



Biodiversity Conservation Monitoring Pty Ltd

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Ecological Assessment of LOT 22 DP:79884 Palmers Lane Pokolbin, NSW.



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Prepared by John Paul King

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Current knowledge of the ecology of most flora and fauna species is poor. As a consequence there is frequently insufficient data to objectively assess the potential ramifications of any given proposal for most species. Therefore, it is typical for ecological assessments to rely to some extent on professional opinion, judgments based on the personal knowledge of the ecological consultant, investigations undertaken specifically for the proposal and/or data derived from previous studies (i.e. literary resources). In scientific jargon, such subjective judgments are 'hypotheses': 'likely' explanations developed through a synthesis of available information and consultant experience in the discipline. These hypotheses are considered quite accurate within the profession as the experience of the consultant balances any insufficiency of data to the standards of the discipline; they nevertheless remain subjective opinions unless tested scientifically.

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Executive Summary

This report has been prepared in support of a development application for the proposed tourist development at LOT: 22 DP: 79,884, Palmers Lane Pokolbin. The proposed development is approximately 5.5 ha and includes Tourism and Visitor Accommodation facility comprising Function Centre, Serviced Apartments and Associated Civil Works.

The design and final footprint of the proposed development was arrived at by strict adherence to the following ecological criteria set by the author:

- Mature trees and remnant native vegetation would not be cleared;
- Areas identified as key fauna and flora habitat would to the greatest extent possible be avoided;
- Ecologically sensitive areas are to be avoided and protected in perpetuity;
- If creek crossings are required, a location lacking mature trees is to be used and the crossing span must extend beyond the designated creek line buffer at that location;
- Creek woodland rehabilitation would occur to restore damaged habitats; and,
- Water quality devices and treatments will only occur within areas of low ecological value.

Investigations into the existing environments at the site yielded the following results.

Vegetation significance

Investigations identified four vegetation communities onsite, two of these are examples of the Nationally listed Central Hunter Valley eucalypt forest and woodland, which is a Critically Endangered Ecological Community (CECC EPBC Act 1999). One is an intact forest/woodland, the other is a derivative of this CECC. Nonetheless, these are both of high conservation value. The third community recorded is consistent with the determination for Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion (TSC Act 1995). This community onsite intergrades with the above CECC and as such is of high conservation value. The remaining community recorded is consistent with the Endangered Ecological Community Central Hunter Riparian Forest (EEC). This community is within the Mary Anne's Creek line and its banks, again a threatened community but of less conservation concern than the CECC.

Figure 1 highlights the location of all proposed infrastructure relative to native vegetation (Vegetation classes shown describes the relative vegetation condition classes derived quantitatively)

Significant Flora

One sample from a red gum collected onsite is tentatively confirmed as the threatened tree *Eucalyptus glaucina*. It's possible that this is crossed with *E.punctata* onsite as it had some misleading characteristics. The project however does not involve clearing of any trees or eucalypt communities so it was deemed not necessary to investigate further. Surveys did not locate any other threatened or rare flora species onsite.



Figure 1. Proposal relative to natural vegetation cover

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Location: Gillards Lane, Pokolbin NSW

Vegetation communities

All communities recorded onsite belong to threatened communities. The proposal has been specifically designed to avoid these communities. Refer to Table 1 below.

Table 1. Communities recorded onsite

	Common Description of this Map unit onsite	Association with threatened communities	Conservation Significance
Map Unit 1:	Spotted Gum/ Grey Box/ Red Gum forest and woodland	Central Hunter Ironbark - Spotted Gum - Grey Box Forest typically forms an open forest to woodland.	Highly significant. Greatest conservation significance of vegetation in NSW.
Map Unit 2:	Scattered trees and isolated woodland patches derived from Spotted Gum/ Grey Box/ Red Gum forest and woodland.	Central Hunter Ironbark - Spotted Gum - Grey Box Forest typically forms an open forest to woodland.	Highly significant. Greatest conservation significance of vegetation in NSW.
Map Unit 3:	Spotted Gum/ Red Ironbark/ forest	Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion	Of high significance rare examples in the local area and intergrades with Central communities with important overlapping habitat qualities that are lacking from core areas of either community.
Map Unit 4:	River Oak Riparian Forest	River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Of high significance rare examples in the local area. Also provides important linking functions in a fragmented landscape.

Environment Australia has prepared Draft Conservation Advice for the Central Hunter Valley eucalypt forest and woodland complex ecological community. A critical aspect of this advice for this project is the determination of derived grasslands/shrublands derived from the CECC.

It follows that for grasslands to be classed as being derived from CHVEF and to be recognised as part of this nationally protected ecological community they need to comprise $\geq 70\%$ native vegetation cover, and that connects discrete patches of the ecological community that are in close proximity to each other (up to 100m apart). In such cases these isolated patches connected by native endemic grasses are to be considered as a single patch. The advice goes further to add that these grasslands are an important part of the broader ecosystem and may have potential for restoration, possibly to a condition that in the future will make them eligible for inclusion in the nationally protected ecological community. The justification for this inclusion are:

- They contain much of the native plant biodiversity of the ecological community and act as a seed bank and source of genetic material; and,
- The derived grasslands/shrublands also act as buffer zones, that protect the woodland remnants from adjacent activities, and stepping stones that enable the movement of fauna between remnant woodlands.

The findings from 32 quantitative vegetation and flora quadrats (400m²) undertaken as part of this assessment shows that native flora recorded within samples taken within grassland plots in proximity to the project area never represented more than 40% of the diversity recorded. In conclusion, the grassland areas of the site do not comprise derived grasslands of CHVEF and the proposal aims to retain all trees and restore degraded lands.

This project is unique and does not present the normal raft of environmental problems that can plague urban developments. For example;

- The entire project is off-grid, with many sustainable solutions, such as, solar, water collection and reuse, and composting toilets,
- Over all a very low presence of impervious surfaces,
- Organic gardening practices will be used for all aspects of site management,
- The design is very sensitive to environment having a very "light touch to the earth", and
- The remainder of the site will have grazing removed to facilitate the natural regeneration of native communities.

Given that this project does not physically impact on CHVEF or derived grasslands and it will enhance the potential for CHVEF to recover on site, the project will not impact on the CECC and does not restrict the potential for the natural regeneration of this community in the future. Figure 2 details the vegetation communities recorded onsite. As such, this proposal does not represent a significant impact on any of the endangered communities recorded onsite and a referral to the minister under the provisions of the EPBC Act 1999 is not required.

Significant Fauna

Nine (9) significant fauna species were recorded onsite and in the local area;

- | | |
|------------------------|--------------------------|
| • Grey-crowned Babbler | • Squirrel glider |
| • Masked Owl | • Eastern Bentwing-bat |
| • Speckled Warbler | • Little Bentwing-bat |
| • Dusky Woodswallow | • Grey-headed Flying-fox |
| • Varied Sittella | |

The proposal will enhance habitat on site for Grey-crowned Babbler, Speckled Warbler, Varied Sittella and potentially to a lesser extent for Masked Owl and Squirrel glider. This will be occur because:

- Improved management of grassland and improvements in orchids (Grey-crowned Babbler);
- Removal of cattle increases native shrub regeneration (Speckled Warbler)
- Natural regeneration leads to a self-sustaining woodland that continues in perpetuity by permitting succession. Leading to healthier upper canopies and a greater number of hollows (Varied Sittella, Masked Owl, Squirrel glider)

Notwithstanding, several potential impacts for these species and other species considered to have habitat on site were identified in this assessment, including:

- Noise and light pollution;
- Disturbance to breeding activities during construction;
- Disturbance to links across the site posed by planned infrastructure.

The potential concerns have been addressed in this assessment. In short, the following is proposed:

- The proposal will have almost zero light output (due to a desire to see the night sky and provide an intimate environment).
- Intensive construction activities to minimise impacts on breeding animals by avoiding peak times and monitoring activities; and,
- Although the project area has a footprint of 5.5ha there is only 0.8ha of infrastructure that would potentially pose a hindrance to movement of terrestrial animals, which of the nine threatened species recorded onsite, and the species predicted to have habitat on site, none are terrestrial species.

In total, twenty Eight (28) mature hollow bearing trees (HBT) were recorded onsite. The proposal will not at any stage require the removal of HBT's. Of these 28 HBT's four are considered highly significant hollow bearing trees that require preservation and management into the future.

Construction of the development will not directly impact significant natural areas (i.e. modify or remove habitats) or have secondary impacts (i.e. downstream impacts or change competition) to any ecologically sensitive areas. Therefore, the potential for impacts to the ecology of the area are minimal. Table 2 highlights the recommendations are made in this report.

Table 2. Recommendations made in this report

	Before Approval	Before Construction commencement	During construction	Long term (5 years)
Recommendations	Incorporation of species specific habitat requirements into landscape plan	Incorporate habitat management objectives into a fauna management plan and incorporate into a site management plan	Supervision of construction activities by qualified ecologist	Undertake monitoring of fauna using replicated sample plots onsite and offset (control sites) to provide quantitative data on the health of the population relative to local populations
Mitigation Strategies	na	Permanent marking of nest sites, hollow trees and stags.	Collection of any material onsite that can provide habitat for species in the remainder of the site, such as logs and debris found in paddock areas	Regeneration of creek line habitats and woodland habitats to restore damaged areas and increase creek line functioning.
	na	na	Creation and restoration of woodland habitats onsite that supports biodiversity but not increase bushfire hazards	Monitoring and maintenance of restoration efforts.
	na	na	Restoration of creek lines in locations that support biodiversity but not increase bushfire hazards or access across creek lines.	Monitoring and maintenance of restoration efforts.
	na	Undertake seasonal monitoring of potential owl trees to assess usage prior to construction Installation of 3 large owl boxes in woodland area	Supervision and stag watching of owl trees	Monitoring of Owl boxes in woodland area, rehabilitation areas and habitats for threatened fauna species.

It is concluded that the proposal will not impact on habitats for threatened species, populations, or communities to the extent that these are put at further risk. The ecological findings of this assessment are consistent with the results of Pre-Development Application advice conducted for the site. I can see no ecological reasons to not support the proposal.

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1.0 Introduction

This report represents a biodiversity assessment for a proposed tourist development on LOT: 22 DP: 79,884, Palmers Lane Pokolbin (**Figure 1**). The aim of the assessment is to identify any significant ecological matters relevant to the proposal and determine the potential impacts to these matters in accordance with extant legislation. This includes:

- Assessing the condition of flora, fauna and habitats;
- Identifying the presence or likely occurrence of threatened species, populations or communities listed under the *NSW Threatened Species Conservation Act* (1995) (TSC Act) and the *Commonwealth Environment Protection and Biodiversity Conservation Act* (1999) (EPBC Act);
- Undertaking an 'Assessment of Significance' in accordance with Part 5A of the *NSW Environmental Planning and Assessment Act* (1979) (EP&A Act) and impacts on Matters of National Significance under the provisions of the *Commonwealth Environment Protection and Biodiversity Conservation Act* (1999) (EPBC Act) to determine whether the proposal is likely to have a significant impact (direct and indirect) on threatened species, populations or ecological communities or their habitats; and,
- Recommending actions to mitigate ecological impacts associated with the proposal during and after construction.

1.1 Proposed Development

Prior to preparing this report, ecological planning was provided to guide the capabilities of the site to accommodate a tourism style development. This advice shaped the proposal so that it largely avoided native vegetation. This ecological assessment addresses the following components of the proposed development Tourism and Visitor Accommodation facility comprising Function Centre, Serviced Apartments and Associated Civil Works.

This ecological advice guided the development of a landscape scheme which aims to realize a welcoming sanctuary that restores a visitor's connection to the land. The intention is to introduce an authentic agricultural experience for guests.

The landscape scheme will;

Preserve and enhance the existing nature values

The existing vegetation communities will be preserved. The degraded riparian corridors will be repaired and rehabilitated. Extensive fields of native meadows will be introduced to provide habitats for fauna.

Introduce productive landscapes

An experiential rather than ornamental approach is used to determine the new landscape. Kitchen and market gardens, orchards and groves will tie into the natural landscapes and offer a sequence of authentic sustainable agricultural experiences. Guest will be encouraged to pick herbs and vegetables for their meals. Site-specific artworks will emerge from the landscape.

Create authentic and unique experiences

Produce-driven activities and events will be available to the guest. These could include, seasonal fruit picking, agriculture workshops, farmers market, and some low-key farm animal activities. Social activities of different scales and differing events will be able to be held against this rural backdrop.

1.2 Identifying Impacts

Relative to potential ecological impacts, the proposed development includes two phases (construction and management) that will be addressed within:

Construction phase;

- Direct impacts from removal and or modification of habitats limited to highly modified communities.
- Construction of infrastructure.
- Functional changes in site use, both positive and negative.
- Establishment of Asset Protection Zones (APZ).

Management phase;

- Pre-clearing and post clearing monitoring and management of fauna and resources.
- Implementation of Vegetation Management Plan for reserve areas.

The specific areas of issue for this report are presented below and diagrammatically in **Figure 3**:

- **Local Area** – This includes Pokolbin, Cessnock, Grahamstown Dam and Medowie, only used for surveys of widely dispersed species, such as Owls.
- **Study Area** - This includes all terrestrial lands north to North Rothbury, west and south to Broke Rd and west to Rothbury. The Study area within this report is used to explain habitats that are expected to be used by species recorded onsite or that the sub-population onsite forms part of meta-population in the study area. (**Figure 3**).
- **Subject site** - This includes all terrestrial lands within the footprint of the proposed disturbance area of approximately 5.5 ha, as shown in **Figure 3**. Most intensive area of survey.



Legend

Map Unit 1

Central Hunter Ironbark - Spotted Gum - Grey Box Forest open forest to woodland

Map Unit 2

Scattered trees and isolated woodland patches derived from Spotted Gum/ Grey Box/ Red Gum forest and woodland.

Map Unit 3

Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion

Map Unit 4

River Oak Riparian Forest
River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions

Note: These polygons are considered a derivative of Central Hunter Ironbark - Spotted Gum - Grey Box Forest open forest to woodland and area equal conservation importance.

Note: All other vegetation shown without polygons in this map or not belonging to a map unit are not native vegetation and are not included in the map. The map does not include any other native vegetation not acknowledged in this report, in particular in regard to Map unit 1.

Figure 1. Native Vegetation Map Units



Figure 3. Proposal relative to Study Site

2.0 Methodology

Desktop Assessment

A desktop assessment using a search radius of 10km x 10km from the subject site was undertaken for NSW (BioNet) and Commonwealth (EPBC Protected Matters Search Tool) databases for threatened species, populations and ecological communities. Those species, populations or communities that occur within that search radius are presented along with a likelihood of occurrence rating, based on an assessment of the habitat at the subject site. The criteria for likelihood is also outlined in Table 3 Threatened species, populations and communities with a moderate-high likelihood of occurring at the site are summarised in

Table 3 A summary of threatened Flora species, populations and communities considered to have a medium-high likelihood of occurring at the

Table 3-1 A summary of threatened Flora species, populations and communities considered to have a medium-high likelihood of occurring at the proposed Asset Protection Zone.

Common Name	Scientific Name	Likelihood of Occurrence
<i>Rutidosia heterogama</i>	Heath Wrinklewort	Moderate
<i>Acacia bynoeana</i>	Bynoe's Wattle	Low
<i>Prostanthera cuneolifera</i>	Singleton Vine Bush	Moderate
<i>Callistemon linearifolius</i>	Netted Bottle Brush	Moderate
<i>Eucalyptus castrensis</i>	Singleton Mallee	Low
<i>Eucalyptus fracta</i>		Low
<i>Eucalyptus glaucina</i>	Slaty Red Gum	Present
<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>		Low
<i>Eucalyptus pumila</i>	Pokolbin Mallee	Low
<i>Cymbidium canaliculatum</i>	<i>Cymbidium canaliculatum</i> population in the Hunter Catchment	Low
<i>Pterostylis gibbosa</i>	Illawarra Greenhood	Moderate
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	High
<i>Persoonia pauciflora</i>	North/Rothbury Persoonia	High
<i>Leionema lamprophyllum</i> subsp. <i>obovatum</i>	<i>Leionema lamprophyllum</i> subsp. <i>obovatum</i> population in the Hunter Catchment	Low
<i>Zannichellia palustris</i>		Low

Table 3-2 A summary of threatened communities considered to have a medium-high likelihood of occurring at the proposed Asset Protection Zone.

Common Name	Scientific Name	Likelihood of Occurrence
Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basins Bioregions	Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basins Bioregions	Low
Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions	Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions	<u>Present</u>
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Low
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Low
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions	Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions	Low
Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions	Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions	High
Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion	Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion	Moderate
Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions	Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions	Low
Hunter Valley Weeping Myall Woodland in the Sydney Basin Bioregion	Hunter Valley Weeping Myall Woodland in the Sydney Basin Bioregion	Low
Kurri Sand Swamp Woodland in the Sydney Basin Bioregion	Kurri Sand Swamp Woodland in the Sydney Basin Bioregion	Low
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Low
Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion	Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion	<u>Present</u>
Lower Hunter Valley Dry Rainforest in the Sydney Basin and NSW North Coast Bioregions	Lower Hunter Valley Dry Rainforest in the Sydney Basin and NSW North Coast Bioregions	Low
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	Low
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	<u>Present</u>
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Low
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Low
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	Sydney Freshwater Wetlands in the Sydney Basin Bioregion	Low
Warkworth Sands Woodland in the Sydney Basin Bioregion	Warkworth Sands Woodland in the Sydney Basin Bioregion	Low
White Box Yellow Box Blakely's Red Gum Woodland	White Box Yellow Box Blakely's Red Gum Woodland	Low

Table 3- A summary of threatened fauna species, populations and communities considered to have a medium-high likelihood of occurring at the proposed site.

Common Name	Scientific Name	Likelihood of Occurrence
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	Low
<i>Ixobrychus flavicollis</i>	Black Bittern	Low
<i>Circus assimilis</i>	Spotted Harrier	Low
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Low
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	Moderate
<i>Hieraaetus morphnoides</i>	Little Eagle	Moderate
<i>Lopholictinia isura</i>	Square-tailed Kite	Moderate
<i>Falco subniger</i>	Black Falcon	Moderate
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Moderate
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	Moderate
<i>Glossopsitta pusilla</i>	Little Lorikeet	Moderate
<i>Neophema pulchella</i>	Turquoise Parrot	Moderate
<i>Ninox connivens</i>	Barking Owl	Moderate
<i>Ninox strenua</i>	Powerful Owl	Low
<i>Tyto novaehollandiae</i>	Masked Owl	<u>Present</u>
<i>Tyto tenebricosa</i>	Sooty Owl	Low
<i>Climacteris picumnus victoriana</i>	Brown Treecreeper (eastern subspecies)	High
<i>Chthonicola sagittata</i>	Speckled Warbler	<u>Present</u>
<i>Epthianura albiglans</i>	White-fronted Chat	Low
<i>Grantia picta</i>	Painted Honeyeater	Moderate
<i>Meliphaga gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	Moderate
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	<u>Present</u>
<i>Daphoenositta chrysoptera</i>	Varied Sittella	<u>Present</u>
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	<u>Present</u>
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	Moderate
<i>Petroica boodang</i>	Scarlet Robin	Moderate
<i>Petroica phoenicea</i>	Flame Robin	Moderate
<i>Stagonopleura guttata</i>	Diamond Firetail	Moderate
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	Moderate
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	Low
<i>Phascogale cinerea</i>	Koala	Moderate
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	Low
<i>Petaurus australis</i>	Yellow-bellied Glider	Low
<i>Petaurus norfolcensis</i>	Squirrel Glider	<u>Present</u>
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	<u>Present</u>
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	High
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	High
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	High
<i>Falstretus tasmaniensis</i>	Eastern False Pipistrelle	High
<i>Miniopterus australis</i>	Little Bentwing-bat	<u>Present</u>
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	<u>Present</u>
<i>Myotis macropus</i>	Southern Myotis	Low
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	High
<i>Vespertilio corbinii</i>	Eastern Cave Bat	High

2.2 Sampling Plots

The presence flora and fauna and a description of the communities onsite was assessed by a combination of multiple (n=32) random sample plots (20m x 20m) and random meanders (total length 3.8km). Variables sampled in each plot followed that laid out in Table 2.2 and 2.2A below. Over two independent sample periods (7th, 8th, 12th, 16th Sep 2016 and 20th-23rd Dec 2016) ecological surveys were undertaken in the subject site (totalling 120 man hours). Surveys were only undertaken during ideal weather conditions and were always consistent with DECC guidelines for ecological survey and assessment (refer to appendix A). Data collected is shown in Table 4 and 4a.

Table 4. Characteristics of sample plots used for all assessments.

Parameters
Topographic position
Elevation
Slope (%)
Aspect
Soil Type
Easting
Northing
Tree mean height
Tree mean cover
Sub Tree mean height
Sub Tree mean cover
Emergent tree mean height
Emergent tree mean cover
Tall Shrub mean height
Tall Shrub mean cover
Small Tree mean height
Small Tree mean cover
Shrub mean height
Shrub mean cover
Groundcover mean height
Groundcover mean cover

Table 4a. Quantitative variables sampled on site

Composition	Structure
○ native plant species richness ○ native plant species richness by life form ○ cover of exotic species ○ presence/abundance of problematic weed species ○ presence/abundance of threatened plant species ○ presence/abundance of increasers and/or decliners ○ presence/abundance of nectar or seed resources ○ mistletoe abundance ○ evidence of introduced animals (e.g. rabbits, foxes)	○ cover by plant life form ○ cover by vertical stratum ○ number of vegetation strata ○ tree diameter distribution ○ number of trees with hollows ○ measure of tree growth stage ○ basal area of overstorey stems ○ canopy height ○ abundance of large, dead trees ○ presence/abundance of plant functional types ○ litter cover (or other measure grazing, fire, or logging regime of abundance) ○ rock cover ○ Abundance of coarse woody debris

2.3 Targeted Species Surveys

The requirement for targeted sampling and the type of sampling required are assessed by comparing records of threatened species, the knowledge of their distribution in the local area and the suitability of the habitat for these species recorded onsite (See section 2.0 above). The surveys for habitat also recorded some significant species, these results are included in the assessment of habitat potential. The species, populations and communities shown in Table 2-3A and 2-3B are a record on the NPWS Atlas database for the regional area, any species within this table having known habitat requirements matching the habitat qualities of the Study area are targeted in field surveys.

2.4 Field Surveys

Flora

A total of 30 quadrats (20m x 20m) were located within the subject site to sample floristics. Quadrats were located using a random approach whereby pre-determined locations were selected from digital spatial datasets. Quadrats were placed at the pre-determined location using a handheld GPS. Abundance cover scores were applied to all vascular plant species recorded within each quadrat (1 = 1-20%; 2 = 21-40%; 3 = 41-60%; 4 = 61-80%; 5 = 81-100%). Plant nomenclature is derived from the Flora of New South Wales as maintained by the Royal Botanic Gardens at <http://plantnet.rbgsyd.gov.au>.

Fauna

A range of survey methods were employed for this survey. Data from previous sampling was included to determine of suitability of habitats. Guidelines for ecological surveying were followed and when achievable the best case approach was used, refer to Table 5 and 6 and Appendix A for comprehensive details of surveys.

2.4.1 Seasonality and survey timing for targeted species

Not all species can be surveyed at any one time. Table 5 identifies those species having either seasonal or climatic limitations which require seasonal and targeted surveys. When a species cannot be surveyed due to poor climatic conditions (i.e. long term drought), it is assumed by the author to be present.

Table 5. Species seasonality and survey timing.

Common Name	Scientific Name	Most Effective Survey Times	Suitable Survey Times	Special Considerations	Surveys undertaken for other assessments on the subject site	Surveys undertaken for this species in the subject site in 2017
Dwarf Kerauwang	<i>Rulingia prostrata</i>	Flowering mainly between October & November	October and November	No	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects
Heath wrinkle	<i>Rutidosia heterogama</i>	Spring	August to November	No	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects
Black-eyed Susan	<i>Tetradlea juncea</i>	Throughout Spring with multiple site visits required.	August to November	No	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects
	<i>Zannichellia palustris</i>	Flowers during warmer months	November to February	No	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects
Powerful Owl	<i>Ninox strenua</i>	Call Playbacks should be played on dusk and for up to one and a half hours after dusk. Between January to Early May and from late July to December.	Call Playbacks should be played on dusk and one and a half hours after dusk. Between January to Early May then from Late July to December.	It is recommended that call playbacks should not be used during breeding periods this being between Late May early July and Autumn as it can be a reason for nest abandonment.	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects
Grey-crowned babbler	<i>Pomatostomus temporalis</i>	Surveys conducted at least three hours after sunrise is when they are most active, afternoon especially in summer this species is far less active (King pers obv). In late spring the birds are also quite vocal.	All day for small areas. Year round.	It is not suitable to survey during rain.	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects
Masked Owl	<i>Tyto novaehollandiae</i>	Call Playbacks should be played on dusk and for up to one and a half hours after dusk. Between January to Early May and from late July to December.	Call Playbacks should be played on dusk and for up to one and a half hours after dusk. Between January to Early May and from late July to December.	It is recommended that call playbacks should not be played during early Autumn to late Winter as it can be a reason for nest abandonment.	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects

Common Name	Scientific Name	Most Effective Survey Times	Suitable Survey Times	Special Considerations	Surveys undertaken for other assessments on the subject site	Surveys undertaken for this species in the subject site in 2017
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	Trapping surveys targeting Spotted-tailed Quoll should be conducted during the months of October and November	Trapping surveys targeting Spotted-tailed Quoll can also be undertaken throughout the year.	Due to their small numbers and cryptic nature this species is very difficult to trap.	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	Trapping surveys targeting Brush-tailed Phascogale should be conducted during the months of October and November and over summer months when resources are scarce. Winter should be avoided.	Trapping surveys targeting Brush-tailed Phascogale can also be undertaken throughout Summer, Spring and Autumn as there are usually less food resources available and bait is more readily taken.	Traps should be placed a minimum of four metres from the ground.	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects
Squirrel Glider	<i>Petaurus norfolkensis</i>	The ideal time to conduct trapping surveys targeting Squirrel Glider is during the months of October and November when juvenile individuals are likely to be present.	Trapping surveys targeting Squirrel Glider can also be undertaken throughout Summer, Spring and Autumn as there are usually less food resources available and bait is more readily taken.	Traps should be placed a minimum of four metres from the ground.	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects
Koala	<i>Phascolarctos cinereus</i>	Spotlight surveys are the most effective method of surveying Koala as the species is usually most active during the first four hours of night time hours. Males are more vocal during the summer breeding periods. Faecal pellet surveys of known Koala feed trees is also a noted survey methods for this species.	Diurnal surveys are also an effective way of surveying Koala. These also can be conducted all year round.	None	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	When a high number of trees are flowering or fruiting.	All night long.	None	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects
Little Bent-wing Bat	<i>Miniopterus australis</i>	First three hours after sunset between, Summer and Spring	First three hours after sunset in Autumn. A stationary all-night survey station should also be erected.	The coldest nights of winter especially following or during rain should be avoided.	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects
Eastern Bent-wing Bat	<i>Miniopterus schreibersii</i>	First three hours after sunset between, Summer and Spring	First three hours after sunset in Autumn. All-night stationary survey station should also be erected.	The coldest nights of winter especially following or during rain should be avoided.	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects
Eastern Freetail Bat	<i>Mormopterus norfolkensis</i>	Unknown	Unknown. All-night stationary survey station should also be erected.	The coldest nights of winter especially following or during rain should be avoided.	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	First three hours after sunset between, Summer and Spring	First three hours after sunset in Autumn. All-night stationary survey station should also be erected.	The coldest nights of winter especially following or during rain should be avoided.	Spring and Summer 2016	Yes. 4 separate visits over 2 months at 22 Plots + meandering transects

Field surveys are shown in Table 5 below. These surveys were undertaken over a 3 month period with seasonality and timing limitations accounted for. These methods are consistent with the required approaches in various survey and assessment guidelines.

Table 6. Standard ecological survey requirements for the area and type of land represented in the study area, based on the DECC guidelines for Flora and Fauna assessment (DECC 2010). Column three (effort study area) represents the total effort undertaken in this study.

Method	Suggested minimum effort	Survey period	Effort Study Area	Comment
Flora				
Quadrats	1 quadrat per stratification unit <2 hectares 2 quadrats per 2-50 hectares of stratification unit 3 quadrats per 51-250 hectares of stratification unit 5 quadrats per 251-500 hectares of stratification unit 10 quadrats per 501-1000 hectares of stratification unit, plus one additional quadrat for each extra 100 hectares thereof.	Seasonal. 2 week surveys in spring and summer of 2016	22 quadrats completed per survey period (Total 60)	Sufficient quantity to assess vegetation and locate threatened flora.
Traverses	1x100m traverse per stratification unit <2 hectares 2x100m traverses per 2-50 hectares of stratification unit 3x100m traverses per 51-250 hectares of stratification unit 5x100m traverses per 251-500 hectares of stratification unit 10x100m traverses per 501-1000 hectares of stratification unit, plus one additional 100m traverse for each extra 100 hectares thereof	Seasonal. 2 week surveys in spring and summer of 2016	3x800m traverses replicated for rare flora species.	Sufficient quantity to assess vegetation.
Frogs				
Systematic day habitat search	One hour per stratification unit	Varies according to the seasonal peak of activity of target species	2 hours per day for 8 days	Sufficient quantity to assess habitat.
Night habitat search of damp and watery sites	30 minutes on two separate nights per stratification unit	See above	2 hours per night (8 nights)	Sufficient quantity to assess habitat. No water within study site.
Nocturnal call playback	At least one playback on each of two separate nights	See above	10 min at four locations each night (8 nights) 20 min per night (8 nights)	Survey period appropriate for call playback. Sufficient quantity to assess habitat. No water within study site.
Night watercourse search	Two hours per 200m of water body edge	See above		Adjacent habitats searched.
Reptiles				
Habitat search	30-minute search on two separate days targeting specific habitat	November to March	1 hour over two days	Sufficient quantity to assess habitat.
Pitfall traps with drift nets	24 trap nights, preferably using six traps for a minimum of four consecutive nights	November to March	12 pits on two drifts for 2 lots of four nights	Sufficient quantity to assess habitat.
Spotlighting	30-minute search on two separate nights targeting specific habitat	November to March	2 hours per night (8 nights)	Sufficient quantity to assess habitat.
Diurnal Birds				
Area search	This matter has not been resolved as yet but it is likely that a species-time curve approach should be utilised for surveying diurnal birds. For example, the survey session for a particular day may cease when no additional species are identified within a set time period. This approach better accommodates the variety of habitat types and birds found in NSW.	All year	Entire area search methods used with a results based stopping rule enforced. All habitat groups searched on alternative days for total of 8	Sufficient quantity to assess habitat.

Method	Suggested minimum effort	Survey period	Effort Study Area	Comment
	Per stratification unit.		days per group per survey period replicated 3 times.	
Wetland census	A one-hour census at dawn or dusk, for each identified wetland.	All year	20 min per night (8 nights)	Sufficient quantity to assess habitat
Water source census	A 20-minute census at dawn or dusk, for each identified water source.	All year	20 min per night (8 nights)	Sufficient quantity to assess habitat
Nocturnal Birds				
Call playback	Sites should be separated by 800 metres – 1km, 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 2-4km apart and conducted during the breeding season.	All year	10 min at four locations each night (8 nights)	Sufficient quantity to assess habitat.
Day habitat search	Search habitat for pellets, and likely hollows. Flushing of Bush Stone-curlews by walking through potential habitat.	All year	All large hollow bearing trees surveyed for pellets.	Sufficient quantity to assess habitat.
Stag-watching	Observing potential roost hollows for 30mins prior to sunset and 60mins following sunset.	All year	All large hollow bearing trees stag watched.	Sufficient quantity to assess habitat.
Spotlighting	Spotlighting for Plains Wanderer and Bush Stone-curlew by foot or from a vehicle driven in first gear.	All year	Walking transects of grassland areas conducted each night for 8 consecutive nights	Sufficient quantity to assess habitat.
Non-flying mammals				
Total Effort	Effort per stratification unit up to 50 hectares, plus an additional effort for every additional 100 hectares	Animal sampled		
Small Elliott traps	100 trap nights over 3-4 consecutive nights	small mammals	40 traps for 4 nights (160 trap nights)	Sufficient quantity to assess habitat.
Large Elliott traps	100 trap nights over 3-4 consecutive nights	Medium to large mammals	40 traps for 4 nights (160 trap nights)	Sufficient quantity to assess habitat.
Arboreal Elliott traps	24 trap nights over 3-4 consecutive nights	Arboreal mammals	40 traps for 4 nights (160 trap nights)	Sufficient quantity to assess habitat.
Wire cage traps	24 trap nights over 3-4 consecutive nights	Medium to large mammals	40 traps for 4 nights (160 trap nights)	Sufficient quantity to assess habitat.
Pitfall traps with drift nets	24 trap nights over 3-4 consecutive nights	small mammals	40 traps for 4 nights (160 trap nights)	Sufficient quantity to assess habitat.
Hair tubes	10 large and 10 small tubes in pairs for at least 4 days and 4 nights	small and medium mammals		
Arboreal hair tubes	3 tubes in each of 10 habitat trees up to 100 hectares of stratification unit, for at least 4 arboreal mammals days and 4 nights	Not undertaken due to sufficient live trapping effort	NA	Not undertaken due to sufficient live trapping effort

Method	Suggested minimum effort	Survey period	Effort Study Area	Comment
Spotlighting on foot	2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights	arboreal and terrestrial mammals	3X 800 m walking transects	Sufficient quantity to assess habitat.
Spotlighting from vehicle	2 x 1 km of track at maximum speed of 5km per hour, up to 200 hectares of stratification unit, on 2 separate nights	arboreal and terrestrial mammals	NA	NA
Sand plots	6 soil plots for 4 nights	mostly medium to large terrestrial mammals	NA	NA
Call playback	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	gliders, koalas	10 min at four locations each night (8 nights)	Sufficient quantity to assess habitat.
Stag-watching	Observing potential roost hollows for 30 minutes prior to sunset and 60 minutes following sunset	gliders and possums	All large hollow bearing trees stag watched 10 min at four locations 2 trees each night (8 nights).	Sufficient quantity to assess habitat.
Search for scats and signs	30 minutes searching each relevant habitat, including trees for scratch marks	all mammals		
Track search	1km of track search with emphasis on where substrate is soft	mostly medium to large terrestrial mammals	NA	NA
Collection of predator scats	Opportunistic collection of predator scats for hair analysis	all mammals	Yes	
Bats				
Method	Effort per 100 hectares (or portion thereof) of stratification unit targeting preferred habitat	Survey period		
Harp trapping	Four trap nights over two consecutive nights (with one trap placed outside the flyways for one night)	October to March	Two traps set for four nights.	Sufficient quantity to assess habitat.
Mist netting	For targeted survey: one trap set for at least two hours duration starting at dusk, for two nights	October to March	Not undertaken due open areas and cattle	NA
Ultrasonic call recording	Two sound activated recording devices utilised for the entire night (a minimum of four hours), starting at dusk for two nights	October to March	Two Anabat set all night for 8 nights rotating at the 4 sites.	Sufficient quantity to assess habitat.
Trip line	For targeted survey of water bodies: at least two hours duration starting at dusk, for two nights	October to March	Not required due to limited habitat.	NA
Spotlighting and transect Walking.	For targeted survey near likely food resources: 2 x 1 hour spotlighting on two separate nights	All year	2 Hour spotlighting for 8 nights.	Sufficient quantity to assess habitat.
Day habitat search	Search for bat excreta at or near potential habitats	All year	Not undertaken	NA

2.4.2 Weather conditions recorded during surveys

Rainfall was low during the spring and summer of 2016 until rain broke in February March of 2017. Thus, sampling days were generally undertaken during dry average mean months, 70 mm (Sep 2016) and 75mm (Dec). Generally, this would be considered a limitation of sampling if key frog and fish habitat was identified, however both are limited onsite and in addition the proposal has no plans impact on these habitats, so we considered sampling conditions to be suitable for the range of species likely to use the site. Refer to Table 7.

Table 7. Weather data

Date	Minimum temperature (°C)	Maximum temperature (°C)	Rainfall (mm)	9am relative humidity (%)	3pm Temperature (°C)	3pm relative humidity (%)	3pm wind direction	3pm MSL pressure (hPa)	Surveys undertaken
7/09/2016	4.9	23.8	0	81	22.6	54	E	1027.5	Flora, Habitat, plant community, fauna diurnal and nocturnal
8/09/2016	8.6	24.2	0	75	22.8	48	ENE	1023.4	Flora, Habitat, plant community, fauna diurnal and nocturnal
12/09/2016	3.4	22.6	0	74	21.8	51	ESE	1017.4	Flora, Habitat, plant community, fauna diurnal and nocturnal
16/09/2016	11	21.9	0.2	65	20.6	48	NW	1015.3	Flora, Habitat, plant community, fauna diurnal and nocturnal
20/12/2016	11.7	34	0	60	33.1	36	NW	1005.4	Flora, Habitat, plant community, fauna diurnal and nocturnal
21/12/2016	16.9	30.9	0	64	28.3	52	SE	1009.6	Flora, Habitat, plant community, fauna diurnal and nocturnal
22/12/2016	19	24.2	0	71	23.3	57	ESE	1016.6	Flora, Habitat, plant community, fauna diurnal and nocturnal
23/12/2016	16.3	28.9	0	62	28.7	50	E	1014.7	Flora, Habitat, plant community, fauna diurnal and nocturnal

3.0 Results

3.1 Flora and Vegetation Communities of the Study Area

3.1.1 Flora Diversity in the Subject Site

Sampling undertaken for this assessment recorded approximately 172 flora species in the study area (Refer to Appendix B for details). Of these, approximately 23 exotic flora species were recorded. Approximately 13% of the floral diversity recorded is contributed to non-indigenous flora species throughout the entire site (Refer to table 8 and Plot data in Appendix A).

3.1.2 Vegetation communities within the Subject Site

Investigations identified four vegetation communities onsite, two of these are examples of the Nationally listed Central Hunter Valley eucalypt forest and woodland, which is a Critically Endangered Ecological Community (CECC EPBC Act 1999). One is an intact forest/woodland, the other is a derivative of this CECC. Nonetheless, these are both of high conservation value. The third community recorded is consistent with the determination for Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion (TSC Act 1995). This community onsite intergrades with the above CECC and as such is of high conservation value. The remaining community recorded is consistent with the Endangered Ecological Community Central Hunter Riparian Forest (EEC). This community is within the Mary Anne's Creek line and its banks, again a threatened community but of less conservation concern than the CECC.

Descriptions of vegetation map units. Allocation of map units to NSW Vegetation Classes (Keith 2004) and LHCCREMS units (NPWS 2000) is approximate only. Both of these classifications were designed to describe vegetation at a very broad scale (state and region, respectively) and site-scale vegetation units do not always readily fit into such broad-scale classifications. (TSC Act = Threatened Species Conservation Act; NW Act = Noxious Weeds Act; aff = affinity with but not equivalence).

Table 8 Vegetation structure and characteristics results from sample plots.

Parameters	h12-1	h12-2	h12-3	h12-4	h12-5	h12-6	h12-7	h12-8	h12-9	h12-10	h12-11
Topographic position	creekline	midslope	creekline	creekline	creekline	creekline	Hilltop	Hilltop	Mid slope	Mid slope	lower slope
Elevation											
Slope (%)	3	7	1	1	1	1	4	2	4	3	4
Aspect	sw	sw	south	south	south	south	n/w	n	w	w	sw
Soil Type	sandy/loam	sand/gravel	alluvial	alluvial	alluvial	alluvial	sand	sandy loam	sandy loam	sandy loam	sandy
Easting	339602	339630	3396536	339512	339488	339372	339493	339579	339488	339541	339385
Northing	6374713	6374977	6374765	6374558	6374428	6375004	6375124	6375279	6375131	6375470	6375087
Tree mean height	11	16	8	9	11	10	16	11	10	0	18
Tree mean cover	3	4	5	5	3	5	4	3	2	0	2
Sub Tree mean height	0	12	0	6	6	0	6	7	0	0	10
Sub Tree mean cover	0	3	0	2	2	0	2	2	0	0	3
Emergent tree mean height	0	0	0	0	0	6	0	0	1	0	1
Emergent tree mean cover	0	0	0	0	0	4	0	0	3	0	2
Tall Shrub mean height	0	6	0	0	0	0	0	3	0	3.5	0
Tall Shrub mean cover	0	2	0	0	0	0	0	2	0	3	0
Small Tree mean height	0	0	2	2	1	0	0	0	0	0	0
Small Tree mean cover	0	0	2	3.5	3	0	0	0	0	0	0
Shrub mean height	0	3	2	1	3	0	1	2	1	1	2.5
Shrub mean cover	0	3	1	2	3	0	2	2	2	2	2
Groundcover mean height	0.4	0.4	0.6	1	0.2	1	0.3	0.2	0.2	0.3	0.4
Groundcover mean cover	6	4	5	5	4	4	5	4	5	5	5

Table 8 (continued) Vegetation structure and characteristics results from sample plots.

Parameters	h12-12	h12-13	h12-14	h12-15	h12-16	h12-17	h12-18	h12-19	h12-20	h12-21	h12-22
Topographic position	Mid slope	Mid slope	lower slope	Mid slope	lower slope	Crest	Mid slope	Mid slope	Lower slope	Lower slope	Lower slope
Elevation											
Slope (%)	3	3	2	6	4	5	6	6	3	2	3
Aspect	ne	e	ne	w	w	ne	e	w/nw	n	ne	se
Soil Type	conglom	conglom	sandy	sandy loam	sandy loam	conglom	sandy	Loam	sandy loam	loam	sandy loam
Easting	339291	339282	339309	339617	339636	339721	339669	339431	339389	339389	339395
Northing	6374704	6374552	6374396	6374348	6374509	6375138	6375324	6375225	6374800	6374799	63744598
Tree mean height	17	16	16	16	16	18	0	0	0	0	13
Tree mean cover	3	3	3	4	2	3	0	0	0	0	2
Sub Tree mean height	1	9	10	5	8	6	0	0	0	0	0
Sub Tree mean cover	2	3	3	3	3	2	0	0	0	0	0
Emergent tree mean height	2	2	0	0	0	0	1	1	1	1.5	1.5
Emergent tree mean cover	2	2	0	0	0	0	2	2	2	2	2
Tall Shrub mean height	3	3	6	0	0	2	0	0	0	0	0
Tall Shrub mean cover	3	2	2	0	0	2	0	0	0	0	0
Small Tree mean height	1	0	0	0	1	3	2	1	0	1	1
Small Tree mean cover	2	0	0	0	2	2	2	2	0	1	3
Shrub mean height	1	1	1.5	2	1	1	1	1	1	0.6	0.6
Shrub mean cover	2	1	2	3	1	1	3	3	2	2	1
Groundcover mean height	0.2	0.2	0.2	0.5	0.4	0.4	0.5	0.4	0.3	0.4	0.4
Groundcover mean cover	4	5	4	5	5	4	6	6	6	6	6

Table 8 (continued) Vegetation structure and characteristics results from sample plots.

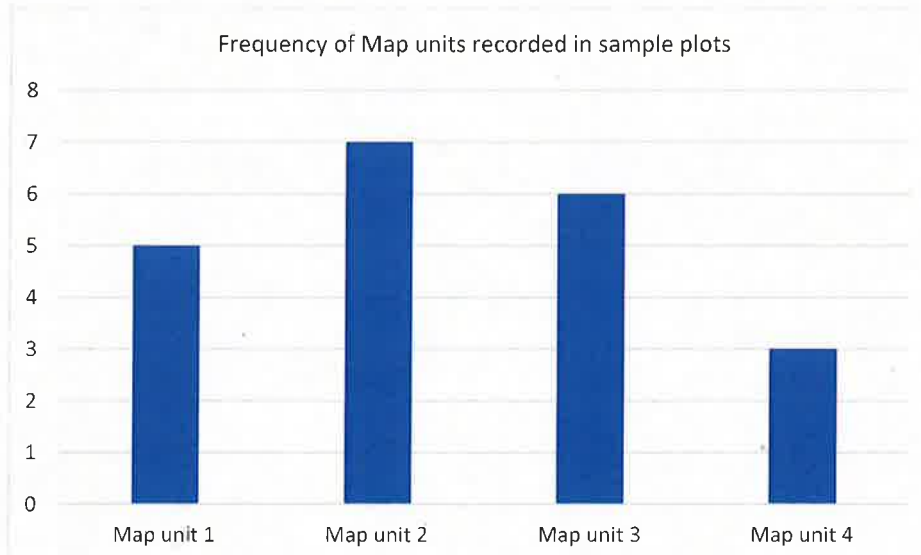
Parameters	h12-23	h12-24	h12-25	h12-26	h12-27	h12-28	h12-29	h12-30	h12-31	h12-32
Topographic position	Creekline	lower slope	lower slope	lower slope	lower slope	lower slope	Mid slope	Mid slope	Lower slope	Lower slope
Elevation										
Slope (%)	2	2	2	2	4	3	4	4	3	2
Aspect	e	ne	ne	nw	ne	ne	w	w/nw	n	ne
Soil Type	sandy loam	sandy	sandy	sandy loam	sandy loam	sandy loam	sandy	sandy loam	sandy loam	loam
Easting	339524	339402	339387	339380	339373	339334	339325	339322	339289	339346
Northing	6374401	6374466	6374529	6374625	6374709	6374714	6374606	6374514	6374440	6374433
Tree mean height	8	11	13	17	0	0	0	0	0	0
Tree mean cover	2	2	2	1	0	0	0	0	0	0
Sub Tree mean height	1	9	5	0	0	0	0	0	0	0
Sub Tree mean cover	2	2	2	0	0	0	0	0	0	0
Emergent tree mean height	1	1	1	0	0	0	0	0	1	1
Emergent tree mean cover	1	1	1	0	0	1	0	0	1	1
Tall Shrub mean height	5	0	0	0	0	1	0	0	1	1
Tall Shrub mean cover	3	0	0	0	0	0	0	0	0	0
Small Tree mean height	1	0	0	0	0	0	0	0	0	0
Small Tree mean cover	1	0	0	0	0	0	0	0	0	0
Shrub mean height	1	1	1	1	0	0	0	0	1	1
Shrub mean cover	1	1	1	1	0	0	0	0	2	2
Groundcover mean height	0.2	0.3	0.3	0.2	0.2	0.2	0.3	0.2	0.3	0.3
Groundcover mean cover	4	4	4	5	5	4	6	6	5	5

3.1.3 Map Units

Shown in Figure 4 (within this report)	Common Description of this Map unit onsite	Association with threatened communities	Conservation Significance
Map Unit 1:	Spotted Gum/ Grey Box/ Red Gum forest and woodland	Central Hunter Ironbark - Spotted Gum - Grey Box Forest typically forms an open forest to woodland dominated	Highly significant. Greatest conservation significance of vegetation in NSW.
Map Unit 2:	Scattered trees and isolated woodland patches derived from Spotted Gum/ Grey Box/ Red Gum forest and woodland.	Central Hunter Ironbark - Spotted Gum - Grey Box Forest typically forms an open forest to woodland dominated	Highly significant. Greatest conservation significance of vegetation in NSW.
Map Unit 3:	Spotted Gum/ Red Ironbark/ forest	Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion	Of high significance rare examples in the local area and intergrades with Central communities with important overlapping habitat qualities that are lacking from core areas of either community.
Map Unit 4:	River Oak Riparian Forest	River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Of high significance rare examples in the local area. Also provides important linking functions in a fragmented landscape.

All identified Map Units and communities were represented in the sample plots (n=22) sampling as shown in Figure 3.1

3.1. Frequency of sampling plots relevant to Map Unit descriptions as expressed by dominant over story trees.





Legend

Map Unit 1

Central Hunter Ironbark - Spotted Gum - Grey Box Forest open forest to woodland

Map Unit 2

Scattered trees and isolated woodland patches derived from Spotted Gum/ Grey Box/ Red Gum forest and woodland

Map Unit 3

Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion

Map Unit 4

River Oak Riparian Forest
River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions

Note: These polygons are considered a derivative of Central Hunter Ironbark - Spotted Gum - Grey Box Forest open forest to woodland and are of equal conservation importance.

Note: All other vegetation shown without polygons in this map or not belonging to a map unit are not native vegetation. This includes agricultural land, urban areas, and other land uses. The map includes scattered trees in acknowledged in this report, in particular in regard to Map unit 1.

Figure 1. Native Vegetation Map Units

Map Unit 1: Spotted Gum/ Grey Box/ Red Gum forest and woodland (Central Hunter Ironbark - Spotted Gum - Grey Box Forest typically forms an open forest to woodland dominated) and Map Unit 2: Scattered trees and isolated woodland patches derived from Spotted Gum/ Grey Box/ Red Gum forest and woodland (Central Hunter Ironbark - Spotted Gum - Grey Box Forest typically forms an open forest to woodland dominated).

Within the site this community was mapped as two map units. Map unit 1 being a disturbed but intact unit with multiple structural layers and descriptive flora species (See Plate 1 and 2). Map unit 2 on the other hand is a derivative of this community. In the local area, typically Central Hunter Ironbark - Spotted Gum - Grey Box Forest forms an open forest or woodland where it is often dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark), *Corymbia maculata* (Spotted Gum) and *Eucalyptus moluccana* (Grey Box). *Eucalyptus fibrosa* (Broad-leaved Ironbark) and *Eucalyptus tereticornis* (Forest Red Gum) may also be present in locals. In the local area *Allocasuarina luehmannii* (Bulloak) and *Acacia parvipinnula* (Silver Streamed Wattle) are common yet sparse in mature forests but *Allocasuarina luehmannii* can be a dominant in regenerating forests, which was the case on this site with several patches. Onsite shrub layer cover was very variable, due to narrow linear remnants and a history of grazing. When present shrubs included *Daviesia ulicifolia* subsp. *Ulicifolia* (Gorse Bitter Pea), *Pultenaea spinosa* (Grey Bush Pea), and *Bursaria spinosa* subsp. *Spinosa* (Native Blackthorn).

Ground cover in this community has many similarities to other local forest communities and as such can be a highly variable and poor descriptive characteristics. Common species recorded onsite include *Cheilanthes sieberi* subsp. *Sieberi* (Poison Rock Fern), *Cymbopogon refractus* (Barbed Wire Grass), *Pratia purpurascens* (Whiteroot), *Lomandra multiflora* subsp. *Multiflora* (Many-flowered Mat-rush), *Pomax umbellata* (Pomax), *Glycine tabacina* (Variable Glycine), *Dianella revolute* (Blue Flax Lily), *Laxmannia gracilis* (Slender Wire Lily), *Microlaena stipoides* var. *stipoides* (Weeping Rice Grass), *Lissanthe strigosa* (Peach Heath), *Desmodium varians* (Variable Tick-trefoil), *Dichondra repens* (Kidney Weed), *Eremophila debilis* (Winter Apple), *Calotis cuneifolia* (Purple burr-daisy), *Chrysocephalum apiculatum* (Common Everlasting), *Oxperularia diphylla* (Stinkweed), *Themeda australis* (Kangaroo Grass), and *Wahlenbergia communis* (Tufted Bluebell).

Map Unit 3: Spotted Gum/ Red Ironbark/ forest (Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion)

Within the site this community was mapped as one map unit where it was found closely aligned with the above map unit 1 where there is a natural and significant overlap between flora species especially in the ground cover layer. However, *Allocasuarina luehmannii* (Bulloak) which is a definitive species of map unit 1 above was found within this unit but *Acacia parvipinnula* is a descriptive species for this community. Lower Hunter Spotted Gum – Ironbark Forest is frequently dominated by *Corymbia maculata*, (Spotted Gum) and *Eucalyptus fibrosa* (Broad-leaved Ironbark), and on occasion other species may be locally more frequent such as, *E. punctata* (Grey Gum), *E. canaliculata*, and *E. crebra* (Grey Ironbark). See Plate 3.

Onsite the understorey included, *Acacia parvipinnula*, *Daviesia ulicifolia*, and *Bursaria spinosa*. Onsite ground cover species appear to be a better representation of typical of this unit, such as, *Cheilanthes sieberi*, *Cymbopogon refractus*, *Dianella revolute*, *Entolasia stricta*, *Glycine clandestina*, *Lepidosperma laterale*, *Lomandra multiflora*, *Microlaena stipoides*, *Pomax umbellata*, *Pratia purpurascens*, *Themeda australis* and *Phyllanthus hirtellus*.

Largely the community onsite is intact, and in healthy condition. Overall a good example of a small remnant in the local area.

Map Unit 4 River Oak Riparian Forest (River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions)

This community has a very expansive distribution and as such is very diverse. With the local area River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is

Frequently composed *Casuarina cunninghamiana* subsp. *cunninghamiana* (river oak), *Angophora floribunda* (rough-barked apple), and *Eucalyptus tereticornis* (forest red gum). Small trees was restricted to *M. styphelioides* (prickly-leaved teatree). Shrubs are sparse and due to grazing are limited to only the most tolerant of the species, including, *Bursaria spinosa* subsp. *spinosa* (blackthorn), *Solanum prinophyllum* (forest nightshade). The groundcover is composed of abundant forbs, scramblers and grasses including *Microlaena stipoides* (weeping grass), *Dichondra repens* (kidney weed), *Glycine clandestina*, *Pratia purpurascens* (whiteroot), *Entolasia marginata* (bordered panic), and *Oxalis perennans*. See plate 4.



Plate 1.



Plate 2

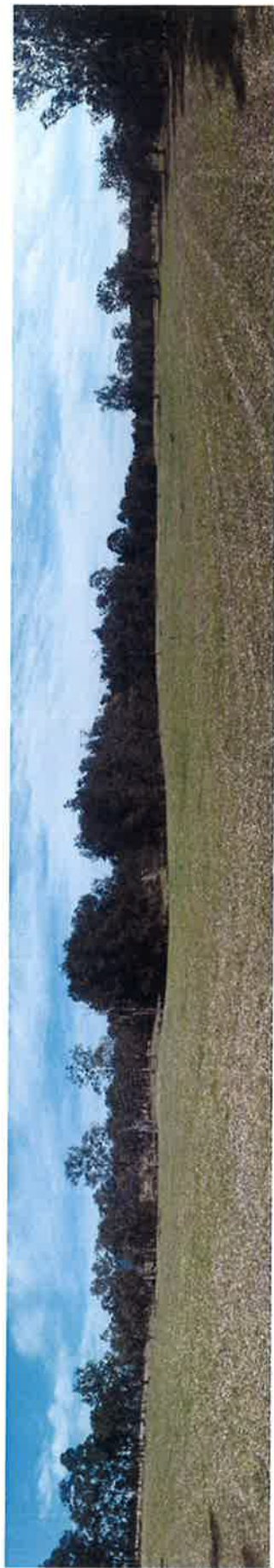


Plate 3



Plate 4

Noxious Weeds

Two flora species observed in the study area are declared as noxious under the Noxious Weeds Act 1993 (NW Act) for the LGA (Table 9). Other invasive species include *Chloris gayana* (Rhodes Grass), *Bidens pilosa* (Cobblers Pegs), *Setaria palmifolia* (Pigeon Grass) and *Verbena bonariensis* (Purple Top). Weeds typically occur along the intermittent creek line, and next to trails.

Table 9 Weeds occurring in the study area

Scientific name	Common name	Noxious weed category	Weed of national significance
<i>Ageratina adenophora</i>	Crofton Weed	4 – Locally controlled weed. Must not be sold, propagated or knowingly distributed.	No
<i>Cortaderia selloana</i>	Pampass Grass	3 – Regionally controlled weed. Must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed	No

3.2 Fauna Recorded in the Study Area

In total 85 fauna species have been recorded in the Study Area. Of these 9 frog species were identified, 11 reptiles, 44 birds and 21 mammals. Overall the Study Area provides forest, woodland, riparian and grassland habitats.

3.2.1 Frog species recorded

A range of habitats for frog species occurs in the study area, ranging from creek lines and pools, dams, wetlands and forest habitats. In total, 10 frog species have been recorded within the study area. These are shown in Table 10 below.

Table 10. Frog species recorded in the study area during past and present surveys.

Scientific name	Common name	Status	Recorded in the Subject Site
<i>Crinia signifera</i>	Common Eastern Froglet	Common	Yes
<i>Limnodynastes dumerilii</i>	Eastern Banjo Frog	Common but rare in area	No
<i>Platypsectrum ornatum</i>	Ornate Burrowing Frog	Common but rare in area	<u>Yes</u>
<i>Limnodynastes peronii</i>	Brown Striped Frog	Common	<u>Yes</u>
<i>Limnodynastes tasmaniensis</i>	Spotted Grass Frog	Common	<u>Yes</u>
<i>Pseudophryne bibronii</i>	Brown Toadlet	Common	Yes
<i>Uperoleia laevigata</i>	Smooth Toadlet	Common	<u>Yes</u>
<i>Litoria caerulea</i>	Green Tree Frog	Common but rare in area	<u>Yes</u>
<i>Litoria latopalmata</i>	Broad-palmed Frog	Common	<u>Yes</u>
<i>Litoria peronii</i>	Peron's Tree Frog	Common	<u>Yes</u>

3.2.2 Reptiles recorded

In total, 18 reptile species have been recorded in the study area (See Appendix B). Of these, 7 species were recorded in the subject site. These are shown below in Table 11 where observations of these relative to the subject site area made.

Table 11. Rare and threatened bird species recorded in the study area during past and present surveys and records on the subject site.

Scientific name	Common name	Status	Recorded in the Subject Site
<i>Underwoodisaurus milii</i>	Thick-tailed Gecko	Common	No
<i>Pygopus lepidopodus</i>	Common Scaly-foot	Common	No
<i>Amphibolurus muricatus</i>	Jacky Lizard	Common	Yes
<i>Amphibolurus nobbi</i>	Nobbi Lashtail	Common	No
<i>Physignathus lesueurii</i>	Eastern Water Dragon	Common	Yes
<i>Pogona barbata</i>	Bearded Dragon	Common	No
<i>Varanus varius</i>	Lace Monitor	Common	Yes
<i>Ctenotus robustus</i>	Striped Skink	Common	No
<i>Ctenotus taeniolatus</i>	Copper-tailed Skink	Common	No
<i>Egernia striolata</i>	Tree Skink	Common	Yes
<i>Pseudemoia platynota</i>	Red-throated Skink	Common	Yes
<i>Tiliqua scincoides</i>	Eastern Blue-Tongued Lizard	Common	No
<i>Dendrelaphis punctulatus</i>	Green tree snake	Common	No
<i>Demansia psammophis</i>	Yellow-faced Whipsnake	Common	No
<i>Furina diadema</i>	Red-naped Snake	Common	No
<i>Pseudonaja textilis</i>	Eastern Brown Snake	Common	Yes
<i>Vermicella annulata</i>	Bandy-Bandy	Common	No
<i>Pseudechis porphyriacus</i>	Red-Bellied Black Snake	Common	Yes

t = threatened species (TSC Act)

m = migratory bird listed on CMABA &/or JAMBA

3.2.3 Birds recorded

In total, 99 avian species have been recorded in the study area (See Appendix B). Of these, 14 species are considered either rare and/or listed as threatened. These species recorded onsite during surveys for this report are shown below in Table 12.

Table 12. Rare and threatened bird species recorded in the study area during past and present surveys and records on the subject site.

Scientific name	Common name	Status	Recorded in the Subject Site
<i>Ephippiorhynchus asiaticus</i>	Black necked stork	t	No
<i>Hieraaetus morphnoides</i>	Little Eagle	t	No
<i>Lophoictinia isura</i>	Square-tailed Kite	t	No
<i>Haliaeetus leucogaster</i>	white-bellied sea eagle	t	No
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	t	No
<i>Ninox strenua</i>	Powerful owl	t	No
<i>Tyto novaehollandiae</i>	Masked Owl	t	<u>Yes</u>
<i>Sericornis sagittatus</i>	Speckled Warbler	t	<u>Yes</u>
<i>Petroica multicolor</i>	Scarlet Robin	t	No
<i>Petroica phoenicea</i>	Flame Robin	t	No
<i>Petroica rosea</i>	Rose Robin	t	No
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler	t	<u>Yes</u>
<i>Daphoenositta chrysoptera</i>	Varied Sittella	t	<u>Yes</u>
<i>Artamus cyanopterus</i>	Dusky Woodswallow	t	<u>Yes</u>

t = threatened species (TSC Act)

m = migratory bird listed on CMABA &/or JAMBA

3.2.4 Bats recorded

Nine (9) flying mammal species were recorded from spotlighting and ultrasonic call detection in the Subject Site. These were Gould's Wattled Bat (*Chalinolobus gouldii*), Chocolate Wattled Bat (*Chalinolobus morio*), Little Bentwing-bat (*Miniopterus australis*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), Little Forest Bat (*Vespadelus vulturnus*) and, and Grey-headed Flying-foxes (*Pteropus poliocephalus*).

Of the two (2) Microchiropteran species recorded, Little Bentwing-bat (*Miniopterus australis*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) and are listed as Vulnerable under schedule 2 of the Threatened Species Act 1995. Grey-headed Flying-fox (*Pteropus poliocephalus*) was regularly recorded foraging in trees of the reference area but no Flying-fox "camp" was found. Grey-headed Flying-fox is listed as Vulnerable under both the Threatened Species Act 1995 and the Environment Protection and Biodiversity Conservation Act 1999. Table 8 details the distribution of these bats across the study area.

Table 13. Bat species recorded in the study area. RA refers to being recorded in the Reference area, whilst PA refers to be being recorded in the Subject Site.

Bat Species recorded	Status	Recorded	Bat Species recorded	Status	Recorded
Gould's Wattled Bat (<i>Chalinolobus gouldii</i>)		<u>Yes</u>	Little Forest Bat (<i>Vespadelus vulturnus</i>)		<u>Yes</u>
Chocolate Wattled Bat (<i>Chalinolobus morio</i>)		<u>Yes</u>	Grey-headed Flying-foxes (<i>Pteropus poliocephalus</i>)	t	<u>Yes</u>
Little Bentwing-bat (<i>Miniopterus australis</i>)	t	<u>Yes</u>	Eastern Bentwing-bat (<i>Miniopterus schreibersii oceanensis</i>)	t	<u>Yes</u>

3.2.5 Nocturnal Species recorded

Fifteen (15) nocturnal species were recorded in the study area by targeted nocturnal surveys, such as spotlighting, trapping, call play back, stag watching, and walking transects. Of these sixteen (6) were native species, of which five (2) of these are listed as threatened (some under TSC Act and others under EPBC Act). The remaining 14 species recorded are all common pest species. Table 9 details the distribution of these across the study area.

Table 14. Mammal species recorded in the subject site.

Native Species	Status	Recorded	Comments
Brush-tailed possum	c	<u>Yes</u>	
Eastern Grey Kangaroo	c	<u>Yes</u>	Large population onsite
Brown antechinus	c	<u>Yes</u>	Very small numbers recorded
Black Rat	P	<u>Yes</u>	small numbers recorded
Brown rat	P	<u>Yes</u>	small numbers recorded
Bush rat	c	<u>Yes</u>	One recorded
European Rabbit	P	<u>Yes</u>	Many individuals
Hare	P	<u>Yes</u>	small numbers recorded
Cattle	P	<u>Yes</u>	Large population onsite
Squirrel glider	(v- tsc)	<u>Yes</u>	3 individuals recorded onsite
Common Wombat	c	<u>Yes</u>	2 recorded onsite
House mouse	P	<u>Yes</u>	1 recorded
Red-necked Wallaby	c	<u>Yes</u>	Several seen
Fox	P	<u>Yes</u>	common

t = threatened species (TSC Act)

c= common

p= pest species introduced

4.0 Key fauna species distribution and abundance recorded onsite

4.1 Key species definition

Key species for this assessment are any species listed as threatened under the provisions of the TSC Act 1995 or listed as threatened or migratory under the provisions of the EPBC Act 1999, or a species which is recorded outside the limits of its known distribution. Based on surveys undertaken for this assessment there are ten species considered likely to be indirectly impacted by the proposal and require further investigation. These are:

1. Grey-crowned Babbler;
2. Wedge-tailed Eagle,
3. Masked Owl;
4. Speckled Warbler;
5. Dusky Woodswallow;
6. Varied Sittella;
7. Squirrel glider;
8. Eastern Bentwing-bat;
9. Little Bentwing-bat; and,
10. Grey-headed Flying-foxes.

It must be reiterated that the proposal will not be removing or modifying vegetation communities, however a small number (~3) of paddock trees (none with hollows) may be required to be removed for construction purposes. Nonetheless, changes in the activities onsite and the tourism activities which include agriculture may indirectly impact on fauna. This section aims to address these concerns as they relate to each species. Species specific recommendations are made within as well as mitigation options.

4.2 Grey-crowned babbler

In total, 11 individual Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) were recorded onsite belonging to three separate troops (See Figure 4). Although listed as threatened the species is a common woodland bird of the central to upper part of the Hunter Valley and is also quite common in modified habitats in the Lower Hunter north of the Hunter River (e.g. Seaham, Woodville). Frequently recorded in managed woodlands, or recreational landscapes where trees and gardens are managed and improved with watering and fertilization, such as golf courses, the species forages in social groups on the ground and within lower branches of both small and large trees.

Multiple nests are constructed by the family group and these are frequently remade seasonally within new trees to minimise parasites. Locations for nests can be found from deep inside small dense sub canopy trees or garden trees, such *Melaleuca armillaris*, or up to the outer branches of large Eucalypts, but are more than frequently recorded in small (<6m) regenerating trees where the nest is made centred around the trunk and bolstered by the main branches. Whilst there is currently no quantitative evidence available regarding the importance of regenerating trees in the regional area, my own observations made over 25

years suggests that regenerating habitats are important and that a continuation of this is likely important into the future.

The proposal includes the improvement of the open paddock areas to enhance understories and incorporate organic gardening into the landscape. As can be seen in Figure 4 the individuals recorded onsite were observed to use all three habitats onsite, woodland riparian forest and parts of the scattered tree community. The use of habitat recorded onsite is consistent with the 92 observations made in the local and added to the NPWS database (Figure 4). The benefits and risks of the proposal and if the site was to remain as is, and have a continuation of current activities is presented below. Specifically, this is presented as this relates to conservation of the local Grey-crowned Babbler population.

Risk Benefit Matrix Grey-crowned Babbler population

Present site activities staying as they are.		Proposal being adopted as is.	
Risk	Benefit	Risk	Benefit
Continued loss of trees due to logging and firewood collection.	Natural regeneration of trees will only be impacted by grazing levels.	If unmanaged natural regeneration may be controlled by gardening objectives.	Logging and firewood collection will cease and management can be introduced.
Continued ongoing grazing may have long term impacts that reduce quality of the habitat as there is no control on intensity.	Natural and exotic grasses are grazed thus keeping grasses low and open with plentiful ground foraging opportunities.	Loss of grazing and introduction of gardens may decrease the area and quality of round foraging habitats.	Introduction of management strategy that retains and improves areas for foraging.
No management and monitoring of population.	Reduced human interaction.	Increased human interaction.	Improved management and monitoring of population.

4.3 Masked Owl

Calls of Masked Owl played through an amplifier are used to elicit territorial responses from individuals within a area. Owls are also often detected opportunistically during spotlight or diurnal searches. 12 hours of Owl call playback were conducted as part of the surveys for this report, this work being conducted by at least two experienced surveyors. Calls were produced by the playing of digital Owl calls on a 20 amp buskers amplifier powered by a 12 volt lead battery (12 nights of one hour Owl call back). 10 minutes of playing was followed by 10 minutes of searching and quite listing (this was repeated for the other Owl species known to the local). 4 continuous nights of surveys were conducted on two occasions. Surveys were only conducted in good weather and commenced shortly after dark, no other work was commissioned to this time.

One individual male Masked Owl was recorded onsite during sampling (See Figure 4). Listed as threatened this species is uncommon in the central to upper part of the Hunter Valley. More records exist for this species in habitats in the Lower Hunter (e.g. North Lake Macquarie) than central, likely a function of clearing and suitability (lower abundance of rats). Frequently recorded in Forests with a matrix of high quality understorey that supports a high abundance of ground mammals and marsupials.

Suitable roost and nest trees are frequently large vertical spouts (>400) in stags up to 15 metres tall. Occasionally in large trunk hollows in the region but much rarer than spouts and trunk hollows are more in demand. Locations for breeding and den trees can be found from anywhere throughout Eucalypt forest

and woodlands, but are more than frequently recorded in quite locations. Disturbance of nesting sites is a real concern for this species as a pair will vacate a suitable nest site once disturbed.

True forest owls require expansive home ranges, where they shift focus to other areas of their home range when food supply starts to get low, allowing restocking of prey species. The site and adjoining forests/woodlands may represent key habitat in the local area that could be used by an individual or a pair. In total, four suitable nest and roost trees (Stags with large vertical spouts i.e. >400 diameter) were recorded onsite, Refer to Table 15 below.

Table 15 Suitable Masked Owl trees recorded onsite

Stag/tree	Easting	Northing	Height	Hollow Type
Stag	339499	6374732	9	600 mm vertical spout
Stag	339499	6374722	8	400 mm vertical spout
Stag	339405	6374530	7	400 mm vertical spout
Stag	339387	6374599	11	500 mm vertical spout

All of these stags were watched at least 3 times over 8 nights for 30-45min each following dusk. An experienced ecologist sat unlighted listening to the tell-tale sounds of owls scratching their way up a spout. When sounds were heard, soft lighting was used to locate the source of the sound before using high powered (>1000 candle power) lights and binoculars to make a positive ID. These surveys were complemented by spotlighting and call playback (for those that seek comprehensive survey details, these can be found in appendix A) On the 5th night 14/9/2016 one Masked owl heard responding to call playback. Once the owl was detected, the playback was discontinued to allow the owl to resume its normal activities. This individual was later that night located 200 metres to the west of the site on adjoining land. It was positively identified by the author (25 years of owl hunting experience) as a male Masked Owl.

The proposal includes the improvement of the open paddock areas to enhance understories and incorporate organic gardening into the landscape. Only one other observation has been made in the local and added to the NPWS database (Figure 4). The risks and benefits of the proposal and if the site was to remain as is, and have a continuation of current activities is presented below. Specifically, this is presented as this relates to conservation of the local Grey-crowned Babbler population. This is rounded out with recommendations for appropriate mitigation strategies and site layout.

Risk Benefit Matrix Masked Owl population

Present site activities staying as they are.		Proposal being adopted as is.	
Risk	Benefit	Risk	Benefit
Continued loss of potential habitat trees due to logging and firewood collection.	Natural regeneration of trees will allow future establishment of suitable trees	If unmanaged natural regeneration may be controlled by gardening objectives.	Logging and firewood collection will cease and management can be introduced.
Ongoing grazing removes habitat for rats.	Continued ongoing grazing retains hunting opportunities by increasing foraging opportunities at edges.	Loss of grazing and introduction of gardens may decrease the area and quality of ground foraging habitats.	Introduction of management strategy that retains and improves areas for foraging.
No management and monitoring of population.	Reduced human interaction.	Increased human interaction.	Improved management and monitoring of population.

Based on regional distribution and the findings made here Masked Owl requires additional mitigation beyond the establishment of the E2 lands in the local area.

4.4 Speckled Warbler

Speckled Warbler was recorded a total of 5 times over the space of 8 days onsite and land adjoining the site to the east (See Figure 4). It is unclear how many individuals are within the local population but at least two birds were seen together, therefore it is at least two. None were recorded onsite during these surveys, but are predicted to use the site from time to time. Listed as a threatened the species is a moderately common rare woodland bird of the central to upper part of the Hunter Valley, but only in large remnants (200ha -400ha). Frequently recorded in woodlands with a grazing history but currently not grazed. Nests are on the ground at the base of a bush or within fallen logs, can be very difficult to locate. A diversity of ground structure, including fallen timber, open tussock, rocks and topography appear to be drivers in selection (untested).

The proposal includes the improvement of the open paddock areas to enhance understories and incorporate organic gardening into the landscape. As can be seen in Figure 4 the individuals recorded onsite were observed to only use woodland and riparian woodland forest. The use of habitat recorded onsite is consistent with the observations made in the local and added to the NPWS database (Figure 4). The risks and benefits of the proposal and if the site was to remain as is, and have a continuation of current activities is presented below. Specifically, this is presented as this relates to conservation of the local Speckled Warbler population. This is rounded out with recommendations for appropriate mitigation strategies and site layout.

Risk Benefit Matrix Grey-crowned Babbler population

Present site activities staying as they are.		Proposal being adopted as is.	
Risk	Benefit	Risk	Benefit
Continued loss of trees due to logging and firewood collection.	Natural regeneration of trees will only be impacted by grazing levels.	If unmanaged natural regeneration may be controlled by gardening objectives.	Logging and firewood collection will cease and management can be introduced.
Continued ongoing grazing may have long term impacts that reduce quality of the habitat as there is no control on intensity.	Natural and exotic grasses are grazed thus keeping grasses low and open with plentiful ground foraging opportunities.	Loss of grazing and introduction of gardens may decrease the area and quality of round foraging habitats.	Introduction of management strategy that retains and improves areas for foraging.
No management and monitoring of population.	Reduced human interaction.	Increased human interaction.	Improved management and monitoring of population.

4.5 Dusky Woodswallow

One Dusky Woodswallow was recorded 900m to the south of the site in *Casuarina glauca* beside Gillard's Lane on the 16/09/2016 (See Figure 4). Very uncommon in the local area, but frequently recorded in natural woodlands and sometimes unmanaged woodlands west of the Great Dividing Range. Although not recorded onsite it is likely that the site would be used.

The proposal includes the improvement of the open paddock areas to enhance understories and incorporate organic gardening into the landscape. The use of habitat near the site is consistent with the other observations made in the local and added to the NPWS database (Figure 4). The risks and benefits of the proposal and if the site was to remain as is, and have a continuation of current activities is presented below. Specifically this is presented as this relates to conservation of the local Dusky Woodswallow population. This is rounded out with recommendations for appropriate mitigation strategies and site layout.

Risk Benefit Matrix Grey-crowned Babbler population

Present site activities staying as they are.		Proposal being adopted as is.	
Risk	Benefit	Risk	Benefit
Continued loss of trees due to logging and firewood collection.	Natural regeneration of trees will only be impacted by grazing levels.	If unmanaged natural regeneration may be controlled by gardening objectives.	Logging and firewood collection will cease and management can be introduced.
Continued ongoing grazing may have long term impacts that reduce quality of the habitat as there is no control on intensity.	Natural and exotic grasses are grazed thus keeping grasses low and open with plentiful ground foraging opportunities.	Loss of grazing and introduction of gardens may decrease the area and quality of round foraging habitats.	Introduction of management strategy that retains and improves areas for foraging.

No management and monitoring of population.	Reduced human interaction.	Increased human interaction.	Improved management and monitoring of population.
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4.6 Varied Sittella

One individual Varied Sittella was recorded adjacent and on the site during sampling (See Figure 4). Newly listed as a threatened species, it is frequently recorded in North Rothbury (may be due to effort more than habitat) and less so in the Pokolbin, which could be a function of reduced forest height, less rough barks and increased fragmentation. Nonetheless, the species uses the habitat onsite and although unsurveyed here, it is likely to occupy the lands to the north of the site that link to the north population. Rarely recorded in managed forest or woodlands, or recreational landscapes. Almost never seen on the ground and frequently at least 10 metres high in the canopy. Nests are constructed along branches high in the canopy.

Varied Sittella occur in eucalypt woodlands and forests where rough-barked species occur, like stringybark or ironbark species occur with either a shrubby understorey or grassy ground cover. They forage in the canopy on large branches, searching knot holes, crevices and beneath loose bark for arthropods. Foraging is usually done arboreally with Varied Sittella rarely observed on the ground.

Varied Sittellas roost in tree branches approximately 14 metres high, in clusters of up to 11 individuals. They maintain no fidelity to any one roost site and sites are scattered throughout the home range. They nest in upright branch fork, usually on dead branches. Nests are generally in Ironbark or stringybark and will nest in the same tree for many seasons. Varied Sittellas breed cooperatively. The proposal includes the improvement of the open paddock areas to enhance understoreys and incorporate organic gardening into the landscape. None of the proposed activities onsite will impact on Varied Sittella and as such no further assessment is required.

4.7 Squirrel glider

Squirrel Glider is a hollow-dependant, mainly nectivorous species (also feeds on insects, exudates, etc.). Although a reliable model of its habitat is yet to be developed, the current knowledge suggests that Squirrel Glider occurs in mixed eucalypt forests with a high proportion of hollow-bearing trees, and winter flowering nectiferous tree or shrub species. Squirrel Glider is sampled using tree-mounted traps and by spot-light searches. Marking of captured individuals can assist with estimation of population size.

Trapping was undertaken along three transects, with sample points at regular intervals. We placed at least 3 traps at each sample point on the three trees with a diameter of at least 0.2m (dbh) nearest to the sample point. The 3 traps represent a single sample. Several different trap types are available depending on the target species and investigator preferences. The most commonly used trap is the Elliott brand folding aluminium box trap (usually size A or B) which is mounted on the trees 3 to 4 metres above the ground using wooden platforms attached at approximately 90° to the tree trunk (angled slightly down towards to trunk to allow rainwater to flow away from, instead of into the trap). We wrap traps in 'bubble wrap' for insulation and enclose the whole trap in a plastic bag to exclude rainwater. Some form of insulating 'nesting' material is placed in the trap.

We also use a specially designed glider trap (HWR Glider Trap). Trial studies have shown them to have as good or better capture rates than Elliott traps, they are not subject to accidental closures, they cannot injure the animals, and they are weather-proof. They are designed to trap target mammals such as the threatened Squirrel Glider, but not more common species, such as Ringtail Possums and Brushtail Possums, thereby maximising their value in surveys of the more 'important' species. Traps are typically baited with a mixed of rolled oats, peanut butter and honey (sometimes with other aromatic additives). A honey-water mixture (1:1) is also applied to the trunk of the tree prior to trapping and after checking each trap where the trap is to be left in place for the next night. A barrier of Tangle Foot brand insect barrier is sometimes used to prevent ant intrusion in the traps. More comprehensive data on methods can be found in Appendix A.

In total, five captures of three individual Squirrel gliders were trapped onsite; a 208gm male(RECAP), 192gm female and a 189 female(RECAP) (See Figure 4). Although the data is limited the number of gliders in the local remnant, including the site is likely to be at least 24 ($\sim 1.8\text{ha}^{-1}$). This patch is connected to Mary Anne's Creek and to habitats in the north and has tenuous links to the east and North Rothbury, links to the west and south are extremely limited and would be unlikely to facilitate any meaningful opportunity. Regardless, this patch is isolated and vulnerable to stochastic events, especially for animals with poor dispersal capabilities like Squirrel glider.

The proposal includes the improvement of the open paddock areas and creek lines to enhance understories and incorporate organic gardening into the landscape. As can be seen in Figure 4 the individuals recorded onsite were observed to use all forest, woodland and riparian forest and parts of the scattered tree community. The use of habitat recorded onsite is consistent with the 33 observations made in the local and added to the NPWS database (Figure 4). The risks and benefits of the proposal and if the site was to remain as is, and have a continuation of current activities is presented below. Specifically this is presented as this relates to conservation of the local Grey-crowned Babbler population. This is rounded out with recommendations for appropriate mitigation strategies and site layout.

Risk Benefit Matrix Squirrel Glider population

Present site activities staying as they are.		Proposal being adopted as is.	
Risk	Benefit	Risk	Benefit
Continued loss of trees due to logging and firewood collection.	Natural regeneration of trees will only be impacted by grazing levels.	If unmanaged natural regeneration may be controlled by gardening objectives and planting may include species not beneficial to Squirrel Glider.	Logging and firewood collection will cease and management can be introduced.
Continued ongoing grazing may have long term impacts that reduce quality of the habitat especially winter flowering shrubs.	None	Loss of grazing and introduction of gardens may decrease the area and quality of foraging habitats.	Introduction of management strategy that retains and improves areas for foraging.
No management and monitoring of population.	Reduced human interaction.	Increased human interaction.	Improved management and monitoring of population.

4.8 Bats and Flying Fox

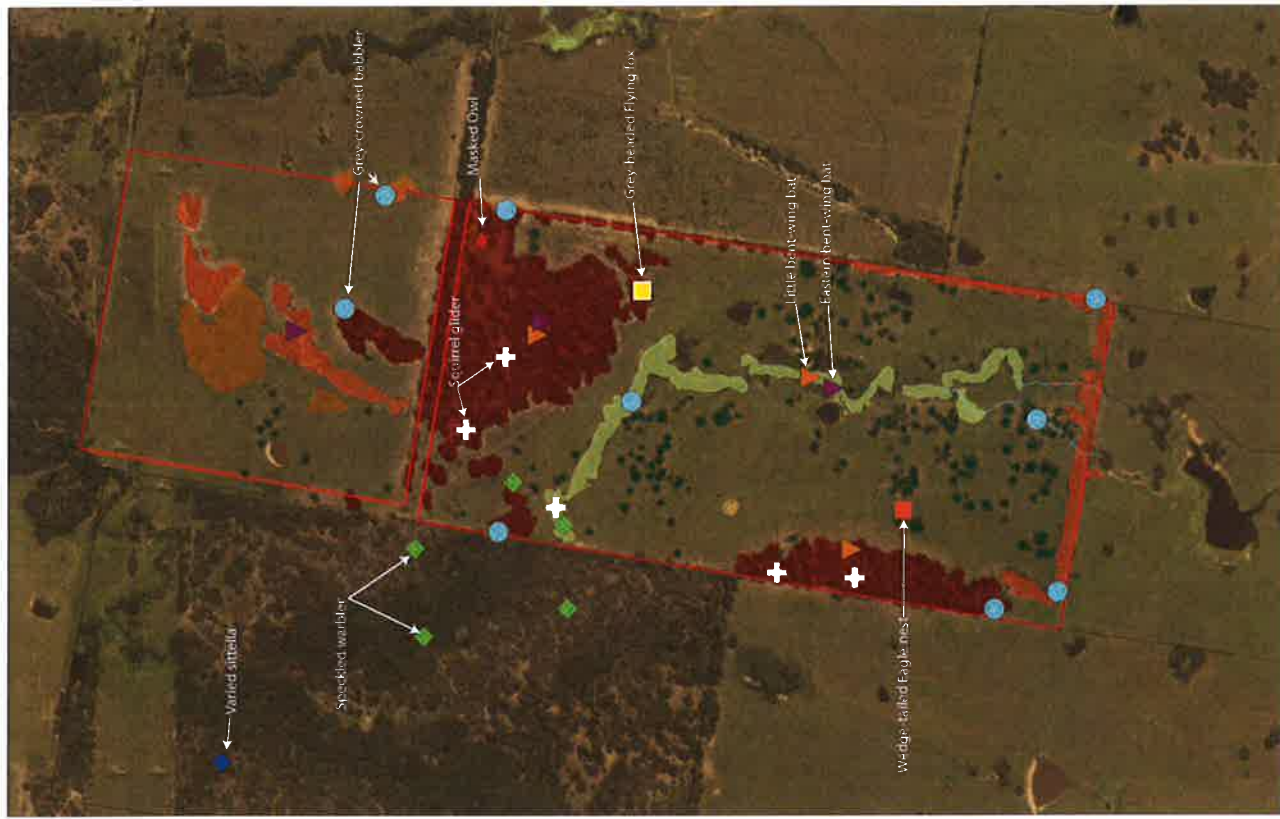
Micro-bats were recorded in all habitats in the study area. Whilst recorded more frequently within open areas within the Subject Site, the value of the site for foraging for micro-bats is clearly of value.

Based on regional distribution and the findings made here (Figure 4) Little Bentwing-bat (*Miniopterus australis*), and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) are considered to be present onsite at least occasionally.

The Bentwing Bats are cave dwelling bats not travel long distances to forage. By comparison Freetail bats are hollow dwelling bats that use mature Eucalypt trees and sometimes in manmade structures. Given that the proposal will not be impacting on hollows bearing trees or modifying forest in a way that would reduce habitat potential these species do not require any further discussion.



Insert of Dusky Woodswallow record



Location: Gillards Lane, Pokolbin NSW	
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Figure 4. Significant fauna recorded

4.9 Significant fauna species recommendations and strategies

Recommendations and strategies for significant fauna recorded onsite is shown in following matrix (Table 16).

Table 16. matrix of recommendations and strategies for all significant fauna

	Before Approval	Before Construction commencement	During construction	Long term (5 years)
Recommendations	Incorporation of species specific habitat requirements into landscape plan	Incorporate habitat management objectives into a fauna management plan and incorporate into a site management plan	Supervision of construction activities by qualified ecologist	Undertake monitoring of fauna using replicated sample plots onsite and offset (control sites) to provide quantitative data on the health of the population relative to local populations
Mitigation Strategies	na	Permanent marking of nest sites, hollow trees and stags.	Collection of any material onsite that can provide habitat for species in the remainder of the site, such as logs and debris found in paddock areas	Regeneration of creek line habitats and woodland habitats to restore damaged areas and increase creek line functioning.
	na	na	Creation and restoration of woodland habitats onsite that supports biodiversity but not increase bushfire hazards	Monitoring and maintenance of restoration efforts.
	na	na	Restoration of creek lines in locations that support biodiversity but not increase bushfire hazards or access across creek lines.	Monitoring and maintenance of restoration efforts.
	na	Undertake seasonal monitoring of potential owl trees to assess usage prior to construction Installation of 3 large owl boxes in woodland area	Supervision and stag watching of owl trees	Monitoring of Owl boxes in woodland area, rehabilitation areas and habitats for threatened fauna species.

5.0 Statutory Requirements

5.1 Environment Protection & Biodiversity Conservation Act 1999

The Commonwealth Environment Protection & Biodiversity Conservation Act, 1999 (EPBC Act) requires the approval of the Commonwealth Environment Minister for all actions that will or are likely to have a significant impact on a matter of national environmental significance (MNES). The Subject will not result in any impacts on MNES pursuant EPBC Act and therefore will not require referral to the Commonwealth Department of the Environment. Detailed assessments follow below for species identified in previous sections as potentially being impacted by the proposal.

5.1.1 National listing of the Central Hunter Valley eucalypt forest and woodland as a critically endangered ecological community

Environment Australia has prepared Draft Conservation Advice for the Central Hunter Valley eucalypt forest and woodland complex ecological community. A critical aspect of this advice for this project is the determination of derived grasslands/shrublands derived from the CECC.

It follows that for grasslands to be classed as being derived from CHVEF and to be recognised as part of this nationally protected ecological community they need to comprise $\geq 70\%$ native vegetation cover, and that connects discrete patches of the ecological community that are in close proximity to each other (up to 100m apart). In such cases these isolated patches connected by native endemic grasses are to be considered as a single patch. The advice goes further to add that these grasslands are an important part of the broader ecosystem and may have potential for restoration, possibly to a condition that in the future will make them eligible for inclusion in the nationally protected ecological community. The justification for this inclusion are:

- They contain much of the native plant biodiversity of the ecological community and act as a seed bank and source of genetic material; and,
- The derived grasslands/shrublands also act as buffer zones, that protect the woodland remnants from adjacent activities, and stepping stones that enable the movement of fauna between remnant woodlands.

The findings from 32 quantitative vegetation and flora quadrats (400m²) undertaken as part of this assessment shows that native flora recorded within samples taken within grassland plots in proximity to the project area never represented more than 40% of the diversity recorded. In conclusion, the grassland areas of the site do not comprise derived grasslands of CHVEF and the proposal aims to retain all trees and restore degraded lands.

In order to be considered a Matter of National Environmental Significance under the EPBC Act, areas of the ecological community must meet the key diagnostic characteristics as outlined in the listing; and at least the minimum Condition thresholds for Moderate quality (i.e. for class C or D). In developing the condition thresholds for the ecological community, it is acknowledged that small patches that remain largely intact can have significant conservation value despite their size. The listing has identified four factors to consider, these are answered in reference to the findings onsite and the impact of the proposal in Table 17.

Table 17. Factors considered in assessment of community onsite

Factors to be considered in determining if the patch meets the community thresholds	Findings onsite	Impact likely?
Mature locally indigenous trees (and hollow bearing trees) are important for the range of habitats and resources they provide to species in the ecological community;	Many large mature trees and hollow trees belonging to this community were recorded onsite and based on results of fauna surveys, these large trees defiantly play an important ecological role.	No. Only two small (~7) trees are likely to be cleared (these may be avoided during construction). No hollow bearing trees are to be removed. Onsite restoration and creation will enhance these habitat trees and provide a successional forest community into the future.
large intact patches are relatively uncommon in this landscape	Yes, true and whilst there is remnant patches onsite they are linear and degraded. Land directly to the west supports a large intact patch.	The proposal includes the rehabilitation and restoration of this community onsite to increase its size and condition.
larger size and/or connectivity to other native vegetation areas are typically beneficial. It is intended that the condition thresholds will exclude heavily degraded patches on farms with isolated paddock trees	The site has 2.9ha of linear fragmented degraded and grazed examples of the community. Based on the distribution of the community onsite, the low-lying areas of the site would have likely (based on distribution present today) the community comprise 15.9ha. Of this area all is highly degraded and does not fit the listing as described. However, it is acknowledged that it is important that connectivity and patch size is retained and enhanced where possible for long term viability.	Whilst the proposal includes development of ~5ha of this degraded area, the proposal also is making commitments to rehabilitate and restore significant areas of habitat to increase patch size and improve connectivity with adjoining patches. Refer to Figure 5.
Small narrow stands of trees over exotic pastures, crops, or weeds that serve as windbreaks or shelter belts	This is true for this community on site where it forms a wind break along the southern and eastern boundary.	These areas onsite are to be retained and rehabilitated as part of this proposal.

5.2 EPBC Koala assessment

Koala survey methods were adapted from those of Phillips (2002). This approach allows the estimation of activity levels based on the percentage of trees with scats present. Our survey comprised two stages. The first involved the locating of likely habitat trees and their searching. Any tree found to have scats present was flagged and further searches were conducted in other areas removed from the vicinity of this tree. Return surveys were conducted on previously identified areas of Koala activity, thus focusing our efforts on areas of high activity. The closest 30 trees around these identified trees were searched for scats. All tree species were recorded, as was the location of the plot. Scats were compared to reference pellets to ensure correct identification. The only deviation from this method was in the vegetation dominated by non feeds, where no koala pellets could be found. Within these sites several searches were conducted in the absence of any use by koala.

Koala scats were not identified under any trees within the site and whilst koala have been recorded in the local area it was not recorded onsite. Within the immediate area of the proposal E.

punctate, *Eucalyptus tereticornis* var. *dealbata*, and *Eucalyptus blakelyi* ranged in cover percentage terms (relative to other mature tree species) from a low of 0% to a upper of 16%. One of the sampled sites (17) had a known koala feed tree representation (this means all types of koala feed tree species) greater than the threshold for koala impact under SEPP 44 of 15%.Refe to table 18.

In summary, secondary koala habitat is present but no koala usage was recorded the site. Nonetheless, we know that the local area provides habitat for a low level populations and based on this we must consider that in the future koala may use the site. Given that no clearing of trees is proposed and the proposal includes restoration and creation of koala habitats we conclude that a referral to the minister is not required. This advice directly follows the Draft EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory).

Table 18. Koala data collected from within the sample sites used for all data collection see section 2.2.

Parameters	h12-1	h12-2	h12-3	h12-4	h12-5	h12-6	h12-7	h12-8	h12-9	h12-10	h12-11
Topographic position	creekline	midslope	creekline	creekline	creekline	creekline	Hilltop	Mid slope	Mid slope	Mid slope	lower slope
Slope (%)	3	7	1	1	1	1	4	2	4	3	4
Aspect	SW	SW	South	South	South	South	N/W	N	W	W	SW
Soil Type	sandy/loam	sand/gravel	alluvial	alluvial	alluvial	alluvial	sand	sandy loam	sandy loam	sandy loam	sandy
Easting	339602	339630	3396536	339512	339488	339372	339493	339579	339488	339541	339385
Northing	6374713	6374977	6374765	6374558	6374428	6375004	6375124	6375279	6375131	6375470	6375087
Tree mean height	11	16	8	9	11	10	16	11	10	0	18
Tree mean cover	3	4	5	5	3	5	4	3	2	0	2
Koala feed tree species cover (%)*	1	5	0	8	12	6	4	1	2	0	1
Koala Pellets (spot assessment technique (SAT) Phillips 2011)	0	0	0	0	0	0	0	0	0	0	0
Mulch (g/m ²)	253	458	354	391	412	408	313	278	239	130	351
Parameters	h12-12	h12-13	h12-14	h12-15	h12-16	h12-17	h12-18	h12-19	h12-20	h12-21	h12-22
Topographic position	Mid slope	Mid slope	lower slope	Mid slope	lower slope	Crest	Mid slope	Mid slope	Lower slope	Lower slope	Lower slope
Slope (%)	3	3	2	6	4	5	6	6	3	2	3
Aspect	NE	E	NE	W	W	NE	E	W/NW	N	NE	SE
Soil Type	Conglom	Conglom	Sandy	Sandy Loam	Sandy Loam	Conglom	Sandy	Loam	Sandy Loam	Loam	Sandy Loam
Easting	339291	339282	339309	339617	339636	339721	339669	339431	339389	339389	339395
Northing	6374704	6374552	6374396	6374348	6374509	6375138	6375324	6375225	6374800	6374799	63744598
Tree mean height	17	16	16	16	16	18	0	0	0	0	13
Koala feed tree species cover	5	6	2	15	6	16	0	0	0	0	2
Koala Pellets (spot assessment technique (SAT) Phillips 2011)	0	0	0	0	0	0	0	0	0	0	0
Mulch (g/m ²)	468	250	459	197	212	237	107	59	307	124	226

*Note: in some cases the survey area required to estimate the nearest 30 trees for the swat technique extended beyond that used for the floristic description used in table 2-2 in section 2-2. This is the reason that the representation of koala trees may differ in this table to that of the floristic table in section 2-2.



Legend

Eucalypt forest regeneration

Creation of 3.2 ha of eucalypt forest consisting of a mixture of Central Hunter Ironbark - Spotted Gum - Grey Box Forest forest/woodland and Lower Hunter Spotted Gum - Ironbark Forest. Pathways, seating and other passive activities to be incorporated into final designs.

Riparian corridor regeneration

Repair and stabilisation of banks using a range of natural regeneration techniques. Inclusion of buffering vegetation and management of corridor to encourage successional tree development to support old growth forest in perpetuity. Increase in the width of corridor (~60m wide) in strategic places that supports ecological function and protects waterways whilst being sensitive to bushfire constraints.

Eucalypt forest windrow regeneration and enhancement

Narrow linear units also require the inclusion of buffering vegetation and specific management actions to encourage successional tree development in perpetuity. Fauna species specific strategies are required to enhance the linking functions of corridors and improve viability of fauna populations in larger patches connected by narrow patches.

5.3 Threatened Species Conservation Act 1995

The Threatened Species Conservation Act, 1995 (TSC Act) provides the legal framework for the listing and declaration of threatened species, populations, endangered ecological communities, key threatening processes and critical habitat. It also provides for the preparation and implementation of recovery plans, threat abatement plans and for licensing.

No listed or declared threatened species, populations, endangered ecological communities, or critical habitat will be impacted by this proposal. Table 19 and Appendix E provides a 7-part test for each threatened species, populations, endangered ecological communities, key threatening processes and critical habitat relevant to the proposed development.

Table 19. TSC species assessed.

Scientific Name	Common Name	Significant Impact Predicted?
<i>Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions</i>	Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions	No
<i>Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion</i>	Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion	No
<i>River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	No
<i>Eucalyptus glaucina</i>	Slaty Red Gum	No
<i>Pterostylis gibbosa</i>	Illawarra Greenhood	No
<i>Grevillea parviflora subsp. parviflora</i>	Small-flower Grevillea	No
<i>Persoonia pauciflora</i>	North Rothbury Persoonia	No
<i>Tyto novaehollandiae</i>	Masked Owl	No
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	No
<i>Chthonicola sagittata</i>	Speckled Warbler	No
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	No
<i>Daphoenositta chrysoptera</i>	Varied Sittella	No
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	No
<i>Petaurus norfolcensis</i>	Squirrel Glider	No
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	No
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	No
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	No
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	No
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	No
<i>Miniopterus australis</i>	Little Bentwing-bat	No
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	No
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	No
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	No

5.5 Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act, 1979 (EP&A Act) provides a framework for the assessment of development and activities which are likely to impact on threatened species, populations or ecological communities as listed pursuant to the TSC Act. It also requires that all relevant threat abatement plans and recovery plans are considered.

5.6 State Environmental Planning Policies (SEPP)

5.6.1 SEPP 44 – Koala Habitat Protection

State Environmental Planning Policy No 44 – Koala Habitat Protection (SEPP 44) was introduced to protect potential and core koala habitat in NSW. Under SEPP 44, developers of land with koala habitat (as defined in the SEPP) have to consider the impact of their proposals on koalas, and in certain circumstances, prepare individual koala plans of management for their land. State Environmental Planning Policy 44 – Koala Habitat Protection (SEPP 44) is relevant in this case and assessed within.

5.7 Relative key threatening processes

The key threatening processes of “clearing of native vegetation”, “Loss of hollow-bearing trees”, and “removal of dead wood and dead trees” are relevant to the proposed development.

5.7.1 Clearing of native vegetation

No native vegetation will be cleared, with a history of grazing, logging, track construction, and burning. The proposed does not include clearing of therefore it is not be deemed a significant removal of native vegetation.

5.7.2 Loss of hollow-bearing trees

No hollow bearing trees will be removed as part of the proposal.

5.7.3 Removal of dead wood and dead trees

No dead wood will be removed as part of the proposal.

The 7 Part tests for each species, population or community potentially impacted by the proposal (Appendix E) include assessments of key threatening processes when they are identified as a species at risk from these processes.

6.0 Predicted Impacts

The proposed development has been designed to avoid impacts on native vegetation and scattered trees. In addition, the proposal includes the regeneration of creek lines and the creation of additional habitats and the creation of extensive organic gardens in cleared land, thus adding to biodiversity. Given this constraint, we sought to minimise the ecological impact by detailed survey of the communities and habitats and identify and design a footprint that achieves the lowest impact levels possible.

Given this the proposed development will not result in a significant impact on ecological matters pursuant to the EP&A Act and EPBC Act.

The aim of the proposed development is to develop a sustainable resort that has a “minimal environmental impact” and to not impact on critical habitat for listed community, species, or population pursuant to the provisions of the Threatened Species Conservation Act 1995 (TSC Act 1995). There is no critical habitat identified within the local area for any species, population or community under the provisions of the TSC Act 1995.

7.0 Management Actions for Terrestrial Ecology

7.1 Introduction

Management plans that may be required for a remnant bushland area include: bushfire management; sediment and erosion control, restoration, weed management and threatened species management. Effective management plans requires adequate monitoring to identify management issues as they arise. Without the monitoring of ecological issues long term and cost effective management to maintain ecological process is unable to be achieved.

7.2 Ameliorative Measures

In general developments have a range of impacts which can be addressed through planning measures, particularly in regard to the actual earthmoving and drainage issues. Table 20, identifies these issues and suggests suitable ameliorative measures. It must be noted that these are only suggestions which could be adopted, however many of these issues will be addressed in other planning documents associated with this Subject.

Table 20. Potential constraints from the development and suitable ameliorative measures.

Impact	Potential Impact and constraints	Ameliorative Measures	Outcome
Native Vegetation & Habitat Clearance	Loss of approximately 5.5 ha of disturbed grassland vegetation.	Preparation of VMP for reserve area.	VMP will cover 20 ha, commence directly following approval and continue for 5 years thereafter. VMP will restore degraded areas of the reserve and rehabilitate areas lacking in vegetation It will also incorporate resources from the operational phase, such as hollows and debris.
Hydrological Changes	Water pollution (Sediment, Nutrients)	Best-practice erosion and sediment controls Sediment detention basins Limit cutting and filling	Manage volumes of water and sediment entering bushland and creeks Retain condition of riparian vegetation
Weed Invasion	Loss of biodiversity	Physical removal and control Implement a VMP for retained vegetation on the subject site Landscaping to incorporate local native species Education of the community	Increased biodiversity
Other Edge Effects	Disturbances to vegetation Impacts to threatened species and their habitats Weed spread	Control vehicle and pedestrian access into E2 lands Restore access trails	Minimal impacts to vegetation from vehicles and pedestrians Enhanced biodiversity Minimised edge effects

8.0 Conclusions

This proposal will not impact on Local or National ecological issues and, will not impact on threatened species, populations, communities or their habitats known to the Local Area.

The aim of this Subject is to have a “minimal environmental impact” and to not impact of critical habitat for any listed community, species, or population pursuant to the provisions of the Threatened Species Conservation Act 1995 (TSC Act 1995). We believe the Subject site meets the definition of a minimal environmental impact and are satisfied that there is no critical habitat identified within the local area for any species, population or community under the provisions of the TSC Act 1995.

Significant Flora

One sample from a red gum collected onsite is tentatively confirmed as the threatened tree *Eucalyptus glaucina*. It's possible that this is crossed with *E.punctata* onsite as it had some misleading characteristics. The project however does not involve clearing of any trees or eucalypt communities so it was deemed not necessary to investigate further. Surveys did not locate any other threatened or rare flora species onsite.

Significant vegetation

All communities recorded onsite are consistent with determinations for threatened communities. The proposal has been specifically designed to avoid these communities. Refer to Table 21 below.

Table 21. Communities recorded onsite

	Common Description of this Map unit onsite	Association with threatened communities	Conservation Significance	Impact
Map Unit 1:	Spotted Gum/ Grey Box/ Red Gum forest and woodland	Central Hunter Ironbark - Spotted Gum - Grey Box Forest typically forms an open forest to woodland dominated	Highly significant. Greatest conservation significance of vegetation in NSW.	No trees impacted and no derived habitats impacted. Restoration of habitat and creation of new areas proposed.
Map Unit 2:	Scattered trees and isolated woodland patches derived from Spotted Gum/ Grey Box/ Red Gum forest and woodland.	Central Hunter Ironbark - Spotted Gum - Grey Box Forest typically forms an open forest to woodland dominated	Highly significant. Greatest conservation significance of vegetation in NSW.	Due to AP2 requirements necessitating moving one of the buildings, the proposal may require the removal of two small (<7m) trees. All grasslands habitats within the proposal area (5.5ha) are exotic grasslands and are not consistent with the determination of derived grasslands. Therefore, the impact is marginal.
Map Unit 3:	Spotted Gum/ Red Ironbark/ forest	Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion	Of high significance rare examples in the local area and intergrades with Central communities with important overlapping habitat qualities that are lacking from core areas of either community.	No trees impacted and no derived habitats impacted. Restoration of habitat and creation of new areas proposed.

Map Unit 4:	River Oak Riparian Forest	River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Of high significance rare examples in the local area. Also provides important linking functions in a fragmented landscape.	No trees impacted and no derived habitats impacted. Restoration of habitat and creation of new areas proposed.
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Significant Fauna

Ten (10) significant fauna species were recorded onsite and in the local area:

- Grey-crowned Babbler
- Masked Owl
- Speckled Warbler
- Dusky Woodswallow
- Varied Sittella
- Squirrel glider
- Eastern Bentwing-bat
- Little Bentwing-bat
- Grey-headed Flying-fox
- Wedge-tailed Eagle

Twenty Eight (28) mature hollow bearing trees (HBT) were recorded onsite. The proposal will not at any stage require the removal of HBT's. Of these 28 HBT's four are considered highly significant hollow bearing trees that require preservation and management into the future.

Construction of the development will not directly impact significant natural areas (i.e. modify or remove habitats) or have secondary impacts (i.e. downstream impacts or change competition) to any ecologically sensitive areas. Therefore, the potential for impacts to the ecology of the area are minimal. The following recommendations are made in this report:

Table 22. Recommendations

	Before Approval	Before Construction commencement	During construction	Long term (5 years)
Recommendations	Incorporation of species specific habitat requirements into landscape plan	Incorporate habitat management objectives into a fauna management plan and incorporate into a site management plan	Supervision of construction activities by qualified ecologist	Undertake monitoring of fauna using replicated sample plots onsite and offset (control sites) to provide quantitative data on the health of the population relative to local populations
Mitigation Strategies	na	Permanent marking of nest sites, hollow trees and stags.	Collection of any material onsite that can provide habitat for species in the remainder of the site, such as logs and debris found in paddock areas	Regeneration of creek line habitats and woodland habitats to restore damaged areas and increase creek line functioning.
	na	na	Creation and restoration of woodland habitats onsite that supports biodiversity but not increase bushfire hazards	Monitoring and maintenance of restoration efforts.
	na	na	Restoration of creek lines in locations that support biodiversity but not increase bushfire hazards	Monitoring and maintenance of restoration efforts.

			or access across creek lines.	
	na	Undertake seasonal monitoring of potential owl trees to assess usage prior to construction Installation of 3 large owl boxes in woodland area	Supervision and stag watching of owl trees	Monitoring of Owl boxes in woodland area, rehabilitation areas and habitats for threatened fauna species.

In conclusion, the proposal will not impact on habitats for threatened species, populations, or communities to the extent that these are put at further risk. The ecological findings of this assessment are consistent with the results of Pre-Development Application advice conducted for the site. I can see no ecological reasons for not supporting the proposal.

Appendix B – Flora and Fauna Data

Family	Species name	Common name	Status	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Acanthaceae	<i>Brunoniella punilio</i>	Dwarf Blue Trumpet										1						1		1															
Alliaceae	<i>Nothoscordum borbonicum</i>	Onion Weed	*										1								2														
Anacardiaceae	<i>Schinus molle</i>	Pepper Tree	*														1																		
Antennariaceae	<i>Caesia parviflora</i>	Pale Grass-lily																																	
Apiaceae	<i>Centella asiatica</i>	Indian Pennywort																																	
Apiaceae	<i>Cyclospermum leptophyllum</i>	Slender Celery	*																																
Apiaceae	<i>Daucus glaberrimus</i>	Native Carrot																																	
Apocynaceae	<i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush	*																																
Apocynaceae	<i>Marsippospora rostrata</i>	Milk Vine																																	
Asphodelaceae	<i>Asphodelus fistulosus</i>	Onion Weed	*																																
Asteraceae	<i>Aster subulatus</i>	Wild Aster	*																																
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs	*																																
Asteraceae	<i>Brachyscome multifida</i> var. <i>multifida</i>																																		
Asteraceae	<i>Cassinia aculeata</i>	Dolly Bush																																	
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	*																																
Asteraceae	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	*																																
Asteraceae	<i>Cotula australis</i>	Common Cotula																																	
Asteraceae	<i>Eichlonia spp.</i>	A. Cudweed																																	
Asteraceae	<i>Gnaphalium calycos</i>	Cudweed	*																																
Asteraceae	<i>Hypochaeris radicata</i>	Catsear	*																																
Asteraceae	<i>Ozothamnus diosmifolius</i>	White Dogwood																																	
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	*																																
Asteraceae	<i>Solidago siliqua</i>	Bindyi	*																																
Asteraceae	<i>Sonchus oleraceus</i>	Common Sowthistle	*																																
Asteraceae	<i>Sonchus spp.</i>	Sowthistle	*																																
Asteraceae	<i>Tagetes minuta</i>	Stinking Roger	*																																
Asteraceae	<i>Vittadinia cuneata</i>	A. Fuzzweed																																	
Asteraceae	<i>Vittadinia spp.</i>	Fuzzweed																																	
Brassicaceae	<i>Capsella bursa-pastoris</i>	Shepherd's Purse	*																																
Brassicaceae	<i>Lepidium africanum</i>	Common Peppercress	*																																
Cactaceae	<i>Opuntia stricta</i>	Prickly Pear	*																																
Caryophyllaceae	<i>Cerastium glomeratum</i>	Mouse-ear Chickweed	*																																

Family	Species name	Common name	Status	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
Casuarinaceae	<i>Allocasuarina luehmianii</i> (emerg.)	Bullock																																		
Casuarinaceae	<i>Allocasuarina luehmianii</i>	Bullock																			2															
Casuarinaceae	<i>Casuarina cunninghamiana</i> subsp.	River Oak		2					1	3	1	0	1	1	1	1	3	0	0	3																
Casuarinaceae	<i>Casuarina cunninghamiana</i>	Swamp Oak				5	5	2	5																											
Chenopodiaceae	<i>Atriplex semibaccata</i>	Creeping Saltbush																																		
Commelinaceae	<i>Commelina cyanea</i>	Native Wandering Jew																																		
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed																																		
Cyperaceae	<i>Gahnia aspera</i>	Rough Saw-sedge		1			2	3	2	2	2	2	1	2	1	2	3	3	1						1											
Cyperaceae	<i>Lepidosperma laterale</i>	Variable Sword-sedge							2	1	2		1	2	2	2			2		1	2			1											
Eriaceae	<i>Leucopogon juniperinus</i>	Prickly Beard-heath		2					2	1	1	0	0	1	1	0	0	0	2																	
Eriaceae	<i>Lissanthe sirigosa</i>	Peach Heath							2	2	1	0	0	1	1	0	0				3	1														
Eriaceae	<i>Lissanthe sirigosa</i> subsp. <i>subulata</i>	Peach Heath																																		
Fabaceae (Faboidae)	<i>Daviesia ulicifolia</i>	Gorse Bitter Pea																																		
Fabaceae (Faboidae)	<i>Daviesia ulicifolia</i> subsp. <i>ulicifolia</i>	Pea							2	1	0	0	2	2	2	0	0	0	2																	
Fabaceae (Faboidae)	<i>Glycine clandestina</i>	Twining glycine		1																	3															
Fabaceae (Faboidae)	<i>Glycine latifolia</i>			2				1								1			1																	
Fabaceae (Faboidae)	<i>Glycine</i>	Small-leaf Glycine		1			2											1																		
Fabaceae (Faboidae)	<i>Glycine microphylla</i>								1							1			1																	
Fabaceae (Faboidae)	<i>Glycine</i> spp.																																			
Fabaceae (Faboidae)	<i>Glycine labacina</i>	Variable Glycine																																		
Fabaceae (Faboidae)	<i>Glycine tomentella</i>	Woolly Glycine																																		
Fabaceae (Faboidae)	<i>Hardenbergia violacea</i>	False Sarsaparilla																																		
Fabaceae (Faboidae)	<i>Indigofera australis</i>	Australian Indigo																																		
Fabaceae (Faboidae)	<i>Medicago sativa</i>	Lucerne	*						1										1	1																
Fabaceae (Faboidae)	<i>Pultanea spinosa</i>	A Bush Pea								1																										
Fabaceae (Faboidae)	<i>Trifolium repens</i>	White Clover	*	2																														1		

Family	Species name	Common name	Status	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
Fabaceae (Mimosoideae)	<i>Acacia amblyogona</i>	Fan Wattle		1																																
Fabaceae (Mimosoideae)	<i>Acacia brownii</i>	Heath Wattle		3																		3														
Fabaceae (Mimosoideae)	<i>Acacia parvipinnula</i>	Silver-stemmed Wattle																																		
Gentianaceae	<i>Centaurium erythraea</i>	Common Centaury	*					1	2	1	0	1	1	0	2																					
Geraniaceae	<i>Geranium solanderi</i> var. <i>solanderi</i>																																			
Goodeniaceae	<i>Goodenia spp.</i>							2	1																											
Hypoxidaceae	<i>Hypoxis spp.</i>																																			
Indicaceae	<i>Romulea rosea</i> var. <i>australis</i>	Onion Grass	*	1																																
Juncaceae	<i>Juncus acutus</i> subsp. <i>acutus</i>	Sharp Rush	*				3	4	1	5																										
Juncaceae	<i>Juncus subsecundus</i>	Finger Rush					1																	1												
Juncaceae	<i>Juncus usitatus</i>										1		1										1													
Lamiaceae	<i>Ajuga australis</i>	Austral Bugle																																		
Lauraceae	<i>Cassytha glabella</i> f. <i>glabella</i>																																			
Linaceae	<i>Linum marginale</i>	Native Flax																																		
Linaceae	<i>Linum trigynum</i>	French Flax	*																																	
Lobeliaceae	<i>Pratia purpurascens</i>	Whiteroot		1			1	2	2	1	1	1	2							2																
Lomandraceae	<i>Lomandra filiformis</i> subsp. <i>filiformis</i>								1											2	1	1		1												
Lomandraceae	<i>Lomandra glauca</i>	Pale Mat-rush							2				1							2																
Lomandraceae	<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	Many-flowered Mat-rush																																		
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush		1					1	1			1																							
Loranthaceae	<i>Amymma canabaei</i>	Needle-leaf Mistletoe					1	2																												
Loranthaceae	<i>Dendrophthoe vitellina</i>																																			
Luzuriagaceae	<i>Geltonoplesium cymosum</i>	Scrambling Lily																																		

Family	Species name	Common name	Status	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
Loranthaceae	Muelleria eucalyptoides																																			
Malaceae	Pyracantha angustifolia	Orange Firethorn	*			1	1	3	1																											
Malvaceae	Brachychiton populneus subsp. populneus																																			
Malvaceae	Sida corrugata	Corrugated Sida																																		
Malvaceae	Sida rhombifolia	Paddy's Lucerne	*										1		4		4		3	1				1												
Menispermaceae	Stephania japonica var. discolor	Snake Vine																																		
Myoporaceae	Eremophila debilis	Amulla																																		
Myrsinaceae	Anagallis arvensis	Scarlet Pimpernel	*																																	
Myrtaceae	Angophora floribunda	Rough-barked Apple		3				3				2	2				2		1						3											
Myrtaceae	Angophora floribunda	Rough-barked Apple																																		
Myrtaceae	Callistemon linearis	Narrow-leaved Bottlebrush		3								3	4									1	2	2	2	1	0	1	0	0	0	0	0	0	0	0
Myrtaceae	Corymbia maculata	Spotted Gum								1	3		4										2													
Myrtaceae	Eucalyptus crebra	Narrow-leaved Ironbark																																		
Myrtaceae	Eucalyptus fibrosa	Red Ironbark																																		
Myrtaceae	Eucalyptus moluccana (emer)	Grey Box								2																										
Myrtaceae	Eucalyptus moluccana	Grey Box																																		
Myrtaceae	Eucalyptus punctata	Grey Gum	2																3	3																
Myrtaceae	Eucalyptus tereticornis	Red Gum																		1																
Myrtaceae	Eucalyptus var. dealbata																																			
Myrtaceae	Eucalyptus blakelyi	Blakely's Red Gum																3		2																
Myrtaceae	Melaleuca nodosa																																			
Myrtaceae	Melaleuca styphelioides	Prickly-leaved Tea Tree																																		
Orchidaceae	Caladenia catenata	White Caladenia																																		
Oxalidaceae	Oxalis corniculata	Creeping Oxalis	*																																	
Oxalidaceae	Oxalis perennans			2	1									1						1																
Phyllodraceae	Phyllodium lanuginosum	Frogmouth		1						1					1				1								1	0	1	1	0		1	2	1	0

Family	Species name	Common name	Status	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
Phyllanthaceae	<i>Beyrnia oblongifolia</i>	Coffee Bush								1									1	2																	
Phyllanthaceae	<i>Phyllanthus hirtellus</i>	Thyme Spurge		1			2													1	1	1		1													
Phyllanthaceae	<i>Phyllanthus gummifolius</i>																																				
Phyllanthaceae	<i>Poranthera microphylla</i>	Small Poranthera																																			
Pittosporaceae	<i>Bursaria spinosa</i>	Native Blackthorn		2															3																		
Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues	*			1	1	1	0	1	3	4	3	0	2	0	2	2	1	0			1	1		3	1	2	0	0	0	1	1	0			
Plantaginaceae	<i>Plantago spp.</i>	Plantain															0																				
Plantaginaceae	<i>Veronica spp.</i>		*																																		
PHORMIACEAE	<i>Dianella caerulea</i> var. <i>caerulea</i>									1										1																	
Poaceae	<i>Andropogon virginicus</i>	Whisky Grass	*																																		
Poaceae	<i>Aristida spp.</i>	A Wiregrass		2																						2											
Poaceae	<i>Aristida vagans</i>	Threeawn		3					1	2	2	2	1	3	2	0	4	3	4																		
Poaceae	<i>Axonopus fissifolius</i>	Narrow-leaved Carpet Grass	*																																		
Poaceae	<i>Bothriochloa spp.</i>	Redgrass, Bluegrass	*	3							2	2	2								2		2	2	2	1	1	1	0	2	2	2	2	0			
Poaceae	<i>Chloris gayana</i>	Rhodes Grass	*			3	3	3	3	2	1	2	3	3	1	1	0	3	3	2	3	3	4	4	4	4	2	1	0	0	2	1	2	2	2		
Poaceae	<i>Chloris truncata</i>	Windmill Grass								1										1																	
Poaceae	<i>Cymbopogon refractus</i>	Barbed Wire Grass							3		2	3	3	2	2	1	1	2																			
Poaceae	<i>Cynodon dactylon</i>	Common Couch		3	5	5	5	3			3	2	2	2	2			3	2	1	2	3		2	2	2	4	2	4	3	4	2	2	2	2		
Poaceae	<i>Dichelachne micrantha</i>	Shorthair Plumegrass		1												2			1	1																	
Poaceae	<i>Digitaria spp.</i>	A Finger Grass	*																																		
Poaceae	<i>Digitaria parviflora</i>					1	1		1		2																										
Poaceae	<i>Echinopogon caespitosus</i> var. <i>caespitosus</i>	Tufted Hedgehog Grass																																			
Poaceae	<i>Echinopogon ovatus</i>	Forest Hedgehog Grass		2																																	
Poaceae	<i>Ehrharta erecta</i>	Panic Veldgrass	*								2		1		1		1	1	2	2			1														
Poaceae	<i>Erioblasia stricta</i>	Wiry Panic							3		1		3	2	2	1			2	1																	
Poaceae	<i>Eragrostis brownii</i>	Brown's Lovegrass																							1	2											
Poaceae	<i>Eragrostis leporcarpa</i>	Drooping Lovegrass																																			
Poaceae	<i>Eragrostis leptostachya</i>	Paddock Lovegrass																				1		1													
Poaceae	<i>Eleocharis gracilis</i>	Eleocharis																				1				1											

Family	Species name	Common name	Status	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Poaceae	<i>Imperata cylindrica</i>	Blady Grass		2																					2										
Poaceae	<i>Lolium perenne</i>	Perennial Ryegrass	*			1	1	1																											
Poaceae	<i>Lachnagrostis filiformis</i>	Weeping Grass						1												1															
Poaceae	<i>Microlaena stipoides</i> var. <i>stipoides</i>			1	2	2	2	2																											
Poaceae	<i>Panicum effusum</i>	Hairy Panic																																	
Poaceae	<i>Paspalum urvillei</i>				1															1						1	0	1	0	0	0	1	0		
Poaceae	<i>Paspalum spp.</i>																																		
Poaceae	<i>Pennisetum clandestinum</i>	Kikuyu Grass	*		2	1																													
Poaceae	<i>Rytidosperma fluvium</i>																				1														
Poaceae	<i>Setaria parviflora</i>		*	1															1																
Poaceae	<i>Sorghum spp.</i>		*																																
Poaceae	<i>Sporobolus creber</i>	Slender Rat's Tail Grass																							1										
Poaceae	<i>Themeda triandra</i>			3						2									1	2															
Polygalaceae	<i>Cornespermia sphaerocarpon</i>																																		
Polygonaceae	<i>Rumex crispus</i>				1																														
Proteaceae	<i>Grevillea montana</i>			1					1											1															
Plantaginaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	Rock Fern																																	
Ranunculaceae	<i>Clematis glycinoides</i> var. <i>glycinoides</i>	vine		1	1	1			2	0	2	2	3						1	2	2	2		1	1										
Ranunculaceae	<i>Ranunculus plebeius</i>	Forest Buttercup																																	
Rubiaceae	<i>Opercularia diphyllo</i>	Stinkweed		1	2	2	2																												
Rubiaceae	<i>Opercularia hispida</i>	Hairy Stinkweed																																	
Rubiaceae	<i>Pomax umbellata</i>	Pomax	*	1	1				1	1	1	1								1															
Rubiaceae	<i>Richardia humistrata</i>																																		
Rubiaceae	<i>Exocarpos strictus</i>	Dwarf Cherry																																	
Sapindaceae	<i>Dodonaea triquetra</i>	Large-leaf Hop-bush		1																															
Sapindaceae	<i>Dodonaea viscosa</i> subsp. <i>cuneata</i>	Wedge-leaf Hop-bush																																	
Scrophulariaceae	<i>Parentiella latifolia</i>	Red Bartsia	*																																
Family	Species name	Common name	Status	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Solanaceae	<i>Lycium ferocissimum</i>	African Boxthorn	*																																
Solanaceae	<i>Solanum prinophyllum</i>	Forest Nightshade																																	
Solanaceae	<i>Solanum cinereum</i>	Narrara Burr							1																										
Thymelaeaceae	<i>Primelea linifolia</i>	Slender Rice Flower						1		1					2																				

Appendix B - EP&A Act seven Part Tests of Significance

This test focusses on the potential impact species and communities via submission to a 7-part test as determined by process of elimination, as outlined in section 2.0 of this report. Essentially all species with a high chance of occurring on the site, or were recorded on the site (at one time or another) are included in this test. If a proposal is to remove any area of native vegetation or introduce a source of disturbance to a site then this 7-part test would include all species with at least a **moderate** chance of occurrence. This is not the case here so we are focusing on high to present onsite species only.

Common Name	Scientific Name	Likelihood of Occurrence
<i>Eucalyptus glaucina</i>	Slaty Red Gum	Present
<i>Pterostylis gibbosa</i>	Illawarra Greenhood	Moderate
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	High
<i>Persoonia pauciflora</i>	North Rothbury Persoonia	High

Eucalyptus glaucina Slaty Red Gum 7-Part Test

- (a) *the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

Slaty gum is a rare to the local area, only being found largely west of Maitland on grassy woodlands on moderate and good soils. One tree found onsite had superficial similarities as *Eucalyptus glaucina*, however it was likely a cross of other red gums onsite and given that no habitats of red gum are to be cleared onsite and that the areas where it is likely to occur are to be regenerated then this does not require further investigation. On this basis, it is considered unlikely that *Eucalyptus glaucina* would be impacted, and thus the proposed activity **will not** disrupt the lifecycle of a viable local population and **will not** place this species at risk of extinction.

- (b) *in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*

This factor applies a similar test as in factor (a) to endangered populations.

- (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 removed or modified as a result of the action.*

Not applicable to *Eucalyptus glaucina*.

- 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 to *Eucalyptus glaucina*.

- (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.*

The proposed activity will not result in the removal or modification of suitable habitat in the Subject Site.

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

The proposed activity will not increase fragmentation and in fact the proposal includes measures that increases connectivity through regeneration and restoration plans.

ii. 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 impact includes the development of 5.8ha of pasture area where no *Eucalyptus glaucina* or other red gums are present, and no trees will be removed as part of this proposed activity. Given this the impact is low and will not impact on 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 such habitats have yet been gazetted for *Eucalyptus glaucina*.

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

Yes, the proposed activity and the regeneration plans are consistent with the objectives for management of 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.

No, the proposal does not constitute 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.

Pterostylis gibbosa Illawarra Greenhood 7-Part Test

- (a) the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

Illawarra greenhood is a large ground dwelling orchid have green flowers. A population is known from the Milbrodale area. It can be found on fertile moist sites in forest and can tolerate only occasional levels of grazing. Surveys were undertaken onsite during potential flowering periods. None were recorded. The proposed activity within heavily grazed paddocks will not impact on suitable habitat for this species. Given that no habitats for Illawarra greenhood are to be cleared onsite and that the areas where it is likely to occur are to be regenerated then this does not require further investigation. On this basis, It is considered unlikely that Illawarra greenhood would be impacted, and thus the proposed activity will **not** disrupt the lifecycle of a viable local population and will **not** place this species at risk of extinction.

- (b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*

This factor applies a similar test as in factor (a) to endangered populations.

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

- iii. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be removed or modified as a result of the action.*

Not applicable to Illawarra greenhood.

- iv. 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 to Illawarra greenhood.

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

- iii. the extent to which habitat is likely to be removed or modified as a result of the action proposed.*

The proposed activity will not result in the removal or modification of suitable habitat in the Subject Site.

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

The proposed activity will not increase fragmentation and in fact the proposal includes measures that increases connectivity through regeneration and restoration plans.

- iv. 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 impact includes the development of 5.8ha of pasture area where no Illawarra greenhood habitat is present, and no forest and woodland will be removed as part of this proposed activity. Given this the impact is low and will not impact on 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 such habitats have yet been gazetted for Illawarra greenhood.

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

Yes, the proposed activity and the regeneration plans are consistent with the objectives for management of 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.

No, the proposal does not constitute 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.

Grevillea parviflora subsp. Parviflora Small-flower Grevillea 7-Part Test

(a) the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Small-flower Grevillea is a small spreading shrub with characteristic spider like flowers of this genus. Found largely in the Kurri Kurri sand swamp forest in the local area, but can also be recorded in other sandy sites. Surveys were undertaken onsite during potential flowering periods. None were recorded. The proposed activity within heavily grazed paddocks will not impact on suitable habitat for this species. Given that no habitats for Small-flower Grevillea are to be cleared onsite and that the areas where it is likely to occur are to be regenerated then this does not require further investigation. On this basis, it is considered unlikely that Small-flower Grevillea would be impacted, and thus the proposed activity **will not** disrupt the lifecycle of a viable local population and **will not** place this species at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

This factor applies a similar test as in factor (a) to endangered populations.

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

v. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be removed or modified as a result of the action.

Not applicable to Small-flower Grevillea.

vi. 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 to Small-flower Grevillea.

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

v. the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposed activity will not result in the removal or modification of suitable habitat in the Subject Site.

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

The proposed activity will not increase fragmentation and in fact the proposal includes measures that increases connectivity through regeneration and restoration plans.

vi. 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 impact includes the development of 5.8ha of pasture area where no Small-flower Grevillea habitat is present, and no forest and woodland will be removed as part of this proposed activity. Given this the impact is low and will not impact on 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 such habitats have yet been gazetted for Small-flower Grevillea.

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

Yes, the proposed activity and the regeneration plans are consistent with the objectives for management of 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.

No, the proposal does not constitute 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.

Persoonia pauciflora North Rothbury Persoonia 7-Part Test

(a) the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

North Rothbury Persoonia is a small spreading shrub with needle like leaves. Found only in North Rothbury at three locations. Surveys were undertaken onsite during potential flowering periods. None were recorded. The proposed activity within heavily grazed paddocks will not impact on suitable habitat for this species. Given that no habitats for North Rothbury Persoonia are to be cleared onsite and that the areas where it is likely to occur are to be regenerated then this does not require further investigation. On this basis, It is considered unlikely that North Rothbury Persoonia would be impacted, and thus the proposed activity **will not** disrupt the lifecycle of a viable local population and **will not** place this species at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

This factor applies a similar test as in factor (a) to endangered populations.

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

vii. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be removed or modified as a result of the action.

Not applicable to North Rothbury Persoonia.

viii. 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 to North Rothbury Persoonia.

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

vii. the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposed activity will not result in the removal or modification of suitable habitat in the Subject Site.

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

The proposed activity will not increase fragmentation and in fact the proposal includes measures that increases connectivity through regeneration and restoration plans.

- viii. 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 impact includes the development of 5.8ha of pasture area where no North Rothbury Persoonia habitat is present, and no forest and woodland will be removed as part of this proposed activity. Given this the impact is low and will not impact on 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 such habitats have yet been gazetted for North Rothbury Persoonia.

- (f) whether the action proposed is consistent with the objectives or actions of a recovery or threat abatement plan.**

Yes, the proposed activity and the regeneration plans are consistent with the objectives for management of 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.**

No, the proposal does not constitute 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.

Common Name	Scientific Name	Likelihood of Occurrence
Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions	Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions	<u>Present</u>
Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion	Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion	<u>Present</u>
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	<u>Present</u>

Table 3-2 A summary of threatened communities considered to have a medium-high likelihood of occurring at the proposed Asset Protection Zone.

Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions 7-Part Test

- (a) *the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

Central Hunter Ironbark-Spotted Gum-Grey Box Forest is a critically endangered community that is known to the local area and was recorded onsite during surveys for this assessment. It is characterised by being found on Permian sediments and is dominated by Narrow-leaved Ironbark, Spotted gum and Grey box; in highly disturbed and cleared areas the dominant overstory can also be Bullock. Several patches fitting this determination were recorded onsite. In the Hunter Valley where the distribution of this community overlaps with the Lower Hunter Spotted gum community, there can be ecotones where there is a bit of both communities in a patch area. This is in part true on this site, and as such, early on in the planning process all forest and woodland patches onsite were marked as having the highest conservation value and it was determined that they all be entirely avoided in the proposed activity. Moreover, it was determined that even the type of development should be of a nature that would not impact on the community.

Notwithstanding that the proposal will preserve all forest and woodland patches onsite, there still remains conservation concerns onsite for this community. Firstly, the paddock area includes scattered trees that would have prior to clearing, at least included some areas of this community. So taking the precautionary approach we have considered all paddock areas as being derived from this community and the following community. The guidelines for assessment of impacts on this community distinguish between degraded patches and patches having moderate (or higher) qualities. Applying these to this site we see that native species are poorly represented in the understorey, due to clearing and continued grazing. Additionally, none of these paddock trees recorded in the proposal area will be removed that the proposal would not be impacting directly on habitat for this community. However, the second concern for the community is its survival in the long term (>50 years), which is reliant on an increase in its total area across its distribution. The best way to achieve this is to conserve patches of scattered trees of this community and regenerate, especially when adjacent to healthy patches. This concern is not taken lightly in this proposal and thus there is at least 7.7ha of regeneration and improvement proposed in forests and woodlands onsite. A minimum of 3.5ha of regeneration of scattered tree habitat and the linking of the two largest remnants in the local area, also makes up part of this proposal. Given the clear avoidance of forest and woodland, the conservation of paddock trees and the plan to establish 3.5ha and regenerate additional areas, it is considered unlikely that Central Hunter Ironbark-Spotted Gum-Grey Box Forest would be impacted, and thus the proposed activity will **not** disrupt the lifecycle of a viable local population and will **not** place this community at risk of extinction.

- (b) *in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*

This factor applies a similar test as in factor (a) to endangered populations.

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

- ix. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be removed or modified as a result of the action.**

No. This proposal will result in an expansion of Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the local area.

- x. 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.**

No. This proposal will result in an improvement to the composition of Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the local area.

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

- ix. the extent to which habitat is likely to be removed or modified as a result of the action proposed.**

The proposed activity will not result in the removal or modification of habitat for Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the Subject Site.

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

The proposed activity will not increase fragmentation and in fact the proposal includes measures that increase connectivity through regeneration and restoration plans.

- x. 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 impact includes the development of 5.8ha of pasture area where no Central Hunter Ironbark-Spotted Gum-Grey Box Forest habitat is present, and no forest and woodland will be removed as part of this proposed activity. Given this the impact is low and will not impact on the long-term survival of the community.

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

No such habitats have yet been gazetted for Central Hunter Ironbark-Spotted Gum-Grey Box Forest.

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

Yes, the proposed activity and the regeneration plans are consistent with the objectives for management of 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.

No, the proposal does not constitute 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.

Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion 7-Part Test

(a) the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Lower Hunter Spotted Gum-Ironbark Forest is an endangered community that is known to the local area and was recorded onsite during surveys for this assessment. It is characterised by being found on Permian sediments and is dominated by Broad-leaved Ironbark, Spotted gum and Grey gum. Several patches fitting this determination were recorded onsite. In the Hunter Valley where the distribution of this community overlaps with the Central Hunter

Ironbark-Spotted Gum-Grey Box Forest, there can be ecotones where there is a bit of both communities in a patch area. This is in part true on this site, and as such, early on in the planning process all forest and woodland patches onsite were marked as having the highest conservation value and it was determined that they all be entirely avoided in the proposed activity. Moreover, it was determined that even the type of development should be of a nature that would not impact on the community.

Notwithstanding that the proposal will preserve all forest and woodland patches onsite, there still remains conservation concerns onsite for this community. Firstly, the paddock area includes scattered trees that would have prior to clearing, at least included some areas of this community. So taking the precautionary approach we have considered all paddock areas as being derived from this community and the above community. The guidelines for assessment of impacts on this community distinguish between degraded patches and patches having moderate (or higher) qualities. Applying these to this site we see that native species are poorly represented in the understorey, due to clearing and continued grazing. Additionally, none of these paddock trees recorded in the proposal area will be removed that the proposal would not be impacting directly on habitat for this community. However, the second concern for the community is its survival in the long term (>50 years), which is reliant on an increase in its total area across its distribution. The best way to achieve this is to conserve patches of scattered trees of this community and regenerate, especially when adjacent to healthy patches. This concern is not taken lightly in this proposal and thus there is at least 7.7ha of regeneration and improvement proposed in forests and woodlands onsite. A minimum of 3.5ha of regeneration of scattered tree habitat and the linking of the two largest remnants in the local area, also makes up part of this proposal. Given the clear avoidance of forest and woodland, the conservation of paddock trees and the plan to establish 3.5ha and regenerate additional areas, it is considered unlikely that Lower Hunter Spotted Gum- Ironbark Forest would be impacted, and thus the proposed activity **will not** disrupt the lifecycle of a viable local population and **will not** place this community at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

This factor applies a similar test as in factor (a) to endangered populations.

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

xi. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be removed or modified as a result of the action.

No. This proposal will result in an expansion of Lower Hunter Spotted Gum- Ironbark Forest in the local area.

xii. 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.

No. This proposal will result in an improvement to the composition of Lower Hunter Spotted Gum- Ironbark Forest.

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

xi. the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposed activity will not result in the removal or modification of habitat for Lower Hunter Spotted Gum- Ironbark Forest in the Subject Site.

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

The proposed activity will not increase fragmentation and in fact the proposal includes measures that increases connectivity through regeneration and restoration plans.

xii. 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 impact includes the development of 5.8ha of pasture area where no Lower Hunter Spotted Gum- Ironbark Forest habitat is present, and no forest and woodland will be removed as part of this proposed activity. Given this the impact is low and will not impact on the long-term survival of the community.

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

No such habitats have yet been gazetted for Lower Hunter Spotted Gum- Ironbark Forest.

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

Yes, the proposed activity and the regeneration plans are consistent with the objectives for management of 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.

No, the proposal does not constitute 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.

River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions 7-Part Test

(a) the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

River-Flat Eucalypt Forest on Coastal Floodplains is a endangered community that is known to the local area and was recorded onsite during surveys for this assessment. It is characterised by being found on rivers and creek lines and is dominated in the local area by forest red gum and rough-barked Apple. Onsite a tall understorey of River Oak is the dominant vegetation cover, which is due to past clearing. Floodplain areas adjacent to the creek line blend into areas of upland forest communities and delineating where this transitions from one community to another is subjective. This area is characterised onsite by rough-barked Apple dominating paddock areas, which would on first thoughts indicate that it is derived from this community. However this dominance could equally be because of natural seeding of these areas from large remnant rough-barked Apples in the creek line.

The proposal will preserve all riparian corridors onsite. In the proposal there is one locality where creeks are to be crossed. The location chosen for this is an area devoid of trees. This crossing point has been supplemented by the expansion and enhancement of the corridor up to 60 m wide in other localities onsite. Overall, this proposal will see the regeneration and improvement of 1.5h onsite. Given the clear avoidance of riparian corridors, the conservation of paddock trees and the plan to establish 1.5ha and regenerate additional areas, it is considered unlikely that River-Flat Eucalypt Forest on Coastal Floodplains would be impacted, and thus the proposed activity **will not** disrupt the lifecycle of a viable local population and **will not** place this community at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

This factor applies a similar test as in factor (a) to endangered populations.

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

xiii. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be removed or modified as a result of the action.

No. This proposal will result in an expansion of River-Flat Eucalypt Forest on Coastal Floodplains.

xiv. 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.

No. This proposal will result in an improvement to the composition of River-Flat Eucalypt Forest on Coastal Floodplains

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

xiii. the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposed activity will not result in the removal or modification of habitat for River-Flat Eucalypt Forest on Coastal Floodplains in the Subject Site.

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

The proposed activity will not increase fragmentation and in fact the proposal includes measures that increase connectivity through regeneration and restoration plans.

xiv. 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 impact includes the development of 5.8ha of pasture area where no River-Flat Eucalypt Forest on Coastal Floodplains habitat is present, and no forest and woodland will be removed as part of this proposed activity. Given this the impact is low and will not impact on the long-term survival of the community.

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

No such habitats have yet been gazetted for River-Flat Eucalypt Forest on Coastal Floodplains.

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

Yes, the proposed activity and the regeneration plans are consistent with the objectives for management of 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.

No, the proposal does not constitute 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.

Table 3-3 A summary of threatened fauna species, populations and communities considered to have a medium-high likelihood of occurring at the proposed Asset Protection Zone.

Common Name	Scientific Name	Likelihood of Occurrence
<i>Tyto novaehollandiae</i>	Masked Owl	<u>Present</u>
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	High
<i>Chthonicola sagittata</i>	Speckled Warbler	<u>Present</u>
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	<u>Present</u>
<i>Daphoenositta chrysoptera</i>	Varied Sittella	<u>Present</u>
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	<u>Present</u>
<i>Petaurus norfolcensis</i>	Squirrel Glider	<u>Present</u>
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	<u>Present</u>
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	High
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	High
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	High
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	High
<i>Miniopterus australis</i>	Little Bentwing-bat	<u>Present</u>
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	<u>Present</u>
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	High
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	High

Daphoenositta chrysoptera (Varied Sittella) 7-Part Test

- (a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.**

Varied Sittella occur in eucalypt woodlands and forests where rough-barked species occur, like stringybark or ironbark species occur with either a shrubby understorey or grassy ground cover. They forage in the canopy on large branches, searching knot holes, crevices and beneath loose bark for arthropods. Foraging is usually done arboreally with Varied Sittella rarely observed on the ground.

Varied Sittellas roost in tree branches approximately 14 metres high, in clusters of up to 11 individuals. They maintain no fidelity to any one roost site and sites are scattered throughout the home range. They nest in upright branch fork, usually on dead branches. Nests are generally in Ironbark or stringybark and will nest in the same tree for many seasons. Varied Sittellas breed cooperatively.

The proposed actions are located largely within grassy paddock areas with scattered tree (5.5ha), with no impact on potential habitat. Whilst there is a small number of suitable trees within the proposal area, none of these are proposed to be removed.

Varied Sittella **will not** utilise the paddock areas, instead preferring to utilise habitats within the canopy. Varied Sittella rarely venture to the forest floor and as such the proposed activities **will not** disrupt the lifecycle of a viable local population and **will not** place this species at risk of extinction.

- (b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.**

This factor applies a similar test as in factor (a) to endangered populations.

- (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 removed or modified as a result of the action.**

Not applicable to Varied Sittella.

- 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 to Varied Sittella.

- (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.**

The proposed activity will result in the removal of 5.5 of marginal habitat.

- 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.**

Based on the small scale of impact, the potential habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

- 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 importance of the habitat to be removed is considered to be low. As stated previously, Varied Sittella are considered unlikely to utilise the grassy paddock areas.

Varied Sittella were observed or heard during the field surveys which. Only marginal suitable habitat for this species was observed within the proposal footprint.

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

No such habitats have yet been gazetted for Varied Sittella. The proposal will not remove any habitat that will directly impact on this species capacity to maintain its lifecycle within the locality.

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

At this point in time no recovery plan has been prepared for this species by OEH. Recovery strategies identified for the species include:

- Retain existing vegetation and remnant stands along roadsides and in paddocks.

Response: No remnants in impact site. Action is consistent with the Objectives.

- Increase the size of existing remnants by planting trees and establishing buffer zones.

Response: No proposed action will result in a net increase through regeneration of reservation habitats. Action is consistent with the Objectives.

- Where remnants have lost connective links, re-establish links by revegetating corridors or stepping stones.

Response: No remnants are fragmented or will be fragmented. Action is consistent with the Objectives.

- Limit firewood collection and retain dead timber in open forest and woodland areas.

Response: Not applicable. Action is consistent with the Objectives.

- Encourage regeneration of habitat by fencing remnant stands and managing the intensity and duration of grazing.

Response: Fencing of conservation lands (e2) is currently being undertaken in the study area. Action is consistent with the Objectives.

- Control weeds in areas of known habitat.

Response: A vegetation management plan will be established over 20ha of E2 land adjacent to the subject site. Action is consistent with the Objectives.

(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.

None of the 34 'key' threatening processes listed under the Threatened Species Conservation Act apply to the proposed actions on this site. The NSW OEH have identified that the following processes are affecting this species:

- Sensitive to habitat isolation and simplification;

Response: A comprehensive vegetation management plan will be established over the E2 lands in the study area. Action is consistent with the Objectives.

- Land clearance is a barrier to movement;

Response: This small area of marginal habitat area will not introduce a barrier to movement. Action is consistent with the Objectives.

- Habitat degradation by small-scale clearing including fence lines and road verges;

Response: This action does not involve clearing of habitat. Action is consistent with the Objectives.

- Dominance by Noisy Miners who readily colonise disturbed areas;

Response: The dominance of the impact site by Noisy Miner colony has already occurred. Action is consistent with the Objectives.

- Loss of paddock trees and connectivity.

Response: This action does not involve clearing of habitat. Action is consistent with the Objectives.

***Pyrrholaemus sagittatus* Speckled warbler 7-Part Test**

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Speckled Warblers are frequently located within the grassy ground layer of dry sclerophyll forests and woodlands, generally in box-ironbark associations. They are predominantly insectivorous but also forage on seeds and plant material when foraging through grass tussocks, leaf litter, fallen timber, low shrubs and trees. Within the Hunter Valley this species is also associated with rocky slopes which provide additional foraging substrate.

Speckled warblers are a sedentary species and are affected by the removal of timber within their home range. They generally have a home range between 2.5 and 8 hectares and spend their time foraging throughout their range spending 2-3 days in small sections.

Speckled warblers frequently roost in young eucalypt saplings in the open where the foliage is sparse. Nests are built in depressions on the ground amongst grass and low shrubs usually at the base of saplings sheltered by overhanging branches. When nesting, Speckled Warblers decrease their home range to within a 60 metre circumference of the nest.

The proposal footprint includes 5.5 ha of grassy paddock areas with scattered trees. The paddock areas are grassed, it contains few trees or shrubs or Course Woody Debris. The Speckled Warbler was not recorded during the survey in open paddock areas. It is considered unlikely that Speckled Warblers would occur within the Proposal footprint, given that there is no breeding or foraging habitat. The proposed activity **will not** disrupt the lifecycle of a viable local population and **will not** place this species at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

This factor applies a similar test as in factor (a) to endangered populations.

(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 removed or modified as a result of the action.***

Not applicable to Speckled Warbler.

- 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 to Speckled Warbler.

(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.***

The proposed activity will result in the removal of 5.5 ha pasture with scattered trees in the Proposal footprint, identified here as marginal habitat.

- 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.***

Based on the small scale of impact (<5.5 ha of pasture) the potential habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

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 importance of the habitat to be removed is considered to be low. As stated previously, Speckled Warbler is considered unlikely to utilise the grassy paddock areas.

No Speckled Warbler were observed or heard during the field surveys within the proposal footprint and no suitable habitat for this species was recorded. Individuals were observed on adjacent land in healthy remnant forest and woodland. Only marginal suitable habitat for this species was observed within the proposal area.

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

No such habitats have yet been gazetted for Speckled Warbler. The proposal will not remove any habitat that will directly impact on this species to maintain its lifecycle within the locality

(f) Whether the action proposed is consistent with the objectives or actions of a recovery or threat abatement plan.

At this point in time no recovery plan has been prepared for this species by OEH. Seven priority action statements (PAS) have been developed to assist in the recovery of this species. This assessment process has been done in accordance with the PAS actions of identifying habitat for protection and management of woodland bird issues.

- Conduct ecological research to determine habitat and resource requirements, threats and conservation issues.
Response: Not applicable.

- Undertake surveys for threatened woodland birds in new and existing conservation reserves containing suitable habitat to assess the species' conservation status and identify key breeding and foraging habitat. .
Response: Not applicable.

- Identify key habitats or areas for protection and enhanced management through incentives.
Response: Not applicable.

- Develop habitat identification, management and enhancement guidelines for woodland birds.
Response: Not applicable.

- Implement sympathetic habitat management in conservation reserves, council reserves and crown reserves where the species occurs.
Response: Not applicable

- Increase understanding of woodland birds through promotion of the DEC website and other educational material.
Response: Not applicable

- Develop an Expression of Interest targeted towards private landowners to locate new sites and from this negotiate, develop and implement conservation management agreements.
Response: Not applicable

(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.

None of the 34 'key' threatening processes listed under the Threatened Species Conservation Act apply to the proposed action on this site. The NSW OEH have identified that the following processes are affecting this species:

- Fragmented nature of the populations and their small size the species is susceptible to catastrophic events and localised extinction;

Response: The action will not fragment habitat, or introduce catastrophic events.

- Clearance of remnant grassy woodland habitat for paddock management reasons and for firewood;

Response: The action does not include clearing of remnant grassy woodland habitat

- Poor regeneration of grassy woodland habitats;

Response: Not applicable

- Modification and destruction of ground habitat through removal of litter and fallen timber, introduction of exotic pasture grasses, heavy grazing and compaction by stock and frequent fire;

Response: The action will introduce any of these threats. These threats have been active on the lands for over 50 years.

- Habitat is lost and further fragmented as land is being cleared for residential and agricultural developments. In particular, nest predation increases significantly, to nest failure rates of over 80%, in isolated fragments;

Response: The action includes clearing for residential purposes; however, no fragmentation of woodlands or forests is occurring as part of this action.

- Nest failure due to predation by native and non-native birds, cats, dogs and foxes particularly in fragmented and degraded habitats.

Response: Not applicable

Masked Owl (*Tyto novaehollandiae*) 7-Part Test

- (a) the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

Masked Owl inhabits a diverse range of wooded habitats that provide tall or dense mature trees with hollows suitable for nesting and roosting. Within NSW most records are from open dry sclerophyll forest, tall open forests as well as in ecotones between forests and farmlands. Roosts in forested areas, in dry forests they are frequently located in moist or sheltered microhabitats in gullies and drainage lines. Roost in large eucalypt trees in large vertical hollows with average dimensions of 1.5 metres deep and 50cm wide.

Nest trees are generally an isolated or emergent live eucalypt tree within remnant woodland or forest. Nest hollows usually in trunks and near-vertical spouts. Nest locations are frequently cited near abundant food resources.

Forage predominantly on terrestrial prey but are also known to take arboreal and scansorial prey in dense vegetation. Prefers foraging in mosaically arrayed vegetation, but can also utilise in open country adjoining forests and woodlands. Prey taken is normally small to medium sized terrestrial mammals which are generally found in forested or woodland communities. Travel long distances from roost locations to forage for prey.

Several trees provided potential roosting and nesting habitat for Masked Owl. These trees were stag watched for 4 nights in succession without Masked Owl being recorded either entering or exiting the trees. A single Male Masked Owl was visually recorded within the site during spotlighting. Masked owl is quite rare in the local area with limited records being recorded.

The local area does provide suitable foraging habitat and trapping results indicate average results for potential prey species (Black rat and Bush rat). Based on the typical home range of an individual and vegetation in the local area, the vegetation onsite and adjacent to the site is likely important habitat for the individual.

Nonetheless, no hollow bearing trees are to be removed and potential foraging habitat will be significantly impacted by the proposal. The proposed activity **will not** disrupt the lifecycle of a viable local population and **will not** place this species at risk of extinction.

- (b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*

This factor applies a similar test as in factor (a) to endangered populations.

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

- xv. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be removed or modified as a result of the action.*

Not applicable to Masked Owl.

- xvi. 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 to Masked Owl.

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

- xv. the extent to which habitat is likely to be removed or modified as a result of the action proposed.*

The proposed activity will result in the removal of 5.5ha of a forest pasture in the Subject Site, identified here as marginal foraging habitat. No suitable nest tree will be removed.

- xvi. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.*

Based on the small scale of impact, the potential habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

xvii. 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 importance of the habitat to be removed is considered to be low.

Masked Owl was observed during the field surveys. Only a small area of marginal habitat for this species was observed within the proposal footprint.

No such habitats have yet been gazetted for Masked Owl. The proposal will not remove any habitat that will directly impact on this species to maintain its lifecycle within the locality.

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

No such habitats have yet been gazetted for Masked Owl.

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

NSW DEH has identified 31 PAS actions to help with the recovery and amelioration of threats on this species. These include:

1. Seek scholarship funds for an identified aboriginal student to investigate the cultural and historic significance of the Masked Owl;

Response: Not applicable

2. Encourage CMAs to invest in actions that actively manage and/or conserve large forest owl habitat as part of their Catchment Action Plans;

Response: Not applicable

3. Current information on owl and habitat identification must be maintained on the threatened species website;

Response: Not applicable

4. Prepare guidelines addressing issues associated with habitat protection and management and survey and assessment on private lands;

Response: Not applicable

5. Promote awareness of the research needs of the Masked owl among the scientific and academic community;

Response: Not applicable

6. Seek an ARC Linkage Grant or other joint funding opportunity to initiate research into identified key areas of the biology and ecology of the three large forest owls;

Response: Not applicable

7. Convene a threatened owl workshop with relevant experts and stakeholders to reassess the state conservation status of the Masked Owl;

Response: Not applicable

8. Prepare environmental impact assessment guidelines to assist consent and determining authorities and environmental consultants to assess impacts of developments on the Masked Owl;

Response: Not applicable

9. Provide up to date and accurate large forest owl and habitat information in the PVP Developer - Threatened Species Tool;

Response: Not applicable

10. Provide up to date information and data for the Biobanking assessment methodology;

Response: Not applicable

11. Use records of concurrence and licence conditions to develop a set of prescriptive guidelines that may be used to mitigate the impacts of developments on the Masked Owl outside conservation reserves and State forests;

Response: Not applicable

12. Investigate the implementation of the forestry threatened species licence owl prescriptions by carrying out proactive audits targeting these prescriptions and through IFOA monitoring and reporting;

Response: Not applicable

13. Make an assessment of the implementation and effectiveness of forestry owl prescriptions and if necessary refine the prescriptions and negotiate changes to the forestry threatened species licences;

Response: Not applicable

14. Encourage private landholders to undertake management options to conserve and/or actively manage forest owl habitat;

Response: Not applicable

15. Develop a sampling methodology stratified across different land tenures and disturbance histories, as well as a set of standardised regional monitoring protocols;

Response: Not applicable

16. Implement a regional monitoring program. This will be undertaken once owl habitat models have been refined, validated and sampling strategy developed.

Response: Not applicable

17. Investigate and pursue the cooperative involvement of other agencies, researchers and the community in the implementation of the regional monitoring program;

Response: Not applicable

18. Monitor and report on effectiveness of concurrence and licence conditions previously applied to reduce impacts of development on Masked Owls and their habitats, by recording conditions, picking case studies and checking owl presence post development;

Response: Not applicable

19. Finalise the large forest owl Multi species plan for Sooty, Masked and Powerful Owl by 2006;

Response: Not applicable

20. Encourage student radio tracking Subjects examining the use of logged and unlogged forest by the Masked Owl species;

Response: Not applicable

21. Update and refine existing Masked Owl habitat models using the best available information and map the amount of modelled habitat across forested land in NSW;

Response: Not applicable

22. Carry out post-harvest surveys in locations where Masked Owls were detected prior to logging to determine if they are continuing to occupy the habitat;

Response: Not applicable

23. Design a sampling strategy to test the modelled habitat for the presence of Masked Owls and undertake field validation; and

Response: Not applicable

24. Estimate amount of mapped modelled habitat for Masked Owls that is occupied (based on proportion of sample sites with owls in them). Use this to further estimate number of owl territories within different land tenures (based on home range data).

Response: Not applicable

PAS actions require individuals where possible identify actions to which they can contribute. In terms of this Subject, the actions this document will contribute are points 4, 11, 12 and 15. This needs clarification from client's perspective, cost, duration, effectiveness of outcomes etc.

(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 proposed action will only constitute minor vegetation modification within disturbed road corridors through slashing of vegetation where required. While minor, these actions are likely to contribute, albeit not in a significant manner to the following key threatening processes.

- Native vegetation clearing; and
- Anthropogenic climate change.

The NSW DEH have identified that the following threatening processes are acting upon this species:

- Loss of mature hollow-bearing trees and changes to forest and woodland structure, which leads to fewer such trees in the future.
- Clearing of habitat for grazing, agriculture, forestry or other development.
- A combination of grazing and regular burning is a threat, through the effects on the quality of ground cover for mammal prey, particularly in open, grassy forests.
- Secondary poisoning from rodenticides.
- Being hit by vehicles.

The proposed action will not impact upon any of the threatening process identified by DEH. The modification of already disturbed habitats is unlikely to impact on any habitat utilised by this species.

Pomatostomus temporalis temporalis Grey-crowned Babbler 7-Part Test

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

Grey-crowned babblers occur in open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Occur in sedentary territorial groups, each of which usually contained a single breeding pair and a number of non-breeding birds (King 1980).

Babblers are almost entirely insectivorous foraging occurred within the crevices of branches and tree trunks, under and round plants (tussock grasses), bark, stones, logs and cow-dung and in soil and leaf litter (King 1980). Rarely do Grey-crowned Babblers venture into the canopy to forage.

The entire group usually roost together in a single domed nest with the nests in shrubs or eucalypt saplings and are maintained year round. Grey-crowned Babblers have a cooperative breeding strategy where the whole troop helps to raise nestlings. The breeding nest is generally built by predominantly by the breeding pair with older auxiliary members doing more work than younger ones (Dow and King 1984)

Territories range from one to fifty hectares (usually around ten hectares) and are defended all year. Territorial disputes with neighbouring groups are frequent and may last up to several hours, with much calling, chasing and occasional fighting.

The range of the eastern subspecies of Grey-crowned Babbler extends from north Queensland to southern Victoria, and into the south-eastern corner of South Australia (Higgins & Peter, 2002). In New South Wales, it is naturally most abundant on the western slopes and plains, scattered populations east of the Great Divide (Higgins & Peter, 2002). A decline in abundance has been recorded in inland areas, including inland NSW, with the species becoming locally extinct in some areas (Higgins & Peter, 2002). The preferred habitat is described as mainly open forests and woodlands, with an open shrub layer, sparse ground cover, and fallen timber and leaf-litter (Higgins & Peter, 2002). Conspicuous dome-shaped nests are constructed and sedentary family groups of between 2-13 birds breed co-operatively once a year (Davidson and Robinson 1992). Nests are also used as roost sites (Higgins & Peter, 2002). Foraging is divided between ground foraging in leaf litter and arboreal gleaning and mining on the bark of trees (Higgins & Peter, 2002).

Earlier observations in the local area suggested that the bird is restricted to the edges of large eucalypt vegetation patches (HWR 2004). This apparent preference for the edges of forested vegetation was a question we sought to answer through the additional investigations undertaken in this study.

Most of the remnant native vegetation within the local area occurs on privately-owned land, which constrained the study design. Although access was gained to several private lots, the majority of private land was surveyed by the use of roadways and reserves adjacent to the private land. Sample sites were haphazardly selected. Observations were undertaken over a three month period in 2003 (June to August) and during October 2012. Linear transects were searched on foot, by bicycle and by car.

The habitats where Babbler was located in our study has affinities with essential elements described in other studies. Costello (1981) identified five key habitat conditions that were required for Grey-crowned Babblers (eastern subspecies) to be present in his study in Vic: (1) woodland or open forest on fertile heavy soils; (2) more trees at sites not supporting Babblers; (3) many, large eucalypts with trunks > 90 cm diameter at breast-height (dbh), or cypress pine with 60 cm dbh; (4) understorey of saplings and shrubs with dbh 10-30 cm for nesting or sheltering; and (5) sparse groundcover layer with much litter and little grass cover.

Ecosystem comparison between the impact site and known habitats

Impact Site	Known Habitat in regional area
Tall pasture with patches of <i>Imperata cylindrica</i> var. <i>major</i> and <i>Cymbopogon refractus</i> . No bare patches and limited leaf litter. Limited coarse woody debris.	Open understorey with bare patches and open sometimes sparse tussock grasses, with coarse woody debris. Grass is patchy or low.
Sandy low fertility soils, conditions improved by grazing, but possibly to low a density to open groundcover conditions.	Moderate fertility sites, frequently improved by watering or light grazing or maintenance (i.e. golf courses are common habitats in the regional area).
Sparse trees with patches of more dense stands. Mixed age trees with saplings below 5 meters rare.	Sparse trees with patches of more dense stands. Mixed age trees with saplings below 5m common.

Our findings suggest that in the Lower Hunter, the Babbler is mostly restricted to the edges of continuous or remnant open forest communities found on or adjacent to Quaternary landscapes. In fact our results show that the interior of these communities provides little habitat value for the Babbler, and the species is completely absent from the majority of remnant forest vegetation in the area.

When a patch in a low lying position on the landscape has been modified by under-scrubbing or grazing (resulting in a more open understorey) Babbler were not only likely to be present, they were found to utilise more of the available patch space. This concentration to the edge of remnants with a low level of ongoing disturbance is likely to be due to several factors. The invasive species *Lantana camara* is widespread in the region and is one of the few weeds that can successfully penetrate the interior of forest patches (King & Buckenly 2002). Although untested in this study, sites where invasive exotic species such as, *Lantana camara*, dominant are unlikely to provide suitable foraging opportunities for ground foraging birds.

Inappropriate disturbance regimes (e.g. fire, grazing) have also been reported to impact on the habitat quality for ground foraging bird species (Lim and Recher 1990) and, although data were not collected to either support or contest these previous findings, qualitative observations indicate that native herbage assemblages appear to be an important habitat requirement for the species.

Based on previous studies on Grey-crowned Babbler and the results on this survey the impact site provides marginal habitat that is limited by fertility and structural diversity of the mid story and the groundcover layers, including debris. In addition, the pattern of occupation in the study area (and the regional area) is modified forest edges that open onto higher fertile sites, of which there is much of this habitat in the local area. This main habitat element however is largely limited within the impact site. Nonetheless, based on the habitat requirements discovered for Grey-crowned Babbler and the habitat present on the impact site, the impact site includes the following habitat for Grey-crowned Babbler (Table 7) and in Figure 6.

Table 7. Grey-crowned Babbler recorded onsite

Habitat quality	Area (ha)	% Regional habitat (3000ha)	Mitigation potential
Marginal	5.5	0.2	A relatively small area of potential habitat can be easily replicated within offsets of 7.7ha (as proposed) onsite, and by improved management and maintenance of selected areas.

In conclusion, the results of surveys and analysis indicate that there are substantial areas of suitable habitat in the local area and the loss of this marginal habitat from the impact site will not constitute a loss of significant habitat, or place the local population of the species at an increased risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the



Figure 6. Grey-crowned Babbler habitat

King Conservation Monitoring Pty Ltd
1300 661 110 or 08 8338 2320
kingaboom.com.au

Location: Gillards Lane, Pokolbin NSW

endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

This factor applies a similar test as in factor (a) to endangered populations.

(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 removed or modified as a result of the action.*

Not applicable to Grey-crowned Babbler.

- 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 to Grey-crowned Babbler.

(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.*

The proposed activity will result in the removal of 5.5ha of a pasture in the impact site is not critical to the local population.

- 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.*

Based on limited habitat to the north and the retention of habitat in the south and west it is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

- 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.*

It is currently difficult to quantify the importance of the habitat, however the foraging records made during these surveys indicate that the species does not utilize the Subject Site. Given the small scale of removal it is predicted that this would not constitute a loss of significant habitat.

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

No such habitats have yet been gazetted for Grey-crowned Babbler.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery or threat abatement plan.

NSW OEH has identified 5 PAS actions to help with the recovery and amelioration of threats on this species. These include:

1. Increase community awareness about the Grey-crowned Babbler through the promotion of the OEH Threatened Species Website and the development of education and extension material for threatened woodland birds;

Response: Not Applicable

2. Implement sympathetic habitat management in OEH reserve, conservation reserves, council reserves and crown reserves where the Grey-crowned Babbler occurs;

Response: Not Applicable

3. Provide stewardship payments, develop property agreements and apply other land management incentives for the protection and enhanced management of woodland vegetation used by the Grey-crowned Babbler;

Response: Not Applicable

4. Conduct annual monitoring of key populations that are managed under property agreements or are within OEH estate, conservation reserves, council reserves and crown reserves;

Response: Not Applicable

5. Conduct ecological research to determine habitat and resource requirements, threats and conservation issues;

Response: Not Applicable

PAS actions require individuals to where possible identify actions to which they can contribute. In terms of this Subject, the actions this document will contribute are points 4, 11, 12 and 15.

(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 proposed action will only constitute vegetation modification within potential habitat. While minor, these actions are likely to contribute, albeit not in a significant manner to the following key threatening processes.

- Native vegetation clearing; and
- Anthropogenic climate change.

The NSW DEH have identified that the following threatening processes are acting upon this species:

- Loss of mature hollow-bearing trees and changes to forest and woodland structure, which leads to fewer such trees in the future.
- Clearing of habitat for grazing, agriculture, forestry or other development.
- A combination of grazing and regular burning is a threat, through the effects on the quality of ground cover for mammal prey, particularly in open, grassy forests.
- Secondary poisoning from rodenticides.
- Being hit by vehicles.

The proposed action will not impact upon any of the threatening process identified by OEH. The modification of already disturbed road corridors is unlikely to impact on any habitat utilised by this species.

Aramus cyanopterus cyanopterus (Dusky woodswallow) 7-Part Test

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Dusky woodswallow can be resident or migratory, where regardless, they are known to respond to regional climatic conditions. Although widespread they are rare within their known distribution and have disappeared from north western NSW. Occupy a range of habitats including low sparse grasslands with Eucalyptus saplings. An individual was recorded to the south of the site, nonetheless the species is expected to use the site from time to time. Given, the species broad habitat use and the suitability of the 5.5ha of grassland to foraging for this species it has been included here for assessment. Importantly for this species, whilst the proposal does include the removal of a small area of grassland, no trees are to be cleared and the development is very mild in nature (when compared to a urban development). This "softness" will provide habitats for future use of the site by Dusky Woodswallow. For example, approximately 70% of the proposed footprint is gardens and orchids, that will provide suitable habitat for this species. In addition, the proposal will increase and improve 7.7ha of forest and woodland onsite.

The proposal **will not** disrupt the lifecycle of a viable local population of *Dusky woodswallow* and **will not** place this species at risk of extinction.

- (b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*

This factor applies a similar test as in factor (a) to endangered populations.

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

- iii. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be removed or modified as a result of the action.*

Not applicable to Dusky woodswallow.

- iv. 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 to Dusky woodswallow.

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

- iv. the extent to which habitat is likely to be removed or modified as a result of the action proposed.*

The proposed activity will result in the removal of 5.5 of marginal habitat.

- v. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.*

Based on the small scale of impact, the potential habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

- vi. 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 importance of the habitat to be removed is considered to be low.

Dusky woodswallow were observed during the field surveys, but only marginal suitable habitat for this species was observed within the proposal footprint.

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

No such habitats have yet been gazetted for Dusky woodswallow. The proposal will not remove any habitat that will directly impact on this species capacity to maintain its lifecycle within the locality.

- (f) whether the action proposed is consistent with the objectives or actions of a recovery or threat abatement plan.*

At this point in time no recovery plan has been prepared for this species by OEH. Recovery strategies identified for the species include:

- Retain existing vegetation and remnant stands along roadsides and in paddocks.

Response: No remnants in impact site. Action is consistent with the Objectives.

- Increase the size of existing remnants by planting trees and establishing buffer zones.

Response: No proposed action will result in a net increase through regeneration of reservation habitats. Action is consistent with the Objectives.

- Where remnants have lost connective links, re-establish links by revegetating corridors or stepping stones.

Response: No remnants are fragmented or will be fragmented. Action is consistent with the Objectives.

- Limit firewood collection and retain dead timber in open forest and woodland areas.

Response: Not applicable. Action is consistent with the Objectives.

- Encourage regeneration of habitat by fencing remnant stands and managing the intensity and duration of grazing.

Response: Fencing of conservation lands is an option. Action is consistent with the Objectives.

- Control weeds in areas of known habitat.

Response: A vegetation management plan will be established for the subject site. Action is consistent with the Objectives.

(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.

None of the 34 'key' threatening processes listed under the Threatened Species Conservation Act apply to the proposed actions on this site. The NSW OEH have identified that the following processes are affecting this species:

- Sensitive to habitat isolation and simplification;

Response: A comprehensive vegetation management plan will be established. Action is consistent with the Objectives.

- Land clearance is a barrier to movement;

Response: This small area of marginal habitat area will not introduce a barrier to movement. Action is consistent with the Objectives.

- Habitat degradation by small-scale clearing including fence lines and road verges;

Response: This action does not involve clearing of habitat. Action is consistent with the Objectives.

- Dominance by Noisy Miners who readily colonise disturbed areas;

Response: The dominance of the impact site by Noisy Miner colony has already occurred. Action is consistent with the Objectives.

- Loss of paddock trees and connectivity.

Response: This action does not involve clearing of habitat. Action is consistent with the Objectives.

Yellow-bellied Sheath-tail Bat *Saccolaimus flaviventris* 7-Part Test

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Yellow-bellied Sheath-tail bats occur in a variety of habitat types and it is suspected they migrate to southern Australia in late summer and early autumn. Very little is known about this species. It is known to roost in tree hollows and forage for insects above the forest canopy but lower in open areas.

Therefore, it is considered unlikely that Yellow-bellied Sheath-tail bats would occur within the footprint of the proposed impact area. The proposed activity will **not** disrupt the lifecycle of a viable local population and **will not** place this species at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

This factor applies a similar test as in factor (a) to endangered populations.

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

- is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be removed or modified as a result of the action.*

Not applicable to Yellow-bellied Sheath-tail bat.

- 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 to Yellow-bellied Sheath-tail bat.

(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.*

The proposed activity will result in the removal of 5.5 ha of pasture in the Subject Site, identified here as marginal habitat.

- 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.*

Based on the small scale of impact the potential habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

- 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 importance of the habitat to be removed is considered low. As stated previously, Yellow-bellied Sheath-tail bats forage aerially and roost in tree hollows. Given, the proposal will only clear/modify pasture grass and will not remove any hollow bearing trees no impact on this species will occur. As such the proposed activities will not affect 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 such habitats have yet been gazetted for Yellow-bellied Sheath-tail bat. The proposal will not remove any habitat that will directly impact on this species to maintain its lifecycle within the locality.

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

At this point in time no recovery plan has been prepared for this species by OEH.

(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.

None of the 34 'key' threatening processes listed under the Threatened Species Conservation Act apply to the proposed actions on these sites. The NSW OEH have identified that the following processes are affecting this species:

- Disturbance to roost and summer breeding sites;
- Clearance of foraging habitat for agricultural development;
- Loss of hollowing bearing trees;
- Clearing and fragmentation of forest and woodland habitat;
- Loss of prey species due to use of insecticides for agricultural production.

The proposed action is not considered to constitute a threatening process, nor is it considered to contribute to the increased impact of a threatening process.

***Petaurus norfolcensis* Squirrel Glider 7-Part Test**

- (a) *in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

Squirrel Glides are known to occur within a variety of woodlands and forests containing an overstorey of winter flowering species such as Spotted Gum (*Corymbia maculata*), Swamp Mahogany (*E. robusta*) and Forest Red Gum (*E. tereticornis*) (Smith and Murray 2003). Where a suitable overstorey isn't available they are known to occupy woodlands and forests containing suitable understorey of gum producing acacias particularly pinnate leaved species or forests/woodlands containing a mix of resources which provide winter and autumn flowering midstorey species such as banksias (*B. integrifolia*, *B. spinulosa*, *B. serrata*, *B. aemula*) in association with spring and summer flowering eucalypts like Scribbly gums and Smooth-barked Apple or sap fed trees like Bloodwoods (Smith and Murray 2003).

Squirrel gliders generally prefer a more open forest compared to the habitats utilised by Sugar gliders and are generally observed more frequently in the upper canopy (Jackson 2000). Typically have a home range of between 4-8 hectares but home range and group structure can be influenced by habitat quality and drought (Sharp 2004), particularly flowering intensity as this will influence breeding potential (Goldingay et al. 2006; Goldingay & Sharp 2004; Quin 1995).

Squirrel Gliders live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein (DEC 2006b). Gliders have been observed to glide 30 metres (Jackson 2000).

Squirrel glider was recorded in the subject site. No habitat was recorded within the proposal footprint. Given the small area of marginal habitat potential is in the proposal area, and that proposal **will not** remove any trees, the proposal **will not** reduce the viability of Squirrel glider in the local area, to a degree that could put the local population at risk of extinction.

- (b) *in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*

This factor applies a similar test as in factor (a) to endangered populations.

- (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 removed or modified as a result of the action.*

Not applicable to Squirrel Glider.

- 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 to Squirrel Glider.

- (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.*

The proposed activity will result in the removal of 5.5 ha of a pasture in the impact site, identified here as marginal habitat.

- 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.*

The proposal will not contribute to the cumulative loss of habitat and the increased fragmentation or isolation of habitat.

- 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.*

It is currently difficult to quantify the importance of the habitat, however the foraging records made nightly during these surveys indicate that the species utilizes the site occasionally. Given the small scale of removal it is predicted that this would not constitute a loss of significant habitat.

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

The proposal would not have any adverse effect on critical habitat. There is a capacity for critical habitats to be gazetted under the Threatened Species Conservation Act 1995. No such habitats have yet been gazetted for Squirrel Glider.

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

NSW DEH has identified 9 PAS actions to help with the recovery and amelioration of threats on this species. These include:

1. Control feral horses at relevant sites to promote retention and growth of mid-storey shrubs;
2. Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity. Give priority to largest hollow bearing trees;
3. Ensure the largest hollow bearing trees (including dead trees) are given highest priority for retention in PVP assessments and other environmental planning instruments, or other land assessment tools;
4. Investigate the effectiveness of logging prescriptions;
5. Prepare a recovery plan for the Squirrel Glider;
6. Conduct surveys and assessments of less known sites to confirm presence of species and negotiate, develop and implement conservation management agreements for high priority sites;
7. Delineate boundaries of population to identify the extent to which populations are interconnected (to determine propensity to move across cleared land);
8. Conduct surveys on the Far South Coast, from Murramarang National Park south to Eden, to determine population size and extent and connectivity of populations (surveys should incorporate potential habitat on public as well as private land); and
9. Model and predict the distribution of Squirrel Gliders across the south west slopes.

PAS actions require individuals to where possible identify actions to which they can contribute. In terms of this Subject, the actions this document will contribute are points 4, 11, 12 and 15.

(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 proposed action will only constitute minor vegetation modification within disturbed road corridors through slashing of vegetation where required. While minor, these actions are likely to contribute, albeit not in a significant manner to the following key threatening processes.

- Native vegetation clearing; and
- Anthropogenic climate change.
-

The NSW DEH have identified that the following threatening processes are acting upon this species:

- Loss and fragmentation of habitat.
- Loss of hollow-bearing trees.
- Loss of flowering understorey and midstorey shrubs in forests.
- Individuals can get caught in barbed wire fences while gliding.
-

The proposed action will not impact upon any of the threatening process identified by DEH. The modification of already disturbed road corridors is unlikely to impact on any habitat utilised by this species.

Eastern Freetail-bat (*Mormopterus norfolkensis*) 7-Part Test

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Mormopterus norfolkensis is a tree-dwelling insectivorous bat which is frequently found in dry eucalypt forest and coastal woodlands. They have also been captured within riparian zones, wet sclerophyll forest and rainforest (Allison and Hoyer 1995). They forage above the canopy or in unobstructed corridors in open areas (Allison and Hoyer 1995) on either winged or wingless ants (Allison 1989).

The habitat requirements of *M. norfolkensis* are not very well known or understood. They are tree dwelling bats (Allison and Hoyer 1995) which roost together in small colonies in hollows or under loose bark (Australian Museum 2004b).

This species has been recorded in the ecotone between cleared corridors and eucalypt forest/woodland and in forest/woodland habitats, frequently in the vicinity of open water (Ecotone Ecological Consultants 1996). Thus, it can be suggested that forest edges adjacent to cleared land provides important habitat for this species as it provides unrestricted flight and minimal clutter whilst being near a potential food source. Foraging activity may be concentrated over small areas of open water, such as dams and creeks, in forest (EEC 1996).

Little is known of the reproductive cycle of *M. norfolkensis*, but the capture of a number of females and no males at one site indicates that there may be some sexual segregation at certain times of year (Allison and Hoyer 1995). Seldom has more than one individual been captured from the locations where the species is known to occur, suggesting population densities, even in suitable areas, are low (EEC 1996). These factors make it nearly impossible to determine the extent of any local population; low population densities may suggest that the local population would cover a large geographical area.

The Eastern Freetail-bat was not recorded foraging within the vegetation remnants contained on the subject site. Potential roosting habitat occurred on the subject site. Tree hollow surveys identified three potential habitat trees within the footprint area, however **none of these** trees will be removed. The proposal will impact on 5.5 hectares of foraging habitat; however all of this habitat can still be used by the species. Notwithstanding, the proposal includes the rehabilitation and creation of habitats so that there is no short-term or long-term loss of habitat for this species.

Given an undertaking of the above recommendations, we consider that this proposal **will not** reduce the viability of Eastern Freetail-bat in the local area, to a degree that could put the local population at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

This factor applies a similar test as in factor (a) to endangered populations.

(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 removed or modified as a result of the action.

Not applicable to Eastern Freetail-bat.

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 to Eastern Freetail-bat.

(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.

The proposed activity will result in the removal of 5.5ha of a forest and pasture with scattered trees in the Subject Site.

- 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.***

The proposal will not contribute to the cumulative loss of habitat and the increased fragmentation or isolation of habitat.

- 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.***

Given that the proposal will not remove any trees and only marginal habitat is present in the proposal area, it is predicted that this would not constitute a loss of significant habitat.

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

The proposal would not have any adverse effect on critical habitat. There is a capacity for critical habitats to be gazetted under the Threatened Species Conservation Act 1995. No such habitats have yet been gazetted for the Eastern Freetail-bat.

- (f) *whether the action proposed is consistent with the objectives or actions of a recovery or threat abatement plan.***

At this point in time no recovery plan has been prepared for this species by OEH. OEH (2006) have identified that the following actions need to be followed in order to recover this species:

- Retain hollow-bearing trees and provide for hollow tree recruitment;
- Retain foraging habitat;
- Minimise the use of pesticides in foraging areas.

The proposal is consistent with all the recovery objectives for this species.

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

The NSW OEH have identified that the following threatening processes are acting upon this species:

- Loss of hollow-bearing trees;
- Loss of foraging habitat;
- Application of pesticides in or adjacent to foraging areas.

The proposed action constitutes a key threatening process, and it is considered to contribute to the increased impact of a threatening process.

Grey-headed Flying-fox *Pteropus poliocephalus* 7-Part Test

- (a) *in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.***

The Grey-headed Flying Fox occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (Churchill 1998; Hall and Richards 2000; NPWS 2009). Urban gardens and cultivated fruit crops also provide habitat for this species. The main threats to the survival of this species are

on-going habitat clearance, particularly along the northern NSW coast. Un-regulated culling may also pose a threat to this species (OEH 2009).

Roost sites (camps) can occur within rainforest patches, *Melaleuca* stands, mangroves, riparian woodland or modified vegetation in urban areas (NPWS 2009). Within the sub-regional area Grey-headed Flying-fox camps occur at Aberdeen, Blackbutt Reserve (Newcastle) and at Singleton. The protection of camp sites is a major factor in the successful management of this species as it has been shown to have a high fidelity to such sites. For example, some camps in NSW have been used for over a century (Eby 2000b cited in NPWS 2001).

No camp sites were identified on the subject site and no Grey-headed Flying-foxes were observed during the survey period. Reproductive age is reached between 2-3 years with only one offspring (generally) produced each year (Martin *et al.* 1996). They return annually to traditional camps to give birth and rear young (Lunney and Moon 1997; Augee and Ford 1999 cited NPWS 2004).

Grey-headed Flying Foxes forage in the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia* (Eby 2000a cited in NPWS 2001), and in fruits of rainforest trees and vines.

Foraging movements are related to food availability, with movements of hundreds of kilometres being recorded (NPWS 2001). However, opportunistic foraging generally occurs at distances < 30 km from camps (occasionally < 60–70 km when food resources are inconsistent) per night (Augee and Ford 1999; Tidemann, *et al.* 1999 cited NPWS 2004).

Between May and June the Grey-headed Flying Fox occurs in northern NSW and Queensland to feed on winter-flowering trees such as Swamp Mahogany (*Eucalyptus robusta*), Forest Red Gum (*E. tereticornis*) and Paperbark (*Melaleuca quinquenervia*) (Eby *et al.* 1999; P. Birt and L. Hall pers. comm. cited NPWS 2004).

A small area of marginal foraging habitat was recorded within the subject site. Given the small area of limited habitat potential of the site, the removal of these resources **will not** reduce the viability of Grey-headed Flying-fox in the local area, to a degree that could put the local population at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

This factor applies a similar test as in factor (a) to endangered populations.

(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 removed or modified as a result of the action.**

Not applicable to Grey-headed Flying-fox.

- 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 to Grey-headed Flying-fox.

(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.**
The proposed activity will result in the removal of 5.5ha of forest and pasture in the Subject Site, identified here as marginal habitat.
- 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.**

The proposal will not contribute to the cumulative loss of habitat and the increased fragmentation or isolation of habitat.

- 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.*

Given the small scale of removal it is predicted that this would not constitute a loss of significant habitat.

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

The proposal would not have any adverse effect on critical habitat. There is a capacity for critical habitats to be gazetted under the Threatened Species Conservation Act 1995. No such habitats have yet been gazetted for Grey-headed Flying-fox.

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

At this point in time no recovery plan has been prepared for this species by OEH. OEH (2006) have identified that the following actions need to be followed in order to recover this species:

- Protect roost sites, particularly avoid disturbance September through November;
- Identify and protect key foraging areas;
- Manage and enforce licensed shooting;
- Investigate and promote alternative non-lethal crop protection mechanisms;
- Identify power line black spots and implement measures to reduce deaths.

In addition OEH (2006) have developed 29 priority actions which can be viewed at the OEH website.

The proposal is not consistent with all the recovery objectives for this species. The proposal seeks to ameliorate impacts through implementation of regeneration or restoration programs where suitable.

(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 NSW OEH have identified that the following threatening processes are acting upon this species:

- Loss of foraging habitat;
- Disturbance of roosting sites;
- Unregulated shooting;
- Electrocution on power lines.

The proposed action constitutes a key threatening process, and it is considered to contribute to the increased impact of a threatening process.

Falistrellus tasmaniensis Eastern False-pipistrelle 7-Part Test

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern False-pipistrelle occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests. This species fly fast around or near the forest canopy foraging for large beetles (O'Neill and Taylor 1986). They selectively forage on the largest prey available (Herr 1998) and most commonly preyed up large moths and beetles (O'Neill and Taylor 1986, O'Neill and Taylor 1989). Most common beetles preyed upon were from the families Coleoptera and Lepidoptera (O'Neill and Taylor 1989).

In north-eastern NSW Eastern False Pipistrelle roosted selectively in older forests which contained large trees with hollows and had a lower density of trees (Herr 1998). Radio-tracking identified that they changed roost trees every night, although roost trees were generally within the same area (300-400m apart) and showed high fidelity to these sites. This species also form bachelor roosts throughout the breeding season (Herr 1998), with maternity colonies located elsewhere within their home range which can be up to 140 hectares.

A small area of marginal foraging habitat was recorded within the subject site. Given the small area of limited habitat potential of the site, the removal of these resources **will not** reduce the viability of Eastern False-pipistrelle in the local area, to a degree that could put the local population at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

This factor applies a similar test as in factor (a) to endangered populations.

(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 removed or modified as a result of the action.

Not applicable to Eastern False-Pipistrelle

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 to Eastern False-Pipistrelle

(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.

The proposed activity will result in the removal of 5.5ha of forest and pasture with scattered trees in the Subject Site, identified here as marginal habitat.

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.

The proposal will not contribute to the cumulative loss of habitat and the increased fragmentation or isolation of habitat.

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.

Given the small scale of removal it is predicted that this would not constitute a loss of significant habitat.

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

The proposal would not have any adverse effect on critical habitat. There is a capacity for critical habitats to be gazetted under the Threatened Species Conservation Act 1995. No such habitats have yet been gazetted for Eastern False-Pipistrelle.

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

NSW DEH has identified 17 PAS actions to help with the recovery and amelioration of threats on this species. These include:

1. Develop and promote State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc.;
2. Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees;
3. Ensure the largest hollow bearing trees, including dead trees and paddock trees, are given highest priority for retention in PVP assessments. Offsets should include remnants in high productivity;
4. Identify areas of private land that contain high densities of large hollow-bearing trees as areas of high conservation value planning instruments and land management negotiations e.g. LEP, CAPs, PVPs;

5. Ensure the Code of Practice for private native forestry includes adequate measures to protect large, hollow-bearing trees and viable numbers of recruit trees;
6. Promote the conservation of these private land areas using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other means;
7. Identify the effects of fragmentation in a range of fragmented landscapes i.e. the farmland/forest interface and the urban/forest interface e.g. movement and persistence across a range of fragment sizes;
8. Research the degree of long-term fidelity to roost trees and roosting areas in order to assess their importance and the effects of their removal;
9. Research the roosting ecology of tree-roosting bats. For example identifying the attributes of key roosts;
10. Identify important foraging range and key habitat components for this species;
11. Identify the susceptibility of the species to pesticides;
12. Investigate the effectiveness of logging prescriptions;
13. Research the effect of different burning regimes;
14. Research the effectiveness of rehabilitation measures intended to increase bat populations in degraded landscapes, such as revegetating and installing bat boxes;
15. Study the ecology, habitat requirements and susceptibility to logging and other forestry practices of this little-known species;
16. Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes;
17. Quantify any benefits of local bat populations to reducing the impact of insect pests on commercial crops; and
18. Better define species distribution through survey in coastal lowlands on- and off-reserve.

PAS actions require individuals to where possible identify actions to which they can contribute. In terms of this Subject, the actions this document will contribute are points 4, 11, 12 and 15.

(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 proposed action will only constitute minor vegetation modification within disturbed road corridors through slashing of vegetation where required. While minor, these actions are likely to contribute, albeit not in a significant manner to the following key threatening processes.

- Native vegetation clearing; and
- Anthropogenic climate change.

The NSW DEH have identified that the following threatening processes are acting upon this species:

- Loss of hollow-bearing trees.
- Loss of foraging habitat.
- Application of pesticides in or adjacent to foraging areas.

The proposed action will not impact upon any of the threatening process identified by DEH. The modification of already disturbed habitats is unlikely to impact on any habitat utilised by this species.

Miniopterus australis Little Bentwing Bat 7-Part Test

- (a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.**

Little Bentwing bats occur in a wide variety of well-timbered habitats including moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. They eat a variety of insects including crane flies, ants, moths and wasps. This species flies rapidly and with considerable manoeuvrability between shrub and canopy layers

Little Bentwing bats travel large distances between different roosts according to changing seasonal needs with winter roosting sites being located in cooler caves to aid in hibernation (Strahan 2000). Roost habitat includes caves, mining tunnels, railway tunnels and storm water drains (Hoye and Spence 2004). Little Bentwing bats also form maternity colonies in spring after which the males and juveniles disperse in summer.

A small area of marginal foraging habitat was recorded within the subject site. Given the small area of limited habitat potential of the site, the removal of these resources **will not** reduce the viability of Little Bentwing bat in the local area, to a degree that could put the local population at risk of extinction.

- (b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.**

This factor applies a similar test as in factor (a) to endangered populations.

- (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 removed or modified as a result of the action.**
Not applicable to Little Bent-wing Bat.
- 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 to Little Bent-wing Bat.

- (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.**
The proposed activity will result in the removal of 5.5ha of forest and pasture with scattered trees in the Subject Site, identified here as marginal habitat.
- 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.**
The proposal will not contribute to the cumulative loss of habitat and the increased fragmentation or isolation of habitat.
- 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.**

It is currently difficult to quantify the importance of the habitat, however the foraging records made nightly during these surveys indicate that the species utilizes the site occasionally. Given the small scale of removal it is predicted that this would not constitute a loss of significant habitat.

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

The proposal would not have any adverse effect on critical habitat. There is a capacity for critical habitats to be gazetted under the Threatened Species Conservation Act 1995. No such habitats have yet been gazetted for Little Bent-wing Bat.

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

NSW DEH has identified 25 PAS actions to help with the recovery and amelioration of threats on this species. These include:

1. Promote bats throughout the rural community as ecologically interesting and important, but sensitive to disturbance at caves/disused mine tunnels;
2. Compile register of all known roost sites in natural and artificial structures including current and historical data and identify significance of roost, e.g. maternity, hibernation, transient roost;
3. Control foxes and feral cats around roosting sites, particularly maternity caves and hibernation sites;
4. Control goats around roosting sites, particularly maternity caves and hibernation sites;
5. Exclude prescription burns from 100m from cave entrance, ensure smoke/flames of fires do not enter caves/roosts in artificial structures;
6. Prepare fire management plans for significant roost caves, disused mines, culverts, especially maternity and winter roosts;
7. Prepare management plans for significant bat roosts especially all known maternity colonies and winter colonies;
8. Protect significant roosts and forest habitat within 10 km of roosts in PVP assessments (offsets should include nearby remnants in high productivity) and other environmental planning instruments;
9. Identify and protect significant roost habitat in artificial structures (e.g. culverts, old buildings and derelict mines);
10. Restrict access where possible to known maternity sites. (e.g.: signs);
11. Restrict caving activity during critical times of year in important roosts used by species, particularly maternity and hibernation roosts;
12. Search for significant roost sites and restrict access where possible. (e.g. gating of caves). Significant includes maternity, hibernation and transient sites including in artificial structures;
13. Undertake non-chemical removal of weeds (e.g. lantana, blackberry) to prevent obstruction of cave entrances;
14. Promote the conservation of these significant roost areas using measures such as incentive funding to landholders, offsetting and biobanking, acquisition for reserve establishment or other means;
15. Monitor the breeding success of maternity colonies in cave roosts over a number of years to determine the viability of regional populations;
16. For roost caves vulnerable to human disturbance, monitor their visitation by people, particularly during winter and spring/summer maternity season and in school holidays;
17. Identify types of winter roosts used by species. Winter roosts suspected to be banana palms and tree hollows;
18. Determine the effectiveness of PVP assessment, offsets and actions for bats;
19. Establish a gating design for disused mines across species range that will not adversely impact species;
20. Identify important foraging range and key habitat components around significant roosts;
21. Identify the susceptibility of the species to pesticides;
22. Measure genetic population structure among cave roosts of maternity colonies to estimate dispersal and genetic isolation, and vulnerability to regional population extinction;
23. Study the ecological requirements of maternity colonies and their environs and migratory patterns;
24. Study the effect of different burning regimes on cave disturbance and surrounding foraging habitat; and
25. Undertake a regular census of maternity colonies (e.g. Willi Willi) and other key roosts in network, especially where there are population estimates from banding in the 1960s.

PAS actions require individuals to where possible identify actions to which they can contribute. In terms of this Subject, the actions this document will contribute are points 4, 11, 12 and 15.

(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 proposed action will only constitute minor vegetation modification within disturbed road corridors through slashing of vegetation where required. While minor, these actions are likely to contribute, albeit not in a significant manner to the following key threatening processes.

- Native vegetation clearing; and

- Anthropogenic climate change.
-

The NSW DEH have identified that the following threatening processes are acting upon this species:

- Disturbance of colonies, especially in nursery or hibernating caves, may be catastrophic.
- Destruction of caves that provide seasonal or potential roosting sites.
- Changes to habitat, especially surrounding maternity/nursery caves and winter roosts.
- Use of pesticides.
- Predation from foxes and feral cats, particularly around maternity caves, winter roosts and roosts within culverts, tunnels and under bridges.

The proposed action will not impact upon any of the threatening process identified by DEH. The modification of already disturbed habitats is unlikely to impact on any habitat utilised by this species.

Miniopterus schreibersii oceanensis Eastern Bentwing Bat 7-Part Test

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern Bentwing Bats are known to occur in a variety of habitat types within the Hunter Valley including grassy woodlands, open sclerophyll forests and woodlands. They exhibit a bimodal activity pattern indicative of most bats, where they leave the cave around sunset to feed and return to the roost between 2400 – 0100 to digest before leaving again after an hour to forage until dawn (Codd *et al.* 2001). Hoyer (2000) estimates that whilst they are highly mobile they generally forage within a radius of 20km from their roost site in a night.

Roost and breeding habitat for this species is extremely important and requires cave or mining structures. Female *M. schreibersii oceanensis* undertake a regional migration in spring where they form maternity colonies in certain caves each year, whilst males undertake a much smaller migration to summer roost locations. They are known to travel large distances between different roosts according to changing seasonal needs with winter roosting sites being located in cooler caves to aid in hibernation (Strahan 2000).

A small area of marginal foraging habitat was recorded within the subject site. Given the small area of limited habitat potential of the site, the removal of these resources **will not** reduce the viability of Eastern Bentwing bat in the local area, to a degree that could put the local population at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

This factor applies a similar test as in factor (a) to endangered populations.

(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 removed or modified as a result of the action.*

Not applicable to Eastern Bentwing-bat.

- 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 to Eastern Bentwing-bat.

(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.*

The proposed activity will result in the removal of 5.5ha of forest and pasture with scattered trees in the Subject Site, identified here as marginal habitat.

- 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.*

Based on the small scale of impact (<60 large trees) the potential habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

- 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 importance of the habitat to be removed is considered to be low. As stated previously, Eastern Bentwing-bat are considered unlikely to utilise the grassy paddock areas.

No Eastern Bentwing-bat were observed or heard during the field surveys which examined both the Impact Site and surrounding vegetation. Only marginal suitable habitat for this species was observed within the Impact Site.

No such habitats have yet been gazetted for Eastern Bentwing-bat. The proposal will not remove any habitat that will directly impact on this species to maintain its lifecycle within the locality.

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

No such habitats have yet been gazetted for Eastern Bentwing-bat. The proposal will not remove any habitat that will directly impact on this species capacity to maintain its lifecycle within the locality.

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

At this point in time no recovery plan has been prepared for this species by OEH.

(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.

None of the 34 'key' threatening processes listed under the Threatened Species Conservation Act apply to the proposed actions on these sites. The NSW OEH have identified that the following processes are affecting this species:

- Damage to or disturbance of roosting caves, particularly during the breeding period;
- Loss of foraging habitat;
- Application of pesticides in or adjacent to foraging areas;
- Predation by feral cats and foxes.

The proposed action is not considered to constitute a threatening process, nor is it considered to contribute to the increased impact of a threatening process.

1. 2.17 Eastern Cave Bat *Vespadelus troughtoni* 7-Part Test

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

The Eastern Cave Bat is a cave-roosting species found in dry open forest and woodland near cliffs and rocky overhangs. The presence of native vegetation in close proximity to roosts is important as it provides foraging habitat. Foraging habitat includes forests and non-forested areas. Eastern Cave Bats frequent streams lined with trees but also traverse open paddock areas to forage on vegetated slopes surrounding the roost. Foraging was observed in the air space above the creek.

Maternity roosts were located in the overhangs of large sandstone caves usually containing a dome at the rear. Nearby cliff-lines found that small caves, crevices and overhangs were not used as day-roosts. They frequently switched with most movements between roosts were within 1.5 km, although one female moved about 3.75 km between roosts.

The proposal is within grassy paddock areas with no cliffs or rocky overhangs within 1.5 kilometres of the site..

Eastern Cave bats could potentially utilise the rocky escarpments, the proposed activities will not affect either roosting or foraging habitat utilised by this species. The loss/modification of grassy verge and pasture **will not** disrupt the lifecycle of this species such that it is placed at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

This factor applies a similar test as in factor (a) to endangered populations.

(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 removed or modified as a result of the action.*

Not applicable to Eastern Cave Bat.

- 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 to Eastern Cave Bat.

(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 proposed activity will not result in the removal/modification of habitat.

- 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 Eastern Cave Bat habitat will not become fragmented or isolated by the proposed activities. Pasture grass and grassy road verges will be cleared or modified by the proposed activities. This will not affect connectivity to similar landscapes within the local area.

- 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 importance of the habitat to be removed is considered to be low. As stated previously, Eastern Cave Bat forage aurally so the removal/modification of pasture grass and grass road side vegetation will not fragment or isolate habitat for this species, such that its long-term survival is jeopardised within the locality.

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

No such habitats have yet been gazetted for Eastern Cave Bat. The proposal will not remove any habitat that will directly impact on this species to maintain its lifecycle within the locality.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery or threat abatement plan.

At this point in time no recovery plan has been prepared for this species by DECCW.

(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.

None of the 34 'key' threatening processes listed under the Threatened Species Conservation Act apply to the proposed actions on these sites. The NSW DECCW have identified that the following processes are affecting this species:

- Clearing and isolation of dry eucalypt forest and woodland adjacent to cliffs and other areas containing suitable roost and maternity sites.
- Loss of foraging habitat surrounding roost and maternity sites
- Reduction of invertebrate prey due to use of pesticides and herbicides allowing toxicity of blood fat reserves.
- Damage to roost and maternity sites from mining and recreational activities
- Predation by cats and foxes

The proposed action is not considered to constitute a threatening process, nor is it considered to contribute to the increased impact of a threatening process.

2. 2.3 *Brown Treecreeper* *Climacteris picumnus* 7-Part Test

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

Occur on inland plains and foot slopes of the Great Divide, mostly in woodlands and forests dominated by eucalypts with a grassy open understorey and sparse shrub layer. On the foot slopes they tend to prefer inhabiting dry Box Ironbark associations on ridges. They have a permanent home range which they defend throughout the year.

Brown Treecreepers forage on the ground searching in leaf litter, logs and other fallen material, as well as, on tree trunks examining crevices and holes for ants and beetles.

Nests occur anywhere within their home range, but frequently near edges where cooperative breeding opportunities can occur. Roost in hollows in tree trunks and dead limbs in eucalypts. Nest in hollows in dead branches or spouts.

The proposal is located entirely within grassy paddock areas with occasional paddock trees towards the edges but no trees are proposed to be cleared. The grasses within the sites were quite thick and dense with less dense patches occurring at the bases of remnant paddock trees. In general this area was dominated by grassy weeds.

Brown Treecreepers could potentially forage on remnant trees at the edges of paddock areas. The proposed activities will result in the removal/modification of pasture grass. The impacts of the proposed activities **will not** disrupt the lifecycle of a viable local population and **will not** place this species at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

This factor applies a similar test as in factor (a) to endangered populations.

(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 removed or modified as a result of the action.**

Not applicable to Brown Treecreeper.

- 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 to Brown Treecreeper.

(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 proposed activity will not result in the removal/modification of habitat.

- 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**

Brown Treecreeper are considered unlikely to utilise the sites. The proposed activities will only have very small impacts and will not result in habitat becoming fragmented or isolated. This species will not be adversely affected by the proposed activities.

- 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 importance of the habitat to be removed is considered to be low. Brown Treecreeper would not utilise the locations given the absence of foraging habitat within the cleared pasture areas. Brown Treecreeper could potentially utilise some habitats along the forest core or edge, but the activity will not remove habitat for this species. As such it is considered that the proposed activities will not affect the long-term survival of his species.

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

No such habitats have yet been gazetted for Brown Treecreeper. The proposal will not remove any habitat that will directly impact on this species to maintain its lifecycle within the locality.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery or threat abatement plan.

At this point in time no recovery plan has been prepared for this species by DECCW.

(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.

None of the 34 'key' threatening processes listed under the Threatened Species Conservation Act apply to the proposed actions on these sites. The NSW DECCW have identified that the following processes are affecting this species:

- Fragmentation of woodland and forest remnants isolating populations
- Ongoing degradation of habitat, particularly loss of tree hollows and removal of fallen timber
- Lack of regeneration of eucalypt overstorey due to overgrazing
- Loss of ground litter from compaction and overgrazing.

The proposed action is not considered to constitute a threatening process, nor is it considered to contribute to the increased impact of a threatening process.

2.1 Large-eared Pied-bat *Chalinolobus dwyeri* 7-Part Test

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

Large-eared Pied Bats occur in most vegetation types provided there are caves or tunnels in which it can roost. Found in a variety of drier habitats, including the dry sclerophyll forests and woodlands. All bats caught were in or close to caves in sandstone outcrops. This species has broad short wings which suggests that it forages below the canopy on insects.

They roost in caves and abandoned mine tunnels. Individuals disperse from the maternity roosts around April and these roosts are largely unused until the following September. The distance bats move from the maternity roost is likely to be less than 100 km (G.A. Hoyer 2006, pers. comm.).

The proposal is located in grassy paddock areas with isolated paddock trees. The majority of the paddock areas contained no trees or shrubs and all fallen timber has been removed. No isolated canopy trees will be removed by the proposed activity. Given these factors, the proposed activity **will not** disrupt the lifecycle of a viable local population and **will not** place this species at risk of extinction.

As such the works associated with the seismic survey **will not** disrupt the lifecycle of a viable local population and **will not** place this species at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

This factor applies a similar test as in factor (a) to endangered populations.

(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 removed or modified as a result of the action.***

Not applicable to Large-eared Pied-bat.

- 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 to Large-eared Pied-bat.

(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 proposed activity will not result in the removal/modification of habitat.

- 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***

Large-eared Pied Bat being a canopy forager are likely to utilise any section of the proposal area following construction. As such this species will not be affected by fragmentation or isolation.

- 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 importance of the habitat to be removed is considered to be low. Large-eared Pied-bat are canopy foragers and will not be affected by the proposed activities associated with the creation of the proposal. This activity will not affect the long-term survival of this species within the locality.

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

No such habitats have yet been gazetted for Large-eared Pied-bat. The proposal will not remove any habitat that will directly impact on this species to maintain its lifecycle within the locality.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery or threat abatement plan.

At this point in time no recovery plan has been prepared for this species by DECCW.

(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.

None of the 34 'key' threatening processes listed under the Threatened Species Conservation Act apply to the proposed actions on these sites. The NSW DECCW have identified that the following processes are affecting this species:

- Clearing and isolation of forest and woodland habitats near cliffs.
- Loss of foraging habitats close to cliffs and caves.
- Damage to roosting and maternity sites
- Use of pesticides

The proposed action is not considered to constitute a threatening process, nor is it considered to contribute to the increased impact of a threatening process.

Appendix F - EPBC Assessments

EPBC SIGNIFICANCE ASSESSMENT FOR Critically endangered and endangered ecological communities

Significant Impact Criteria	Response
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	No. The proposal will increase connectivity by regeneration. No areas of habitat to be removed.
Adversely affect habitat critical to the survival of an ecological community	No. Marginal poor quality area of 5.5ha will be taken up by the proposal but the proposal will not remove any trees or areas of habitat.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	No. The proposal will not impact on abiotic factors.
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	No. the proposal will increase diversity buy regeneration plans.
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,	No. The proposal will not introduce factors that lead to risks for the community. The entire project is to be off-grid organic farming, so no impact from footprint or from activities running the proposal.
Interfere with the recovery of an ecological community	Regional wide recovery of this community is reliant in increasing the area of this community across its distribution. The planned regeneration will potentially increase this by 250% onsite with out the loss of any existing habitat.

EPBC SIGNIFICANCE ASSESSMENT FOR Vulnerable species Grey-headed Flying-fox (*Pteropus poliocephalus*)

Significant Impact Criteria	Response
Lead to a long-term decrease in the size of an important population of a species	The action will not remove any trees or native habitat. This will not lead to a long-term decrease in the size of an important population of a species
Reduce the area of occupancy of an important population	The impact area is only marginal habitat, thus not considered important to the local population. There are no fruiting trees and large trees that could provide roost sites
Fragment an existing important population into two or more populations	Not applicable. No population present.
Adversely affect habitat critical to the survival of a species	No critical habitat present.
Disrupt the breeding cycle of an important population	No breeding habitat onsite.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The action only includes the removal of sixty trees, of which none are fruiting trees. It will not Modify, destroy, remove or isolate or decrease any habitats.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Not part of the action.
Introduce disease that may cause the species to decline	Not part of the action.
Interfere substantially with the recovery of the species	The loss of these trees is a minor loss of potential marginal habitat.

EPBC SIGNIFICANCE ASSESSMENT FOR listed Migratory species: Rainbow Bee-eater *Merops ornatus*, Satin Flycatcher (*Myiagra cyanoleuca*), Black-faced Monarch (*Monarcha melanopsis*) Rufous Fantail (*Rhipidura rufifrons*)

Significant Impact Criteria	Response
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The action is not proposed on any area of important habitat.
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 action will not introduce an invasive species and the impact area is not an important area of habitat.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The action will not occur on an area greater than 18 ha, which would not be considered a significant proportion of a population.

1.0 Appendices