 hectares (refer to Figure 7.4 of the main report). The community was likely more prevalent across the northern extent of the site (see **Section 2.1.8**), but it has been historically cleared for farming practises due to its more fertile position in the landscape. The Grey Box Grassy Woodland was predominantly restricted to thin corridors along the western and northern boundaries as well as a moderately sized patch on a hilltop in the northern DNG area of the Kokoda Offset Site.

The community comprised a tall eucalypt canopy ranging in height from 17 to 20 metres in height with 30 per cent canopy cover. Inland grey box (*E. microcarpa*) was the dominant canopy species, while Dwyers red gum (*Eucalyptus dwyeri*) also occurred in lower numbers.

An open sub-canopy (up to 20 per cent cover) up to 14 metres in height occurred and was dominated by regenerating canopy species and black cypress-pine (*Callitris endlicheri*).

The community supported a sparse to moderately sparse (15 to 35 per cent cover) ground layer dominated by native grasses and forbs. Commonly recorded species included windmill grass (*Chloris truncate*), speargrass (*Austrostipa scabra* subsp*. falcata*), smallflower wallaby grass (*Rytidosperma setaceum*), open summer-grass (*Digitaria diffusa*), clustered lovegrass (*Eragrostis elongata*), *Aristida* sp., rough raspwort (*Haloragis heterophylla*) and bears-ear (*Cymbonotus lawsonianus*). Introduced flora species were relatively common, namely shivery grass (*Briza minor*), flatweed (*Hypochaeris radicata*), Capeweed (*Arctotheca calendula*) and common chickweed (*Stellaria media*).

The diversity of native flora species and the level of ground cover within the ground layer was reduced due to heavy grazing pressure that occurred in the north of the Kokoda Offset Site.

White Box Grassy Woodland conforms to the TSC Act listed *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions* (EEC) and the EPBC Act listed *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* EEC.

The corresponding biometric vegetation type for this community is Inland Grey Box – Black Cypress Pine Shrubby Woodland on Stony Slopes of NSW South Western Slopes and Riverina Bioregions (Benson 110) (LA151).

2.1.8 Grey Box Grassy DNG

Grey Box Grassy DNG occurred on deeper and more fertile soils in the north of the Kokoda Offset Site, totalling an area of 96 hectares (refer to Figure 7.4 of the main report). Grey Box Grassy DNG occurred on slightly east facing slopes in areas likely to have once been dominated by the Grey Box Grassy Woodland community. The grasslands to the east occur on shallower soils and are likely to be derived from Dwyer's Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Forest.

This community was mostly composed of native grasses and forbs and was largely devoid of mature and regenerating trees. Saplings recorded within the community were likely to be recruiting western grey box (*Eucalyptus microcarpa*), but occurred in very small numbers. Native flora species comprised approximately 45 per cent cover within the Grey Box Grassy DNG areas. Commonly recorded native species included purple wiregrass (*Aristida ramosa*), red grass (*Bothriochloa macra*), redleg grass (*B. decipiens*), *Juncus homalocaulis*, *Elymus scaber*, speargrass (*Austrostipa scabra* subsp*. falcata*), smallflower wallaby grass (*Rytidosperma setaceum*), bogan flea (*Calotis hispidula*), bears-ear (*Cymbonotus lawsonianus*), *Fimbristylis dichotoma*, tufted bluebell (*Wahlenbergia communis*) and winged New Holland daisy (*Vittadinia pterochaeta*). Common introduced species included *Orobanche minor*, Capeweed (*Arctotheca calendula*), flatweed (*Hypochaeris radicata*) and scarlet pimpernel (*Anagallis arvensis*).

Grey Box Grassy DNG is likely to have originated from the Grey Box Grassy Woodland community that occurs on deeper, more fertile soils of the Kokoda Offset Site. These areas occurred in the north of the site which had largely been cleared to support farming activities. Grey Box Grassy DNG may also have influences from Dwyers Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Forest which is a prominent vegetation community across the Kokoda Offset Site but occurs on shallower less fertile soils.

Further surveys are to be undertaken during spring 2013 to map the precise boundaries of the original communities which requires further analysis of floristic structure, topography and soil type.

White Box Grassy Woodland conforms to the TSC Act listed *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions* EEC and the EPBC Act listed *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* EEC.

The corresponding biometric vegetation type for this community is Inland Grey Box – Black Cypress Pine Shrubby Woodland on Stony Slopes NSW South Western Slopes and Riverina Bioregions (Benson 110) (LA151).

2.1.9 Mugga Ironbark Woodland

A single remnant patch of Mugga Ironbark Woodland occurred in the north-eastern extent the Kokoda Offset Site, totalling 1.9 hectares in area (refer to Figure 7.4 of the main report). It occurred on a raised plateau near a semi-permanent creek line. Mugga ironbark (*Eucalyptus sideroxylon*) was generally the sole canopy species present. The canopy was between 15 and 18 metres in height with 25 per cent canopy cover.

A sub-canopy layer (up to 10 per cent cover) up to 8 metres in height and was dominated by Dwyers red gum (*Eucalyptus dwyeri*) and black cypress pine (*Callitris endlicheri*).

A shorter (up to 2.5 metres in height) and slightly denser (up to 15 per cent cover) shrub layer was also occurred. The shorter shrub layer was dominated by rice flower (*Ozothamnus diosmifolius*), while daphne heath (*Brachyloma daphnoides*), currawang (*Acacia doratoxylon*) and western silver wattle (*A. decora*) occurred in low numbers.

Ground cover vegetation was moderate (30 per cent cover) and was dominated by native grasses. Commonly recorded species included *Aristida* sp., *Rytidosperma* sp., windmill grass (*Chloris truncata*) and western rat-tail grass (*Sporobolus creber*). Native forbs were also present in low numbers, namely *Hydrocotyle* sp., *Haloragis* sp. and poison rock fern (*Cheilanthes sieberi* subsp. *sieberi*).

This community did not conform with any TECs listed under the TSC Act or EPBC Act. The corresponding biometric vegetation type for this community is Mugga Ironbark – Inland Grey Box – Pine Tall Woodland of the NSW South Western Slopes Bioregion (Benson 217) (LA165).

2.1.10 Rocky Rise Shrubby Woodland

Rocky Rise Shrubby Woodland was recorded in small to moderate sized habitat areas scattered across the Kokoda Offset Site, restricted to rugged and rocky rises on very skeletal soils. The community totalled 26 hectares in area (refer to Figure 7.4 of the main report).

The community supported a mallee formation canopy that ranged between 6 and 12 metres in height and 10 to 15 per cent cover. It was dominated by Dwyers red gum (*Eucalyptus dwyeri*), while black cypress pine (*Callitris endlicheri*), *Allocasuarina* sp. and currawang (*Acacia doratoxylon*) occurred less frequently. Black cypress pine (*Callitris endlicheri*) also formed reasonably dense (approximately 40 per cent cover) sub-canopies within the community.

Rocky Rise Shrubby Woodland supported a variable vegetative understorey, ranging from sparse to relatively dense (10 to 55 per cent cover). Dominant understorey species included *Lepidosperma laterale*, *Gonocarpus tetragynus*, poison rock fern (*Cheilanthes sieberi* subsp. *sieberi*) and small St. John's wort (*Hypericum gramineum*). Introduced flora species were relatively uncommon in the community. The understorey was also characterised by dominant rock and organic litter components that ranged from 25 to 60 per cent cover when combined.

This community did not conform with any TECs listed under the TSC Act or EPBC Act. The corresponding biometric vegetation type for this community is Dwyers Mallee – Black Cypress Pine – Currawang Woodland of Rocky Hills of Temperate (hot summer) Climate Zone (Benson 186) (LA141).

2.1.11 Farm Track – Disturbed Land

The Farm Track – Disturbed Land community was mapped along the entry track to the existing dwelling on the Kokoda Offset Site and included the surrounding lawns and gardens. The lawns and gardens surrounding the dwelling comprised introduced grass and tree species.

Additional access tracks occur across the Kokoda Offset Site, particularly in the southern forested area. These tracks were not mapped as they were bounded by remnant vegetation, typically had connecting canopies and some ground layer vegetation was present.

This community did not conform with any TECs listed under the TSC Act or EPBC Act. There is no corresponding biometric vegetation type for this community.

2.1.12 Farm Dam

A total of 12 farm Dams were recorded across the Kokoda Offset Site, totalling an area of 1.2 hectares (refer to Figure 7.4 of the main report). Several of the smaller sized dams were empty as a result of the recent dry environmental conditions.

This community did not conform with any TECs listed under the TSC Act or EPBC Act. There is no corresponding biometric vegetation type for this community.

2.2 Threatened Flora Species, Endangered Flora Populations and Threatened Ecological Communities

Table 2.3 contains an assessment of likelihood of occurrence of threatened flora species, endangered flora populations and TECs known to occur (from a NSW Atlas of Wildlife database search and field survey results) or with potential to occur (from a EPBC Protected Matters Database Search and professional opinion) within a 20 kilometre radius of the Kokoda Offset Site.

Table 2.3 - Threatened Flora Species, Endangered Populations or TECs with Potential to Occur at the Kokoda Offset Site

Species	Status		Likelihood of Occurrence at Kokoda Offset Site
	TSC Act	EPBC Act	
Wollemi mint-bush *Prostanthera cryptandroides* subsp. *cryptandroides*	V	V	Low*
Silky Swainson-pea *Swainsona sericea*	V		Moderate
Tylophora linearis	V	E	Low*
Ingram's zieria *Zieria ingramii*	E	E	Low*
Weeping Myall Woodlands	EEC		Not present

Table 2.3 - Threatened Flora Species, Endangered Populations or TECs with Potential to Occur at the Kokoda Offset Site (cont.)

Species	Status		Likelihood of Occurrence at Kokoda Offset Site
	TSC Act	EPBC Act	
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	EEC		Recorded
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia		EEC	Recorded
White Box – Yellow Box – Blakely's Red Gum Woodland	EEC		Recorded
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland		CEEC	Recorded

E = Endangered
V = Vulnerable
EEC = Endangered Ecological Community
CEEC = Critically Endangered Ecological Community
TSC Act = *Threatened Species Conservation Act 1995*
EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*
* = suitable habitat occurs on site, but no recent records within 20 km.

The following sections outline the threatened flora species, endangered flora populations and TECs recorded in the Kokoda Offset Site during the survey.

2.2.1 Threatened Flora Species

No threatened flora species were recorded during the May 2013 survey of the Kokoda Offset Site.

2.2.2 Endangered Flora Populations

No endangered flora populations were recorded during the May 2013 survey of the Kokoda Offset Site.

2.2.3 Threatened Ecological Communities

Four TECs were recorded across the Kokoda Offset Site (refer to Figure 7.4 of the main report) and are listed below:

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act – CEEC).
- White Box – Yellow Box – Blakely's Red Gum Woodland (TSC Act – EEC).
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (EPBC Act – EEC).
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (TSC Act – EEC).

For a full description of vegetation communities identified as conforming with the abovementioned TECs refer to **Section 2.1** above.

3.0 Fauna Survey Results

3.1 Terrestrial Fauna Habitats of the Kokoda Offset Site

Three general fauna habitat types occurred across the Kokoda Offset Site. Each of these broad habitat types has a range of characteristics which influence the habitat value, and the range of fauna species which are likely to be identified within each type. The broad habitat types recorded across the Kokoda Offset Site comprised woodland, grassland, and farm dams.

3.1.1 Woodland Habitat

Woodland habitat of the Kokoda Offset Site was highly variable, comprising a number of vegetation communities that were structurally and floristically diverse. Vegetation communities included integrations of Grey Box Grassy Woodland, Dwyers Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Forest, Mugga Ironbark Woodland, White Box Grassy Woodland and Rocky Rise Shrubby Woodland. The Kokoda Offset Site contained a mixture of *Eucalyptus* sp. with woodland habitat the most abundant habitat type across the Kokoda Offset Site covering approximately 236 hectares. Canopy heights ranged from 6 to 20 metres. Many of the communities integrate and tree age ranged from juvenile saplings to mature trees. There was a high degree of regeneration across the site with many trees showing signs of self-thinning. The shrub layer was present but sparse and contained a variety of *acacia* sp., *Hibbertia* sp., *Lissanthe* sp. and regenerating canopy species. The groundcover of woodland areas generally comprises grasses, litter and rock cover.

Hollows were not commonly recorded in woodland habitat areas and where they occurred they were typically moderately sized or smaller. Hollows were predominately recorded in the northern woodland areas occurring in areas of Grey-box Grassy Woodland, Dwyer's Red Gum Creekline Woodland, Mugga Ironbark Woodland and White Box Grassy Woodland. Hollows were uncommon in areas of Dwyer's Red Gum – Grey Box – Mugga Ironbark – Black Cypress Pine Forest that dominates the southern portion of the Kokoda Offset Site. There was a high amount of fallen timber and litter across throughout the woodland habitat areas of the site.

3.1.2 Grassland

Grassland habitat occurred on the lower slopes of the Kokoda Offset Site covering approximately 111 hectares. Canopy trees were typically absent from this habitat type however occasional mature trees were recorded. Sparse regeneration of canopy species was also recorded. Grassland paddocks were heavily grazed by stock (cows and sheep) and kangaroos. Grassland habitats comprised predominately native grasses and sparse native forbs with no major weed infestations were recorded. The height of grass was generally less than 0.1 metre.

3.1.3 Farm Dams

Farm dams across the Kokoda Offset Site were typically of poor quality and lacked emergent and fringing vegetation. Water quality appeared to be poor and was typically a similar colour to the surrounding soil type. During May 2013 some of the farm dams were dry.

3.2 Terrestrial Fauna Species Recorded in the Kokoda Offset Site

A total of 59 vertebrate fauna species were recorded across the Kokoda Offset Site and comprised two frogs, one reptile, 39 birds and 17 mammals. The 59 species included two threatened bird species and five introduced fauna species. A summary of the species recorded is provided below and the full list of species recorded is shown in Appendix K.

3.2.1 Frogs

Two frog species were recorded across the Kokoda Offset Site, comprising the broad-palmed frog (*Litoria latopalmata*) and eastern sign-bearing froglet (*Crinia parinsignifera*).

No threatened or introduced amphibian species were recorded.

3.2.2 Reptiles

Nine long-necked turtles (*Chelodina longicollis*) were recorded in farm dams across the Kokoda Offset Site. No threatened or introduced reptile species were recorded.

3.2.3 Birds

A total of 39 birds were recorded throughout the Kokoda Offset Site . Commonly observed species included the eastern rosella (*Platycercus eximius*), spotted pardalote (*Pardalotus punctatus*), buff-rumped thornbill (*Acanthiza reguloides*), noisy miner (*Manorina melanocephala*) and silvereye (*Zosterops lateralis*).

Two threatened bird species were recorded (refer to Figure 7.5 of the main report), comprising the:

- little lorikeet (*Glossopsitta pusilla*), listed as Vulnerable under the TSC Act; and
- grey crowned babbler (*Pomatostomus temporalis temporalis*), listed as Vulnerable under the TSC Act.

No introduced bird species were recorded.

3.2.4 Mammals

A total of 17 mammal species were recorded across the Kokoda Offset Site. The most common mammal family was the Vespertilionidae (micro-bats), with seven species recorded, including one threatened species (eastern bentwing-bat, *Miniopterus schreibersii oceanensis*). Two species of micro-bat from the Molossidae family, the white-striped mastiff bat (*Tadarida australis*) and southern freetail-bat (*Mormopterus planiceps*) were also recorded.

Other native mammals recorded included the eastern grey kangaroo (*Macropus giganteus*), common ringtail possum (*Pseudocheirus peregrinus*) and brush tailed possum (*Trichosurus vulpecula*).

One threatened mammal species, the eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) listed as Vulnerable under the TSC Act was recorded (refer to Figure 7.5 of the main report).

A total of five introduced mammal species were identified across the Kokoda Offset Site, comprising the fox (*Vulpes vulpes*), rabbit (*Oryctolagus cuniculus*), cow (*Bos taurus*), sheep (*Ovis aries*) and brown hare (*Lepus capensis*).

3.3 Threatened Fauna Species

A total of three threatened species were recorded across the Kokoda Offset Site:

3.3.1 Little Lorikeet (*Glossopsitta pusilla*)

The little lorikeet, listed as Vulnerable under the TSC Act, was recorded at 2 locations (in groups of 20 and five birds) across the Kokoda Offset Site (refer to Figure 7.5 of the main report). It is likely that the little lorikeet is an occasional visitor to the Kokoda Offset Site during periods of eucalypt flowering.

3.3.2 Grey Crowned Babbler (*Pomatostomus temporalis temporalis*)

The grey crowned babbler, listed as Vulnerable under the TSC Act, was recorded at four locations across the Kokoda Offset Site (refer to Figure 7.5 of the main report). Between two and six individuals were sighted at each location. This species was recorded in open woodland vegetation and is likely to be a resident species across parts of the Kokoda Offset Site.

3.3.3 Eastern bentwing-bat (*Miniopterus schreibersii oceanensis*)

The eastern bentwing-bat, listed as Vulnerable under the TSC Act, was recorded at five locations across the Kokoda Offset Site during micro-bat echolocation recording (refer to Figure 7.5 of the main report). The eastern bentwing-bat was identified as 'confident' as two sites, 'probable' as two sites and as 'possible' at the remaining site. This species may be a resident species that forages across the Kokoda Offset Site. Cave habitats which provide roosting sites are absent from the Kokoda Offset Site.

3.3.4 Endangered Fauna Populations

No endangered fauna populations were recorded or are considered likely to occur within the Kokoda Offset Site.

3.4 Threatened Fauna Species and Endangered Fauna Populations With Potential to Occur Within the Kokoda Offset Site

Table 3.1 contains an assessment of likelihood of occurrence of threatened fauna species and endangered fauna populations known to occur (from a NSW Atlas of Wildlife database search and field survey results) or with potential to occur (from an EPBC Protected Matters Database Search and professional opinion) within a 20 kilometre radius of the Kokoda Offset Site.

Table 3.1 – Likelihood of Occurrence Assessment of Threatened Fauna Species and Endangered Fauna Populations Recorded or Predicted to Occur within a 20 Kilometre Radius of the Kokoda Offset Site

Common Name	Scientific Name	Status		Likelihood of Occurrence
		TSC Act	EPBC Act	
Pink-tailed worm-lizard	*Aprasia parapulchella*	V	V	Potential
Malleefowl	*Leipoa ocellata*	E	V, MIG	Unlikely
Australasian bittern	*Botaurus poiciloptilus*	E	E	Unlikely
Little eagle	*Heiraaetus morphnoides*	V		Potential
Grey falcon	*Falco hypoleucos*	E		Potential
Black falcon	*Falco subniger*	V		Potential
Australian painted snipe	*Rostratula australis*	E	E, MIG	Unlikely
Glossy black-cockatoo	*Calyptorhynchus lathami*	V		Potential
Turquoise parrot	*Neophema pulchella*	V		Potential
Superb parrot	*Polytelis swainsonii*	V	V	Potential
Little lorikeet	*Glossopsitta pusilla*	V		Known
Swift parrot	*Lathamus discolor*	E	E	Potential
Barking owl	*Ninox connivens*	V		Potential
Brown treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V		Potential
Speckled warbler	*Chthonicola saggitatus*	V		Potential
White-fronted chat	*Epthianura albifrons*	V		Unlikely
Regent honeyeater	*Anthochaera phrygia*	CE	E, MIG	Potential
Black-chinned honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V		Potential
Hooded robin (south-eastern form)	*Melanodryas cucullata cucullata*	V		Potential
Scarlet robin	*Petroica boodang*	V		Potential
Flame robin	*Petroica phoenicea*	V		Potential
Grey-crowned babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V		Known
Varied sittella	*Daphoenositta chrysoptera*	V		Potential
Gilbert's whistler	*Pachycephala inornata*	V		Potential
Diamond firetail	*Stagonopleura guttata*	V		Potential
Spotted-tailed quoll	*Dasyurus maculatus*	V	E	Potential
Koala	*Phascolarctos cinereus*	V	V	Potential
Eastern pygmy-possum	*Cercartetus nanus*	V		Potential
Boodie, burrowing bettong	*Bettongia lesueuri graii*	V		Unlikely
Brush-tailed rock-wallaby	*Petrogale penicillata*	E	V	Unlikely
New Holland mouse	*Pseudomys novaehollandiae*		V	Potential
Corbens long-eared bat	*Nyctophilus corbeni*	V	V	Potential
Little pied bat	*Chalinolobus picatus*	V		Potential
Murray cod	*Maccullochella peelii*	V		Unlikely
Macquarie perch	*Macquaria australasica*	E		Unlikely

CE = Critically Endangered
E = Endangered Species
MIG = Migratory species
V = Vulnerable Species

TSC Act = *Threatened Species Conservation Act 1995*
EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*

Table 3.2 contains an assessment of likelihood of occurrence of migratory fauna species known to occur (from a NSW Atlas of Wildlife database search and field survey results) or with potential to occur (from an EPBC Protected Matters Database Search and professional opinion) within a 20 kilometre radius of the Kokoda Offset Site.

Table 3.2 – Likelihood of Occurrence Assessment of Migratory Species Recorded or Predicted to Occur within a 20 Kilometre Radius of the Kokoda Offset Site

Common Name	Scientific Name	Status		Likelihood of Occurrence
		TSC Act	EPBC Act	
Malleefowl	*Leipoa ocellata*	E	V, MIG	Unlikely
Great egret	*Ardea alba*		MIG	Potential
Cattle egret	*Ardea ibis*		MIG	Potential
Australian painted snipe	*Rostratula australis*	E	E, MIG	Unlikely
White-bellied sea-eagle	*Haliaeetus leucogaster*		MIG	Potential
White-throated needletail	*Hirundapus caudacutus*		MIG	Potential
Fork-tailed swift	*Apus pacificus*		MIG	Potential
Rainbow bee-eater	*Merops ornatus*		MIG	Potential
Regent honeyeater	*Anthochaera phrygia*	CE	E, MIG	Potential
Rufous fantail	*Rhipidura rufifrons*		MIG	Unlikely
Satin flycatcher	*Myiagra cyanoleuca*		MIG	Potential
Latham's snipe	*Gallinago hardwickii*		MIG	Potential

CE = Critically Endangered
E = Endangered Species
MIG = Migratory species
V = Vulnerable Species
TSC Act = *Threatened Species Conservation Act 1995*
EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*

APPENDIX J

Kokoda Flora Species List

Appendix J – Kokoda Flora Species List

The following list was developed from surveys of the Kokoda Offset Site as detailed in Appendix H. It includes all species of vascular plants observed within the Kokoda Offset Site during fieldwork completed by Umwelt in 2013. Although substantial, the list will not be comprehensive, because not all species are readily detected at any one time of the year. Many species flower only during restricted periods of the year, and some flower only once in several years. In the absence of flowering material, many of these species cannot be identified, or even detected.

Names of classes and families follow a modified Cronquist (1981) System.

Any species that could not be identified to the lowest taxonomic level are denoted in the following manner:

sp.	specimens that are identified to genus level only;
prob.	specimens for which identification was considered highly likely but not definite; and
poss.	specimens for which identification was considered likely but not definite.

The following abbreviations or symbols are used in the list:

1 to 6	modified Braun-Blanquet cover-abundance score (see Appendix H);
X	species recorded in proximity to, but outside of, quantitative floristic quadrat, or opportunistically during the survey effort;
asterisk (*)	denotes species not native to the study area;
subsp.	subspecies;
var.	variety; and
Bold	font denotes threatened plant species or populations.

All vascular plants recorded or collected were identified using keys and nomenclature in Harden (1992, 1993, 2000 & 2002) and Wheeler *et al*. (2002). Where known, changes to nomenclature and classification have been incorporated into the results, as derived from *PlantNET* (Botanic Gardens Trust 2013), the on-line plant name database maintained by the National Herbarium of New South Wales.

Common names used follow Harden (1992, 1993, 2000 & 2002) where available, and draw on other sources such as local names where these references do not provide a common name.

Table 1 lists the flora species recorded across the Kokoda Offset Site.

Table 1 – Flora Species Recorded Across the Kokoda Offset Site During May 2013

Family/ Subfamily	Scientific Name	Common Name	KQ01	KQ02	KQ03	KQ04	KQ05	KQ06	KQ07	KQ08	KQ09	KQ10	KQ11	KQ12	KQ13	KQ14	KQ15	KQ16	KQ17	OPPS
Coniferopsida																				
Cupressaceae	*Callitris endlicheri*	black cypress pine	3		3	3	3		1	3	4	3	4	1	3		3	2	4	X
Cupressaceae	*Callitris glaucophylla*	white cypress pine																		X
Filicopsida																				
Adiantaceae	*Cheilanthes sieberi* subsp. *sieberi*	poison rock fern	3			2	2	2	2	2	2	3	2	2	2	3	2	3	3	
Magnoliopsida (Flowering Plants) – Liliidae (monocots)																				
Anthericaceae	*Laxmannia gracilis*	slender wire lily									1									
Anthericaceae	*Thysanotus patersonii*	twining fringe-lily										1		1			1	1	1	
Cyperaceae	*Bolboschoenus* sp.									3										
Cyperaceae	*Fimbristylis dichotoma*	common fridge-sedge						2												
Cyperaceae	*Lepidosperma laterale*											4								
Juncaceae	*Juncus homalocaulis*							2												
Juncaceae	*Juncus* sp.					1	3	2		3			2		3	3				
Orchidaceae	*Pterostylis* sp.										2								2	
Poaceae	**Aira cupaniana*	silvery hairgrass						1		2					1					
Poaceae	*Aristida leichhardtiana*		2							3										
Poaceae	*Aristida ramosa*	purple wiregrass						3	3					3		3		3		
Poaceae	*Aristida* sp.			3		3	3								3					

Family/ Subfamily	Scientific Name	Common Name	KQ01	KQ02	KQ03	KQ04	KQ05	KQ06	KQ07	KQ08	KQ09	KQ10	KQ11	KQ12	KQ13	KQ14	KQ15	KQ16	KQ17	OPPS
Poaceae	*Austrostipa bigeniculata*							2												
Poaceae	*Austrostipa scabra* subsp. *falcata*		3		3			3	3		2		3	3	3		3	3	2	
Poaceae	*Bothriochloa decipiens*	red grass						3												
Poaceae	*Bothriochloa macra*	red grass						3								1				
Poaceae	*Bothriochloa* sp.														1					
Poaceae	**Briza minor*	shivery grass	1				2								1	2				
Poaceae	**Bromus molliformis*															1				
Poaceae	*Chloris truncata*	windmill grass			1	2		2							1	2				
Poaceae	*Chloris ventricosa*	tall chloris					1													
Poaceae	*Dichelachne micrantha*													2						
Poaceae	*Digitaria diffusa*						2	2	2							2	1			
Poaceae	**Echinochloa microstachya*	prickly barnyard grass																3		
Poaceae	*Elymus scaber*							3	3						1	2		2		
Poaceae	*Eragrostis brownii*	Browns lovegrass					2													
Poaceae	*Eragrostis elongata*	clustered lovegrass					2	2								3				
Poaceae	*Eragrostis* sp.								2	2			2							
Poaceae	*Microlaena stipoides* var. *stipoides*	weeping grass													1					
Poaceae	*Panicum effusum*	poison or hairy panic	1																	
Poaceae	*Panicum* sp.						1													

Family/ Subfamily	Scientific Name	Common Name	KQ01	KQ02	KQ03	KQ04	KQ05	KQ06	KQ07	KQ08	KQ09	KQ10	KQ11	KQ12	KQ13	KQ14	KQ15	KQ16	KQ17	OPPS
Poaceae	*Rytidosperma setaceum*						3	3	3	3			3	3	2		2			
Poaceae	*Rytidosperma* sp.		2		3	3					2	1				2				
Poaceae	*Sporobolus creber*	slender rats tail grass		3		2														
Poaceae	**Vulpia bromoides*	squirrel tail fesque					1													
Magnoliopsida (Flowering Plants) – Magnoliidae (Dicots)																				
Acanthaceae	*Brunoniella australis*	blue trumpet								1										
Amaranthaceae	*Alternanthera denticulata*	lesser joyweed		1			1													
Apiaceae	*Hydrocotyle* sp.					2	2						1	2	2			2		
Asteraceae	**Arctotheca calendula*	Capeweed	3	3			2	2		1					2	2				
Asteraceae	*Calotis hispidula*	Bogan flea						2												
Asteraceae	*Cassinia laevis*	cough bush									1		1	1						
Asteraceae	**Cirsium vulgare*	spear thistle								2						1				
Asteraceae	*Craspedia variabilis*											2								
Asteraceae	*Cymbonotus lawsonianus*						2	2	3											
Asteraceae	**Hypochaeris radicata*	catsear	3	2			1	3	2						2	3			2	
Asteraceae	*Ozothamnus diosmifolius*	white dogwood				3				2										
Asteraceae	*Senecio* sp.													1		1				
Asteraceae	*Solenogyne* sp.								2											
Asteraceae	**Soliva sessilis*	bindyi	2	1												2				
Asteraceae	**Sonchus oleraceus*	common sowthistle	1					1				1								

Family/ Subfamily	Scientific Name	Common Name	KQ01	KQ02	KQ03	KQ04	KQ05	KQ06	KQ07	KQ08	KQ09	KQ10	KQ11	KQ12	KQ13	KQ14	KQ15	KQ16	KQ17	OPPS
Asteraceae	*Vittadinia pterochaeta*	rough fuzzweed						2												
Asteraceae	*Vittadinia* sp.												1							
Boraginaceae	**Echium plantagineum*	Patersons curse		3												3	3			
Campanulaceae	*Wahlenbergia communis*	tufted bluebell						2												
Caryophyllaceae	**Petrorhagia nanteuilii*						1	2												
Caryophyllaceae	**Stellaria media*	common chickweed					2			2					2					
Casuarinaceae	*Allocasuarina verticillata*	drooping sheoak	2							2		3							2	X
Chenopodiaceae	*Einadia nutans* subsp. *nutans*				3										2			3		
Clusiaceae	*Hypericum gramineum*	small St Johns wort	2				1	2	1			3						1		
Dilleniaceae	*Hibbertia obtusifolia*	hoary guinea flower							3						2			3		
Dilleniaceae	*Hibbertia* sp.																1			
Epacridaceae	*Astroloma humifusum*	native cranberry									2		2	2						
Epacridaceae	*Brachyloma daphnoides*	Daphne heath				2					3									
Epacridaceae	*Lissanthe strigosa*	peach heath					1		3	2	1		2	3	2					
Euphorbiaceae	*Chamaesyce drummondii*	caustic weed			1															
Fabaceae (Faboideae)	*Glycine tabacina*								2									2		

Family/ Subfamily	Scientific Name	Common Name	KQ01	KQ02	KQ03	KQ04	KQ05	KQ06	KQ07	KQ08	KQ09	KQ10	KQ11	KQ12	KQ13	KQ14	KQ15	KQ16	KQ17	OPPS
Fabaceae (Faboideae)	*Hardenbergia violacea*	false sarsaparilla				2														
Fabaceae (Faboideae)	**Medicago sativa*	lucerne		1																
Fabaceae (Faboideae)	*Pultenaea* sp.										1									
Fabaceae (Faboideae)	*Swainsona bracteata*														1					
Fabaceae (Mimosoideae)	*Acacia decora*	western golden wattle				X			1											
Fabaceae (Mimosoideae)	*Acacia doratoxylon*	currawang	3			2				2	2	3			2				2	X
Fabaceae (Mimosoideae)	*Acacia paradoxa*	kangaroo thorn				1				1							2			X
Geraniaceae	*Geranium* sp.								2											
Goodeniaceae	*Goodenia* sp.							3						2				2		
Haloragaceae	*Gonocarpus tetragynus*		2					2				2		2	2	2	2		2	
Haloragaceae	*Haloragis heterophylla*						2													
Haloragaceae	*Haloragis* sp.					1														
Lamiaceae	*Ajuga australis*	austral bugle							3											
Loranthaceae	*Amyema* sp.																			X
Malvaceae	*Sida corrugata*								1											
Myrtaceae	*Calytrix tetragona*										3		1							
Myrtaceae	*Eucalyptus albens*	white box							4											X
Myrtaceae	*Eucalyptus dealbata*	tumbledown red gum													3					
Myrtaceae	*Eucalyptus dwyeri*	Dwyers red gum	2			3	3		3	3	3	2	2	2		1	3	3	3	X

Family/ Subfamily	Scientific Name	Common Name	KQ01	KQ02	KQ03	KQ04	KQ05	KQ06	KQ07	KQ08	KQ09	KQ10	KQ11	KQ12	KQ13	KQ14	KQ15	KQ16	KQ17	OPPS
Myrtaceae	*Eucalyptus macrorhyncha*	red stringybark													3			3		
Myrtaceae	*Eucalyptus melliodora*	yellow box													3			2		
Myrtaceae	*Eucalyptus microcarpa*	inland grey box			4		4				X		2	2			3			X
Myrtaceae	*Eucalyptus moluccana*	grey box								2										
Myrtaceae	*Eucalyptus sideroxylon*	mugga ironbark				4				3	3		4	4			X			X
Oxalidaceae	*Oxalis perennans*						1	2												
Oxalidaceae	*Oxalis* sp.		2																	
Polygonaceae	*Persicaria lapathifolia*	pale knotweed								1										
Primulaceae	**Anagallis arvensis*	scarlet pimpernel	1	3				2							2					
Roseaceae	**Rubus fruticosus* sp. agg.	blackberry																		X
Sapindaceae	*Dodonaea viscosa* subsp. *spatulata*					1														
Scrophulariaceae	**Orobanche minor*	boomrape						1				2	2			1				
Solanaceae	**Solanum nigrum*	black-berry nightshade	1																	
Stackhousiaceae	*Stackhousia* sp.						1													
Sterculiaceae	*Brachychiton populneus* subsp. *populneus*	kurrajong	X											1	2					X

APPENDIX K

Kokoda Fauna Species List

Appendix K – Kokoda Fauna Species List

The following list was developed from field surveys of the Kokoda Offset Site detailed in Appendix H. It includes all species of vertebrate fauna recorded within the Kokoda Offset Site during fieldwork.

The following symbol is used to identify the method of detection in the appendix table:

X	Identified from visual sighting, characteristic call, scat or hair sample.

Any species that could not be identified to the species taxonomic level are denoted in the following manner:

sp.	specimens that are identified to genus level only; and
poss.	specimens for which identification was considered likely but not definite.

The following abbreviations or symbols are used in the list:

asterisk (*)	denotes species not indigenous to the Kokoda Offset Site;
subsp.	subspecies;
MIG	Listed migratory species under the EPBC Act;
V	Vulnerable under Schedule 2 of the TSC Act;
E	Endangered under Schedule 2 of the TSC Act;
C	'Confident' level of identification by Fly by Night Surveys Pty Ltd;
P	'Probable' level of identification by Fly by Night Surveys Pty Ltd;
Po	'Possible' level of identification by Fly by Night Surveys Pty Ltd; and
Opp.	opportunistic record.

Birds recorded were identified using descriptions in Slater *et al*. (2003) and the scientific and common name nomenclature of Birds Australia. Reptiles recorded were identified using keys and descriptions in Cogger (2000), Swan *et al.* (2004), Weigel (1990) and Wilson and Swan (2008) and the scientific and common name nomenclature of Cogger (2000).

Amphibians recorded were identified using keys and descriptions in Cogger (2000), Robinson (1998), Anstis (2002) and Barker *et al.* (1995) and the scientific and common name nomenclature of Cogger (2000). Mammals recorded were identified using keys and descriptions in Strahan (2002), Churchill (2008) and Menkhorst and Knight (2004) and the scientific and common name nomenclature of Strahan (2002) for non-bat species and Churchill (2008) for bats.

Scientific Name	Common Name	Conservation Status		Autumn 2013
		TSC Act	EPBC Act	
AMPHIBIANS				
Myobatrachidae				
Crinia parinsignifera	eastern sign-bearing froglet			x
Hylidae				
Litoria latopalmata	broad-palmed frog			x
REPTILES				
Cheloniidae				
Chelodina longicollis	long-necked turtle			x
BIRDS				
Anatidae				
Chenonetta jubata	Australian wood duck			x
Anas superciliosa	Pacific black duck			x
Columbidae				
Phaps chalcoptera	common bronzewing			x
Ocyphaps lophotes	crested pigeon			x
Phalacrocoracidae				
Phalacrocorax melanoleucos	little pied cormorant			x
Accipitridae				
Elanus axillaris	black-shouldered kite			x
Aquila audax	wedge-tailed eagle			x
Charadriidae				
Vanellus miles	masked lapwing			x
Cacatuidae				
Cacatua roseicapillus	galah			x
Cacatua galerita	sulphur-crested cockatoo			x
Psittacidae				
Glossopsitta pusilla	little lorikeet	V		20,5
Platycercus eximius	eastern rosella			x
Psephotus haematonotus	red-rumped parrot			x
Strigidae				
Ninox novaeseelandiae	southern boobook			x
Tytonidae				
Tyto alba	barn owl			x
Halcyonidae				
Dacelo novaeguineae	laughing kookaburra			x
Climacteridae				
Corombates leucophaea	white-throated treecreeper			x
Maluridae				
Malurus cyaneus	superb fairy-wren			x
Acanthizidae				
Acanthiza lineata	striated thornbill			x
Acanthiza nana	yellow thornbill			x

Scientific Name	Common Name	Conservation Status		Autumn 2013
		TSC Act	EPBC Act	
Acanthiza chrysorrhoa	yellow-rumped thornbill			x
Acanthiza reguloides	buff-rumped thornbill			x
Acanthiza pusilla	brown thornbill			x
Pardalotidae				
Pardalotus punctatus	spotted pardalote			x
Meliphagidae				
Lichenostomus leucotis	white-eared honeyeater			x
Lichenostomus penicillatus	white-plumed honeyeater			x
Manorina melanocephala	noisy miner			x
Anthochaera carunculata	red wattlebird			x
Entomyzon cyanotis	blue-faced honeyeater			x
Pomatostomidae				
Pomatostomus temporalis temporalis	grey-crowned babbler (eastern subsp.)	V		2, 2, 4, 6
Pomatostomus superciliosus	white-browed babbler			x
Campephagidae				
Coracina maxima	ground cuckoo-shrike			x
Pachycephalidae				
Pachycephala pectoralis	golden whistler			x
Pachycephala rufiventris	rufous whistler			x
Colluricincla harmonica	grey shrike-thrush			x
Artamidae				
Gymnorhina tibicen	Australian magpie			x
Strepera graculina	pied currawong			x
Rhipiduridae				
Rhipidura albiscapa	grey fantail			x
Rhipidura leucophrys	willie wagtail			x
Corvidae				
Corvus coronoides	Australian raven			x
Monarchidae				
Myiagra inquieta	restless flycatcher			x
Grallina cyanoleuca	magpie-lark			x
Corcoracidae				
Struthidea cinerea	apostlebird			x
Corcorax melanorhamphos	white-winged chough			x
Petroicidae				
Petroica rosea	rose robin			x
Eopsaltria australis	eastern yellow robin			x
Timaliidae				
Zosterops lateralis	silvereye			x
Hirundinidae				
Hirundo neoxena	welcome swallow			x

Scientific Name	Common Name	Conservation Status		Autumn 2013
		TSC Act	EPBC Act	
Motacilidae				
Anthus novaeseelandiae	Australasian pipit			x
MAMMALS				
Pseudocheiridae				
Pseudocheirus peregrinus	common ringtail possum			x
Acrobatidae				
Trichosurus vulpecula	common brushtail possum			x
Macropodidae				
Macropus giganteus	eastern grey kangaroo			x
Molossidae				
Mormopterus planiceps	southern freetail-bat			C
Nyctinomus australis	white-striped freetail-bat			C
Vespertilionidae				
Miniopterus schreibersii oceanensis	eastern bentwing-bat	V		C
Nyctophilus sp.	unidentified long-eared bat			C
Chalinolobus gouldii	Goulds wattled bat			C
Chalinolobus morio	chocolate wattled bat			C
Scotorepens balstoni	inland broad-nosed bat			P
Vespadelus regulus	southern forest bat			P
Vespadelus vulturnus	little forest bat			C
Canidae				
**Vulpes vulpes*	fox			x
Bovidae				
**Bos taurus*	cow			x
**Ovis aries*	sheep			x
Leporidae				
**Oryctolagus cuniculus*	rabbit			x
**Lepus capensis*	brown hare			x

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