

FloraFauna



Consulting

Ecological Assessment EA-2013-1810

In relation to:

Proposed Land Rezoning

**Lot 246, Lots 265-270 & Lot 310 in DP 754454
and Lot 4 in DP 114687, Wingham**

December 2013

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Project: Ecological Assessment – Lot 246, Lots 265-270 & Lot 310 DP 754454 and Lot 4 DP 114687, Wingham

Client: Boral Pty Ltd

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The preparation of this report has been undertaken in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.

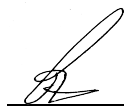
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1. Executive Summary

This report describes the ecological assessment undertaken during November – December 2013 in relation to the proposed rezoning of land situated at the corner of Murray Road and Lambert Street Wingham. The subject site is identified as Lot 246, Lots 265-269 & Lot 310 in DP 754454 and Lot 4 in DP 114687. The combined area of these allotments is approximately 7.6 ha. With the exception of Lot 270, which contains the Wingham Baptist Church the land within the subject site is vacant.

The objectives of the assessment were to describe the ecological characteristics of the survey area within the subject site; identify the impacts of the proposed activity on flora and fauna species, populations, ecological communities and critical habitat; assess the nature, extent, frequency, duration and timing of impacts; assess the extent of threatening processes; assess the significance of the impact on species, ecological communities and populations listed under the *Threatened Species Conservation Act 1995* (TPC Act), *Fisheries Management Act 1994* (FM Act) and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act); and propose environmental management measures to minimise mitigate and if necessary offset impacts.

The survey area encompasses the subject site located at Wingham, which is bounded by Mortimer Street to the north, Lambert Street to the east, Murray Road to the south and Richardson Street to the west. During the field survey two terrestrial plant communities were recorded within the survey area. These included a Spotted Gum - Grey Ironbark dry open forest community as described under the NSW Vegetation Information System (VIS) classification and a derived riparian community that could not be assigned a formal VIS classification due to the extent of modification and degradation of the plant community.

There are a number of potential impacts on biodiversity that are described in Section 5 of this report, which may occur as a consequence of the land within the subject site being rezoned. These include removal of vegetation associated with future development of the site, loss of habitat, interruption to ecosystem processes, and other impacts associated with increased human activities including changes in animal behaviour and artificial lighting. Proposed measures to mitigate the potential impacts are detailed in Section 6 of the report. As previously discussed the subject site is heavily infested with invasive weeds.

From the habitat assessment and database/literature review, it was considered that 8 threatened species as listed under the *Threatened Species Conservation Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999* could potentially utilise the habitat within the survey area.

The Section 5A Assessments appended to this report as Appendix C concluded that the proposal has the potential to impact on some threatened species and populations. Generally however, the impacts can be mitigated by the measures outlined in Section 6 of this report.

2. Introduction

2.1 Background

FloraFauna Consulting has been engaged by Boral Pty Ltd (the client) to prepare an ecological assessment report to assess the potential impacts in relation to the proposed rezoning of land situated at the corner of Murray Road and Lambert Street Wingham.

2.2 Subject Site

The subject site is located at Wingham and comprises nine allotments of land bounded by Mortimer Street to the north, Lambert Street to the east, Murray Road to the south and Richardson Street to the west. The allotments that form the subject site are identified as:

- Lot 246 in DP 744454
- Lots 265-269 in DP 754454;
- Lot 310 in DP 754454; and
- Lot 4 in DP 114687.

The combined area of these allotments is approximately 7.6 ha.

The majority of the land within the subject site is zoned RU1 – Primary Production under the *Greater Taree Local Environmental Plan 2010* (LEP). Part of Lot 269 situated in the north-eastern corner of the subject site is zoned B1 – Neighbourhood Centre.

The larger proportion of the subject site has been cleared of native vegetation and is maintained to a parkland cleared condition through regular slashing. However, a relatively small part of the land adjacent to a small watercourse that dissects the centre of the site contains more substantial areas of native and exotic vegetation.

The subject site is situated within the urban environment of Wingham. The surrounding landscape in which the subject site is situated has undergone significant modification with much of the land having been cleared of native vegetation.

Existing residential development adjoins the subject site to the north, east and west. Beyond the residential areas in these directions are large expanses of cleared agricultural land with some remnant vegetation that is mostly confined to land within road reserves and adjacent to watercourses. To the south of the subject site adjacent to Murray Road is a small commercial precinct that is zoned B6 – Enterprise Corridor that adjoins a relatively large area of cleared agricultural land zoned RU1 – Primary Production through which the north coast railway corridor is situated.

The relative position of the subject site and the general nature of the surrounding landscape are shown in Figure 2.1.



Figure 2.1: Aerial image of the subject site and surrounding landscape

2.3 Proposed Development

It is proposed to rezone the land within the subject site from the current zoning of RU1 – Primary Production and B1 – Neighbourhood Centre to R1 – General Residential and RE1 – Public Recreation.

2.4 Survey Area Description

The survey area encompasses all of the land within the subject site as described under Section 2.2. The extent of the survey area is shown in Figure 2.2.



Figure 2.2: Survey area

2.5 Legislative Context

In NSW the *Environmental Planning and Assessment Act 1979* (EP&A Act) provides the framework for the assessment of development activities. Clause 5A of the Act requires that the significance of the impact of a proposal on threatened species, populations and endangered ecological communities is assessed by preparing a seven-part test in accordance with Clause 5A(2) of the Act.

Other State legislation relevant to the ecological assessment includes the following:

- *Threatened Species Conservation Act 1995* (TSC Act);
- *National Parks and Wildlife Act 1974* (NPW Act);
- *Noxious Weeds Act 1993* (NW Act);
- *Fisheries Management Act 1994* (FM Act);
- State Environmental Planning Policy No. 14 – Coastal Wetlands (SEPP 14);
- State Environmental Planning Policy No. 26 – Littoral Rainforests (SEPP 26);
- State Environmental Planning Policy No.44 – Koala Habitat (SEPP 44).

Commonwealth legislation relevant to the ecological assessment is the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The EPBC Act protects nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the Act as matters of national environmental significance. Matters of national environmental significance relevant to biodiversity are:

- Wetlands of international importance;
- Nationally threatened species and ecological communities;
- Migratory species; and
- Commonwealth marine areas.

Significance of impacts is determined in accordance with the *Significance impact guidelines 1.1 – matters of national environmental significance* (Department of Environment, Water, Heritage and the Arts, 2006). Where a proposal is likely to have a significant impact on a matter of national environmental significance, the proposal is referred to the Federal Environment Minister. The referral process involves a decision on whether or not the proposal is a 'controlled action'. When a proposal is declared a controlled action, approval from the Minister is required.

2.6 Objectives of the Report

The objectives of the ecological assessment are to:

- Describe the ecological characteristics of the subject site including identifying protected and threatened flora and fauna species, populations and ecological communities and their habitats;
- Identify the direct and indirect impacts of the proposed activity on flora and fauna species, populations, ecological communities and critical habitat;
- Assess the nature, extent, frequency, duration and timing of impacts;
- Assess the extent to which the proposed activity contributes to processes threatening the survival of biota on the site;

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- Assess the significance of the impact of the proposed activities on species, ecological communities and populations listed under the TSC Act, FM Act and EPBC Act; and
- Propose management measures to minimise or mitigate and if necessary offset impacts.

3. Survey Methodology

3.1 Licencing

All work in relation to this ecological assessment was undertaken with appropriate licences and authorisations including:

- A Scientific Licence for the purpose of ecological survey and consulting issued subject to the provisions of Section 132C of the NPW Act and regulations; and
- An Animal Research Authority issued by the Department of Industries and Investment (formerly the Department of Primary Industries) Director-General's Animal Care and Ethics Committee for the purpose of biodiversity survey and habitat assessment.

3.2 Nomenclature

The names of plants used in this document follow the *Flora of New South Wales* (Harden, 2000) with updates from the PlantNet website (Royal Botanic Gardens Sydney, 2012).

The description of plant communities used in this document follow the NSW Plant Community Type (PCT) classification from the NSW Vegetation Information System (VIS) classification database (NSW Department of Environment and Heritage). For clarity a description based on observations recorded during the field survey has also been provided.

The names of vertebrate animals used in this document follow the Census of Australian Vertebrates (CAVS) database maintained by the Department of the Environment and Heritage (2004).

3.3 Literature Review and Database Searches

The following literature was reviewed in relation to this ecological assessment:

- Site inspection report dated 23 November 2009, prepared by King and Campbell Pty Ltd;
- Report to ordinary meeting of Greater Taree City Council, dated 16 February 2011, prepared by Kieran Metcalfe (Strategic Planner);
- *Greater Taree Local Environmental Plan 2010* (LEP); and
- Greater Taree Council online land zoning map.

Database searches as summarised in Table 3.1 were undertaken on 27 November 2013.

Database	Source
Atlas of NSW Wildlife (10 km x 10 km search area)	NSW Government Office of Environment and Heritage
PlantNet: ROTAP/Threatened Species Spatial Search (10 km radius)	Sydney Royal Botanic Gardens
EPBC Act Protected Matters Search Tool (10 km buffer)	Department of Sustainability, Environment, Water, Population and Communities

Table 3.1: Database Searches

3.4 Field Survey

An investigation of the subject site was undertaken on Thursday, 28 November 2013 for the purpose of conducting an assessment of the flora and fauna, a survey of trees within the canopy of the plant community and habitat assessment as detailed below.

3.4.1 Flora Assessment

An assessment of the flora was conducted during the field investigation using a modified random meander method after Cropper (1993) and the following information was collected:

- The plant communities, species and populations present (NB: An inventory of the species present was made but cannot be regarded as comprehensive due to the disturbed nature of the site);
- Tree survey;
- Spatial distribution of the vegetation in the survey area;
- Condition of the vegetation; and
- Conservation significance of the vegetation;

3.4.2 Tree Survey

Trees were surveyed to quantify the species composition of the canopy within the plant communities. The purpose of quantifying the species within the canopy was to assist with:

- Determining the plant communities present within the survey area;
- Collection of information for the habitat assessment such as presence of tree hollows; and
- Determining the approximate percentage of Koala feed tree species present as part of the Koala habitat assessment.

For the purposes of this ecological assessment a tree is defined as a perennial plant having a trunk diameter at breast height (DBH) of not less than 100 mm where DBH is the measurement of the trunk at 1.3 m above ground level.

3.4.3 Fauna Assessment

The fauna assessment conducted was restricted to a visual daytime survey. Trapping or other survey techniques such as spotlighting and the like for fauna species was not conducted, nor was a comprehensive species list gathered. During the fauna survey the following information was collected:

- An inventory of bird species present within the site and adjacent land using the “standardised search” method after Watson (2007); and
- Other species of fauna recorded opportunistically during the field survey.

3.4.4 Habitat Assessment

The habitat assessment focused on the potential for species to occur within the survey area based on the type, suitability and condition of the habitat, and the habitat features present. Although recording threatened species during field survey can confirm their presence in an area, the lack of threatened species records does not necessarily indicate that threatened species are absent. Threatened species tend to be rare and in many cases are cryptic by nature, consequently they are often difficult to detect. Suitable habitat is, therefore, a useful indicator and an important matter for consideration when determining the potential for the presence of threatened species. During the field survey the following information was collected:

- Habitat type;
- Habitat features;
- Threatened species and populations likely to be present based on the type of habitat and the habitat features present; and
- Habitat connectivity; and conservation significance (individuals, species, populations and communities).

3.4.5 Koala Habitat Assessment

(a) SEPP 44

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) “aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline.” SEPP 44 Koala Habitat Assessment was undertaken and involved the following points of consideration:

- Determining whether the subject site occurs within a Local Government Area (LGA) listed under Schedule 1 of SEPP 44;
- Determination of *Potential Koala Habitat*; and
- Determination of *Core Koala Habitat*.

(b) EPBC Act

Koala (*Phascolarctos cinereus*) populations in Queensland (QLD), New South Wales (NSW) and the Australian Capital Territory (ACT) have been listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This listing came into legal effect on 2 May 2012.

The Protected Matters Search Tool (PMST) indicates that the Koala or its habitat could occur within the area. Therefore, it is a requirement under the provisions of the EPBC Act that adequate information on the characteristics of any koala populations and the quality of potential habitat within the survey area is collected.

As the PMST indicates that the Koala may be present, it was necessary to conduct a habitat assessment. Since there is a limited amount of information on Koala populations and habitat in the area available, a Koala survey was also undertaken for the purposes of this ecological assessment.

I. Koala Habitat Assessment

The habitat assessment considered features of the survey area including:

- The canopy tree species composition;
- The percentage of the canopy cover of each of the above species;
- The vegetative ground cover (% of the ground area);
- The leaf litter cover (% of the ground area);
- The bare ground (% of the ground area);
- The area of surface water (% of the ground area);
- The distance to surface water (m) (in drought years, survival of a population may be dependent on the presence of vegetation near permanent waterways; Gordon et al, 1988); and
- Evidence of dogs in the area (the potential threat of mortality from dog-attacks will influence impact assessment and impact- mitigation measures required).

II. Koala Survey

As per the *Interim Koala Referral Advice for Proponents* (Department of Sustainability, Environment, Water, Population and Communities, 2012) the Koala survey was undertaken in accordance with the survey techniques outlined in Policy 4 of the *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016* (Queensland Government Environment Protection Agency 2006). As the survey area was relatively small and contained limited potential habitat it was possible to undertake a search of the entire potential habitat within the survey area. Surveys of actual animal sightings were undertaken; however more indirect methods including a search for scats and other indicators such as scratch markings on trees were also utilised.

For the purposes of the EPBC Act, where the Koala is identified as occurring in a study area, it is recommended that the Spot Assessment Technique (SAT) (Phillips and Callaghan, 2011) to provide an indication of how much or frequently the area of habitat is being used by the Koala be undertaken.

3.5 Significance Assessments

Significance assessments were carried out for threatened species, populations and ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Threatened Species Conservation Act 1995* (TSC Act).

In the case of the EPBC Act, the significance assessments were undertaken in accordance with the *Significance Impact Guidelines 1.1 – Matters of National Environmental* (Department of Environment, Water, Heritage and the Arts, 2009). In the case of the TSC Act, the significance assessments were undertaken in accordance with the *Threatened Species Assessment Guidelines – The Assessment of Significance* (Department of Environment and Climate Change, 2007).

The conclusions drawn in this report are based upon information obtained from the review of literature and database searches, and from the ecological assessment undertaken of the survey area at the time of the field investigation. These results are not exhaustive but rather are indicative of the environmental conditions, including the presence or otherwise of threatened species, populations and ecological communities. It should also be recognised that environmental conditions are dynamic and will change over the course of time.

Habitat assessments were completed for all threatened species and populations identified in the database searches (Table 3.1) to determine whether or not suitable habitat exists within the subject site. This is a conservative approach that is more likely to include cryptic species as well those that are otherwise difficult to detect.

3.6 Aboriginal Heritage

Aboriginal objects are physical evidence of the use of an area by Aboriginal people. These objects can also be referred to as 'Aboriginal sites', 'relics' or 'cultural material'. Aboriginal objects include:

- Physical objects, such as stone tools, Aboriginal-built fences and stockyards, scarred trees and the remains of fringe camps;
- Material deposited on the land, such as middens; and
- The ancestral remains of Aboriginal people.

Known Aboriginal objects and sites are recorded on the Office of Environment and Heritage (OEH) Aboriginal Heritage Information Management System (AHIMS). The Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW sets out the process which must be followed in order to satisfy due diligence requirements. The first step in this process is checking for Aboriginal sites on AHIMS by conducting an AHIMS Basic Search in the area of your proposed activity.

If the results of the initial AHIMS Basic Search indicate that AHIMS contains information about an Aboriginal site in the area of the proposed activity an Extensive Search must be undertaken. For the purposes of due diligence the AHIMS Basic Search results may be relied upon for 12 months.

4. Results

4.1 Flora

Based on the floristic assemblage and canopy composition data collected during the flora assessment of the survey area it was determined that two plant communities were present, as described below.

4.1.1 Plant Community Description – NSW Vegetation Information System (VIS) classification

(a) Plant Community 1:

Plant Community Type ID: 1213

Biometric Vegetation Type ID: HU630

Vegetation Type:

- i. **Common Community Name:** Spotted Gum - Grey Ironbark dry open forest of the lower foothills of the Barrington Tops, North Coast.
- ii. **Scientific Community Name:** *Eucalyptus acmenoides*, *Eucalyptus crebra*, *Eucalyptus fibrosa*, *Eucalyptus moluccana* / *Acacia falcata*, *Acacia implexa*, *Allocasuarina torulosa*, *Breynia oblongifolia*, *Aristida vagans*, *Cheilanthes sieberi* subsp. *Sieberi*, *Cymbopogon refractus*, *Dianella caerulea*.
- iii. **Dominant Canopy Species:** *Corymbia maculata* (Spotted Gum), *Eucalyptus siderophloia* (Grey Ironbark), *Eucalyptus creba* (Narrow-leaved Ironbark), *Eucalyptus punctata* (Grey Gum), *Eucalyptus fibrosa* (Red Ironbark), *Eucalyptus acmenoides* (White Mahogany), *Eucalyptus moluccana* (Grey Box), *Eucalyptus tereticornis* (Forest Red Gum).
- iv. **Mid Stratum Species:** *Allocasuarina torulosa* (Forest Oak), *Acacia falcata*, *Acacia implexa* (Hickory Wattle), *Leucopogon juniperinus* (Prickly Beard-heath), *Breynia oblongifolia* (Coffee Bush), *Persoonia linearis* (Narrow-leaved Geebung), *Glycine clandestina* (Twining Glycine), *Hardenbergia violacea* (False Sarsaparilla).
- v. **Ground Stratum Species:** *Aristida vagans* (Threeawn Speargrass), *Cymbopogon refractus* (Barbed-wire Grass), *Echinopogon ovatus* (Forest Hedgehog Grass), *Microlaena stipoides* var. *stipoides* (Weeping Grass), *Entolasia stricta* (Wiry Panic), *Pratia purpurascens* (Whiteroot), *Lomandra multiflora* subsp. *Multiflora* (Many-flowered Mat-rush), *Cheilanthes sieberi* subsp. *Sieberi* (Rock Fern), *Vernonia cinerea* var. *cinerea*, *Dianella caerulea* (Blue Flax-lily).

Vegetation Formation (CMA): Dry Sclerophyll Forests (Shrub/grass subformation)

Vegetation Class: Hunter-Macleay Dry Sclerophyll Forests

Landscape Position: Occurs on foothills and undulating terrain mainly below 400m.

Images of the remnant Spotted Gum - Grey Ironbark dry open forest community that occurs within the subject site is shown in Figure 4.1 and Figure 4.2 below.



Figure 4.1: Remnant Spotted Gum - Grey Ironbark dry open forest in the northern parts of the survey area



Figure 4.2: View of the remnant Spotted Gum - Grey Ironbark dry open forest adjacent to the ephemeral stream in the centre of the site

(b) Plant Community 2

This is a derived plant community with little affinity to any natural plant community as classified under the Vegetation Information System. The community name and description is based entirely on observations made during the field survey.

- i. **Community Name:** Derived Riparian Community;
- ii. **Scientific Community Name:** None;
- iii. **Dominant Canopy Species:** *Senna septemtrionalis* (Arsenic Bush), *Ligustrum sinense* (Small-leaf Privet), *Solanum mauritianum* (Tobacco Bush), *Cinnamomum camphora* (Camphor Laurel), *Melaleuca linariifolia* (Flax-leaved Paperbark), *Hakea salicifolia* subsp. *salicifolia* (Willow-leaved Hakea);
- iv. **Mid Strata Species:** *Ageratina adenophora* (Crofton Weed), *Alocasia* sp. (Elephant Ear), *Lantana camara* (Lantana), *Nephrolepis cordifolia* (Fishbone Fern), *Pteridium esculentum* (Bracken), *Rumex crispus* (Curled Dock);
- v. **Ground Strata Species:** *Tradescantia fluminensis* (Wandering Jew), *Commelina cyanea* (Native Wandering Jew), *Pollia crispata* (Pollia) and *Ranunculus plebeius* (Forest Buttercup).

Note: This plant community is highly degraded and some assumptions have been made regarding its identification. Details regarding the degradation and the reasoning behind this interpretation are provided in the discussion under Section 4.1.2 – Field Observations.

An image of the derived riparian community within the survey area is shown in Figure 4.3 and Figure 4.4.



Figure 4.3: Arsenic bush and Crofton weed within the derived riparian community



Figure 4.4: Derived riparian community dominated by exotic/weed species

4.1.2 Field Observations

(a) Spotted Gum - Grey Ironbark dry open forest community

Observations made during the flora assessment indicated that a highly modified and disturbed Spotted Gum - Grey Ironbark dry open forest community occurred across the majority of the subject site. The principle species in the canopy included *Eucalyptus tereticornis* (Forest Red Gum), *Corymbia maculata* (Spotted Gum), *Eucalyptus moluccana* (Grey Box), *Eucalyptus siderophloia* (Grey Ironbark) and *Eucalyptus acmenoides* (White Mahogany). Generally, the canopy has been significantly reduced so that the community tends to resemble a grassy woodland rather than open forest. In some parts of the site, particularly in the southern and central-northern parts the vegetation has been reduced to managed grassland.

The land within the majority of the subject site is managed. With the exception of the areas adjacent to the watercourse the vegetation within the site is maintained through slashing. This slashing regime appears to have been in place for a considerable period of time so that the understorey is almost absent and the groundcover is maintained to a height of less than 300 mm. In the slashed areas of the site where obstructions such as clumps of trees or old fence lines preclude access to the slashing machinery, remnant understorey vegetation remains. During the field survey it was noted that in these areas the remnant understorey is dominated by exotic species, some of which are serious environmental weeds. The most common species recorded in the understorey was *Ligustrum sinense* (Small-leaf Privet), which is a serious environmental weed. Other common species of the understorey included *Lantana camara* (Lantana) a weed of national significance, and *Asparagus aethiopicus* (Asparagus Fern) a declared noxious weed. Other understorey species recorded included *Lycium ferocissimum* (African Boxthorn), which is listed as a Weed of National Significance as well as juvenile trees such as

Cinnamomum camphora (Camphor Laurel) and *Corymbia torelliana* (Cadaga); a native to far northern Queensland but regarded as a potentially serious weed in NSW. Of the few native species recorded in the understorey of the slashed areas the most common species were juvenile trees from the canopy species as well as *Pittosporum undulatum* (Sweet Pittosporum) and *Acacia implexa* (Hickory Wattle). An image of the remnant understorey within the slashed areas of the site is shown in Figure 4.5.



Figure 4.5: Understorey vegetation at the base of a canopy tree within the slashed area of the site

In the slashed areas of the site the groundcover also tended to be dominated by exotic/weed species. The more common exotic/weed grass species included *Paspalum urvillei* (Vasey Grass), *Setaria sphacelota* (South African Pigeon Grass), *Andropogon virginicus* (Whisky Grass), *Cynodon dactylon* (Common Couch), *Briza maxima* (Quaking Grass), *Chloris gayana* (Rhodes Grass), *Sporobolus africanus* (Parramatta Grass), *Festuca pratensis* (Meadow Fescue) and *Vulpia bromoides* (Squirreltail Fescue). Other widespread exotic/weed species included *Taraxacum officinale* (Dandelion), *Plantago lanceolata* (Lambs Tongue), *Senecio madagascariensis* (Fireweed), *Verbena incompta* (Purpletop), *Bidens pilosa* (Cobbler's Pegs), *Centaureum erythraea* (Common Centaury) and *Trifolium pratense* (Red Clover). Native species were far less common within the groundcover. Those recorded included *Pratia purpurascens* (Whiteroot), *Dianella caerulea* var. *caerulea* (Blue Flax-lily) and *Centella asiatica* (Indian Pennywort). An image of the groundcover typical of the slashed areas of the site is shown in Figure 4.6.



Figure 4.6: Groundcover typical of the slashed areas of the subject site

There was also a small drainage depression located in the northern part of the subject site that contained several species that were not recorded elsewhere within the Spotted Gum - Grey Ironbark dry open forest community. These included the exotic/weed species; *Paspalum mandiocanum* (Broadleaf Paspalum), *Cyperus eragrostis* (Umbrella Sedge) and the native species *Ranunculus plebeius* (Forest Buttercup), which was also recorded within a section of the derived riparian community. An image of the groundcover that occurred within the small drainage depression is shown in Figure 4.7.



Figure 4.7: Groundcover within the small drainage depression

In the areas of the site adjacent to the watercourse that are not subject to slashing there was a higher representation of native species recorded within the groundcover. This could most likely be attributed to reduced light associated with a more intact canopy, which would exclude a significant number of the exotic/weed species and provide more favourable conditions for some native species including *Themeda triandra* (Kangaroo Grass), *Echinopogon ovatus* (Forest Hedgehog Grass), *Lomandra longifolia* (Spiny-headed Mat-rush) and *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern).

Despite a greater canopy cover in the areas adjacent to the watercourse, shade-tolerant exotic/weed species remained a significant component of the floral assemblage including *Ligustrum sinense* (Small-leaf Privet), *Lantana camara* (Lantana) and *Asparagus aethiopicus* (Asparagus Fern), which were widespread.

(b) Derived Riparian Community

Observations made during the flora assessment indicated that the riparian zone associated with the ephemeral stream that dissects the subject site contains a derived plant community that is largely composed of an assemblage of exotic species. Canopy species associated with the adjacent Spotted Gum - Grey Ironbark dry open forest community were recorded up to the edge of the riparian zone.

Within the riparian zone the dominant species of the canopy along the entire length of the watercourse comprised three invasive weed species; *Senna septemtrionalis* (Arsenic Bush), *Ligustrum sinense* (Small-leaf Privet) and *Solanum mauritianum* (Tobacco Bush). At the western (upstream) end of the watercourse a relatively large area has been colonised by *Alocasia* sp. (Elephant Ear) with another relatively large area nearby that has been colonised by *Nephrolepis cordifolia* (Fishbone Fern). Both of these species are regarded as invasive weeds. However, the most significant weed within the watercourse in terms of the extent of its range appears to be *Ageratina adenophora* (Crofton Weed).

During the field survey a small number of native species were recorded within the watercourse. However, some of these species tended to be uncommon, such as *Melaleuca linariifolia* (Flax-leaved Paperbark) with three individuals recorded and *Hakea salicifolia* subsp. *salicifolia* (Willow-leaved Hakea) with two individuals recorded. Other native species were recorded as common associates of the community but often restricted in their range. For instance, *Commelina cyanea* (Native Wandering Jew) was a common associate species of the groundcover but was recorded only in the western part of the watercourse, while *Polliia crispata* (Polliia) and *Ranunculus plebeius* (Forest Buttercup) were common associate species of the groundcover but were only recorded in the eastern part of the watercourse adjacent to the site boundary.

The species of flora recorded within the subject site during the field survey is provided in Appendix A of this report. During the field survey no threatened species or populations of flora or any Endangered Ecological Community were recorded within the survey area.

4.1.3 Tree Survey

During the flora assessment trees within the subject site were surveyed. As previously discussed, the plant communities within the subject site are highly modified and only a small portion of the canopy remains. The growth stage of trees within the subject site ranged from saplings and poles (regrowth) to early-mature and mature (mature) after Woodgate et al (1994). This is indicative of a site that has been cleared in the past and has undergone regeneration, although this has been restricted by an ongoing management regime. It was noted that recruitment of juveniles was confined to areas where slashing had not occurred.

All trees across the subject site were inspected for visible hollows. One tree in the late-mature growth stage in which hollows become more common from the greater number of crown breaks and larger branches breaking was recorded. This individual of *Corymbia maculata* (Spotted Gum) was located in the north-western corner of the site and although it displayed the characteristic signs of senescence associated with the late-mature growth stage no visible hollows were observed. The visible hollow search concluded that there were no hollow-bearing trees present within the subject site.

The tree survey also looked at the species composition of the canopy within the survey. Species composition data was not quantified in detail other than to confirm the identification of species composition and their relative abundance. The results of this aspect of the tree survey indicate that *Eucalyptus tereticornis* (Forest Red Gum), *Corymbia maculata* (Spotted Gum) and *Eucalyptus moluccana* (Grey Box), were the principal species present with *Eucalyptus siderophloia* (Grey Ironbark) and *Eucalyptus globoidea* (White Mahogany) being common associates but less abundant. It was noted during the tree survey that the larger proportion of the subject site lacks a canopy and is maintained as grassland.

4.2 Habitat

The principal components of the habitat within the survey area comprised the Spotted Gum - Grey Ironbark dry open forest community and the derived riparian community. Both communities are highly modified with the Spotted Gum - Grey Ironbark dry open forest community resembling managed parkland and the riparian community being almost completely dominated by exotic/weed species.

As previously discussed in Section 4.1.3 the majority of the Spotted Gum - Grey Ironbark dry open forest community has a reduced canopy, an understorey that has largely been removed and groundcover of mostly managed exotic grasses except in the areas immediately adjacent to the watercourse and around clumps of trees where access to slashing equipment is impeded. As a consequence there is a general absence of habitat features within this community and utilisation of the habitat is likely to be restricted to foraging purposes by a limited number of fauna species.

With respect to the derived riparian community, the aquatic and riparian habitats associated with the ephemeral stream are likely to provide potential habitat for a number of species. Despite the large assemblage and dominance of exotic/weed

within the community the extent of this vegetation cover would afford shelter as well as foraging habitat for a variety of fauna species.

4.3 Fauna

Based upon information gathered during the field survey in relation to the plant communities and the habitat features observed, and notwithstanding the past disturbance and modification that have occurred as detailed above, it was determined that the land within the survey area provides limited potential habitat for some species of fauna. Given presence of some habitat features such as limited food resources in the canopy of the Spotted Gum - Grey Ironbark dry open forest community as well as foraging and shelter habitat available within the derived riparian community there is potential for the habitat within the subject site to be utilised by a number of species including several that are threatened.

Although a comprehensive fauna survey was not undertaken during the field survey a number of species were recorded. These included one reptile and 11 birds. The species of fauna recorded within the subject site during the field survey are appended to this report under Appendix B. During the field survey no threatened species or populations of fauna were recorded within the survey area.

4.4 Protected Matters

Under the provisions of the EPBC Act approval is required for any action that may have a significant impact on matters of National Environmental Significance (NES) or on Commonwealth land. A search of the Department of Sustainability, Environment, Water, Population and Communities web site employing the Protected matters Search Tool with a 10km buffer was undertaken to identify the matters of NES that may occur in, or may relate to the site.

4.4.1 Matters of NES (within 10km radius of the site)

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance:	None
Great Barrier Marine Parks	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	1
Threatened Species:	45
Migratory Species:	34

The threatened ecological community returned in the Protected Matters Search Tool was the critically endangered *Lowland Rainforest of Subtropical Australia*. This plant community was not observed within the survey area during the field survey.

The threatened species returned in the Protected Matters Search Tool have been considered under the Assessment of Significance in Appendix C of this report.

Of the 34 migratory species returned in the Protected Matters Search Tool only two are considered to have potential to utilise the habitat within the subject site. These include:

- *Hirundapus caudacutus* (White-throated Needletail); and
- *Ardea ibis* (Cattle Egret).

Neither of these species is listed as a threatened species. The Cattle Egret was introduced into Australia in the 1930s but the large numbers across northern Australia suggests that the species may have self-introduced from Asia.

4.4.2 Other Matters Protected by the EPBC Act

Commonwealth Lands:	3
Commonwealth Heritage Places:	1
Listed Marine Species:	34
Whales and other Cetaceans:	1
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None
Places on the RNE (Indigenous sites):	3
State and Territory Reserves:	1
Regional Forest Agreements:	1
Invasive Species:	36
Nationally Important Wetlands:	None
Key Ecological Features (Narine):	None

With respect to invasive species returned in the Protected Matters Search, four species of bird and seven species of mammal are considered to have potential to occur within or utilise the land within the survey area. The Protected Matters report also lists 15 weed species under Invasive Species, which includes some of the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The weeds and other invasive species that are known or are considered to have potential to occur within the survey area are listed in Table 4.2 below.

Scientific Name	Common Name
Plantae (Weeds)	
<i>Anredera cordifolia</i>	Madeira Vine
<i>Asparagus aethiopicus</i>	Asparagus Fern *
<i>Dolichandra unguis-cati</i>	Cat's-claw Creeper
<i>Genista sp. X Genista monspessulana</i>	Broom
<i>Lantana camara</i>	Lantana*
<i>Opuntia spp.</i>	Prickly Pears
<i>Rubus fruticosus aggregate</i>	Blackberry
<i>Sagittaria platyphylla</i>	Delta Arrowhead
<i>Senecio madagascariensis</i>	Fireweed*
Aves	
<i>Acridotheres tristis</i>	Indian Myna*
<i>Passer domesticus</i>	House Sparrow
<i>Streptopelia chinensis</i>	Spotted Turtle-dove
<i>Sturnus vulgaris</i>	Common Starling
Mammalia	
<i>Canis lupus familiaris</i>	Domestic Dog
<i>Felis catus</i>	Domestic Cat
<i>Lepus capensis</i>	Brown Hare
<i>Mus musculus</i>	House Mouse
<i>Oryctolagus cuniculus</i>	European Rabbit
<i>Rattus rattus</i>	Black Rat
<i>Vulpes vulpes</i>	Red Fox

Table 4.2: Invasive species known or likely to occur within the survey area

* Indicates species recorded within the survey area during the field survey

Three Weeds of National Significance (WoNS); *Asparagus aethiopicus* (Asparagus Fern), *Lantana camara* (Lantana) and *Senecio madagascariensis* (Fireweed) were recorded within the survey area during the field survey. Furthermore, although not returned in the Protected Matters Search another WoNS; *Lycium ferocissimum* (African Boxthorn) was also recorded during the field survey as a single individual.

4.5 Koala Habitat Assessment

4.5.1 SEPP 44

The subject site is situated in the Port Macquarie-Hastings LGA, which is listed on Schedule 1 – Local Government Areas of SEPP 44.

As per SEPP 44, *Potential Koala Habitat* is defined as:

As per SEPP 44, *Core Koala Habitat* is defined as:

The Atlas of NSW Wildlife database search returned 32 records of the Koala within a 10 km x 10 km search area around the subject site. This indicates that the species has a presence in the area but is not necessarily an indication of a population that is presently on, or utilising the subject site. The locations of the recorded sightings of the Koala within a 10 km x 10 km search area from the Atlas of NSW Wildlife (OEH, 2013) are shown in Figure 4.8 below.

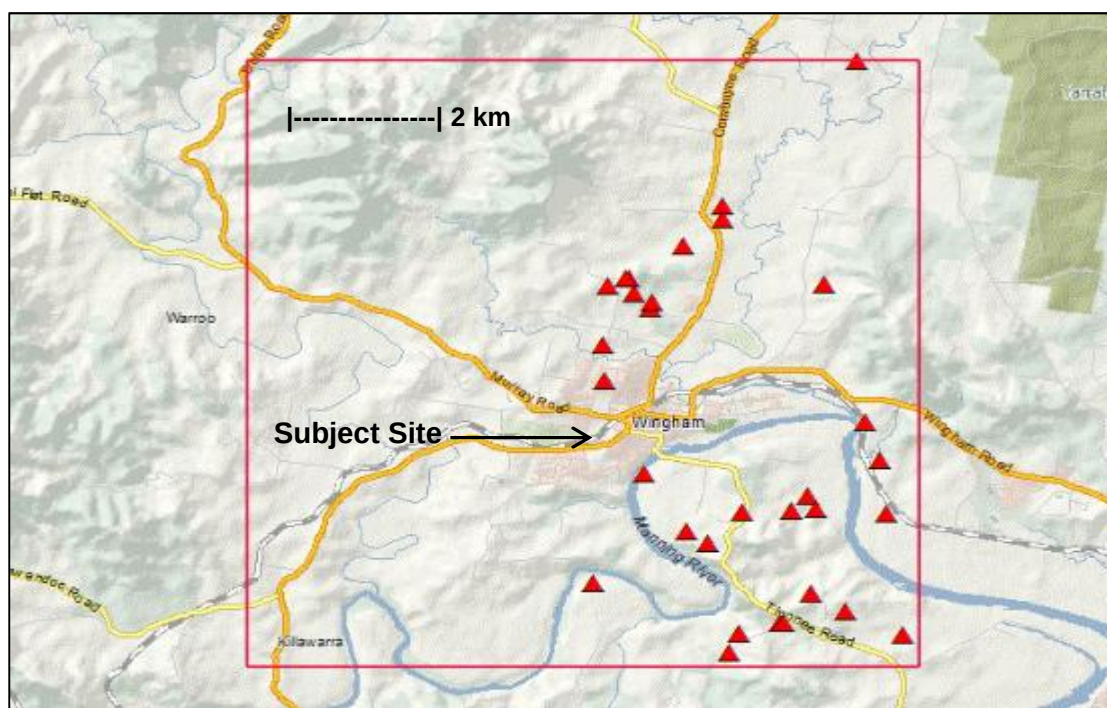


Figure 4.8: Locations of Koala sightings (red markers) within a 10 km x 10 km search area around the subject site. Source: Atlas of NSW Wildlife (OEH)

The Atlas records suggest that there is a local Koala population present within the 10 km x 10 km search area. With one exception all the records are located outside the urban environment with concentrations to the north in an area of remnant forest and also to the south in another area of remnant forest beyond the Manning River. The single record within the urban area is in close proximity (approximately 500 m) to the subject site as indicated in Figure 4.4.

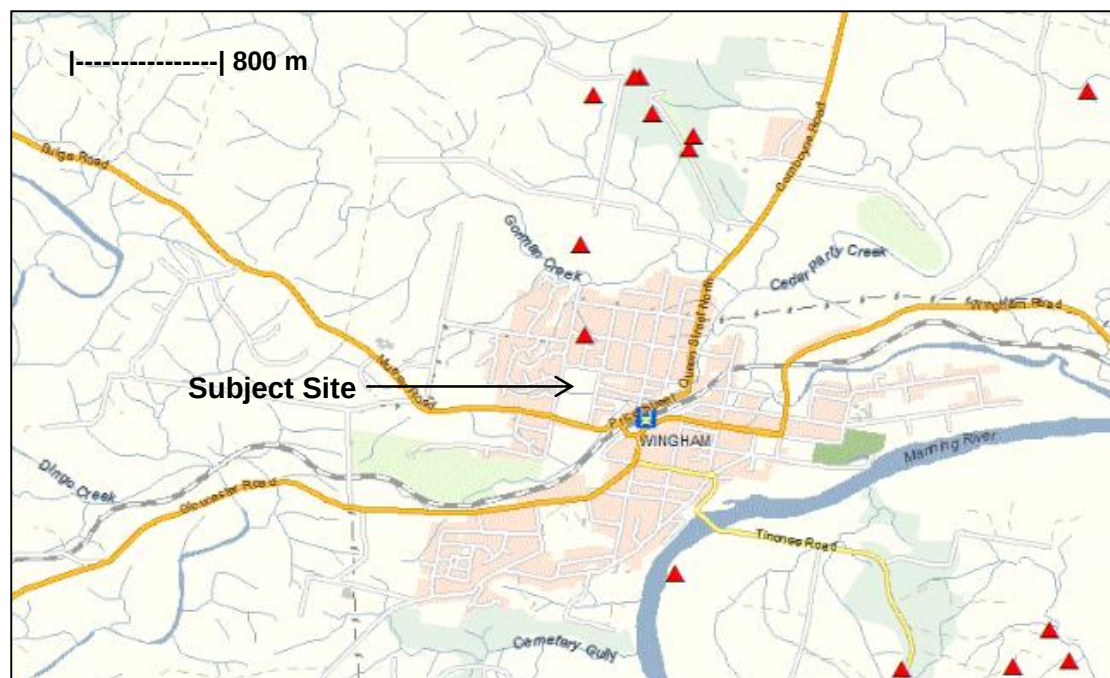


Figure 4.9: Locations of closest Koala sightings (red markers) around the subject site.
Source: Atlas of NSW Wildlife (OEH)

During the field survey a search of the entire habitat within the subject site was undertaken. This included searching the site for actual Koala sightings as well as a Spot Assessment Technique (SAT) survey (a search for scats) and other indicators such as scratch markings on trees. This survey found no evidence of the Koala being present or utilising the habitat within the survey area.

Despite there being potential habitat as defined under SEPP 44 within the subject site it is unlikely that the habitat could be regarded as core Koala habitat given that there was no evidence of the species utilising the habitat, the extent of urbanisation around the site and the lack of suitable habitat corridors to provide linkages to non-urban vegetated areas. On this basis the habitat within the survey area cannot be regarded as core Koala habitat for the purposes of SEPP 44.

4.5.2 EPBC Act

For the purposes of the EPBC Act, habitat critical to the survival of the Koala populations in Queensland, NSW and the Australian Capital Territory are:

- Primary koala food tree species comprise at least 30 % of the over-storey trees;
- Primary koala food tree species comprise less than 30 % of the over-storey trees, but together with secondary food tree species comprise at least 50 % of the over-storey trees;

- Primary food tree species are absent but secondary food tree species alone comprise at least 50 % of the over-storey trees;
- The above qualities may be absent in a forest or woodland but other essential habitat features are present and adjacent to areas exhibiting the above qualities; and
- A relatively high density of koalas is supported, regardless of the presence of food tree species. Koala population densities vary across their range and regional data should be used to judge relative density.

Food trees are those listed under Appendix 2 of the Recovery Plan for the Koala (DECC, 2008). With respect to the subject site, *Eucalyptus tereticornis* (Forest Red Gum); a primary food tree species was recorded in the canopy during the flora assessment. Within the Spotted Gum – Grey Ironbark dry open forest community the primary food tree species comprised greater than 30 % of the over-storey trees. On this basis the habitat within the subject site satisfies the criteria as critical habitat with respect to food resources for the purposes of the EPBC Act.

The following observations of the habitat were made during the field survey with respect to essential habitat features critical to the survival of the Koala populations in Queensland, NSW and the Australian Capital Territory:

- Permanent water is not readily available within or in close proximity to the subject site;
- Dogs are present in the area. There is existing urban development in the immediate vicinity of the survey area in which dogs are kept as domestic pets. Furthermore, there is also rural holdings nearby where it is likely that dogs are also kept as domestic pets and working dogs associated with agricultural activities;
- The habitat within the subject site has been modified through removal of the understorey and significant reduction of the original canopy;
- There is no linkage between the subject site and areas of suitable Koala habitat; and
- The adjacent rural land situated to the south of the subject site has been substantially cleared of native vegetation.

Although the habitat within the subject site satisfies the criteria as critical habitat with respect to food resources, the aforementioned characteristics of the site and the surrounding landscape are impediments to utilisation of the habitat within the subject site by the Koala.

4.6 Aboriginal Heritage

The initial AHIMS basic search undertaken on 10 December 2013 indicated that one Aboriginal site is recorded within or near the subject site. Before proceeding further the record was flagged with King and Campbell who advised that they were aware of the Aboriginal site and had undertaken an extensive AHIMS search and other additional research. The extensive search report indicates that the site is identified as the "Wingham Burial Ground" and is located within the subject site. It is understood that measures have been taken to ensure that the burial ground is protected.

5. Potential Impacts on Biodiversity

The proposal involves the rezoning of the land within the subject site from the current zoning of RU1 – Primary Production to residential. Initially this is unlikely to have any direct impact on biodiversity. However, it is acknowledged that once rezoned for residential purposes it is likely that any subsequent development within the subject site such as subdivision of the land, provision of infrastructure and construction of buildings could impact on biodiversity. Therefore, consideration of the potential impacts on biodiversity that may occur from future development as result of the proposed rezoning is warranted.

The principle impact on biodiversity associated with the proposed rezoning stems from the likely subdivision of what is effectively a relatively large allotment of vacant land into numerous smaller parcels of land each of which would have some form of development entitlement. Essentially, this would result in loss of habitat, albeit one that is highly disturbed, to facilitate the provision of infrastructure and construction of buildings. In the longer term there would also be an ongoing increased human presence that would also potentially impact on biodiversity in various ways such as interruption of ecosystem processes, introduction of environmental weeds and exotic animals, and increased artificial lighting. However, some of these impacts already occur and would continue to occur irrespective of whether the proposed rezoning and any subsequent development proceed or not.

As detailed in Section 4 of this report, the habitat associated with the plant communities across the majority of the subject site has been previously modified in the past. In the northern part of the site there has been a significant reduction of the canopy and a large proportion of the understorey has been removed. In the southern part of the site the entire canopy and understorey has been removed. Regrowth in these areas of land is controlled by an ongoing slashing regime. The ephemeral stream lies between the northern and southern parts of the site. It is highly degraded and heavily infested with invasive weeds and in fact a large assemblage of exotic/weed species was recorded across the site generally. These modifications appear to have been in place for a considerable period of time.

5.1 Vegetation Removal

No vegetation will be removed from within the subject site in relation to the proposed land rezoning. However, once rezoned for residential purposes it is likely that removal of vegetation will be an intrinsic aspect of any future development on the land. It is noted that any removal of vegetation would be restricted to the northern part of the site where remnant forest still remains. Such removal of vegetation, which essentially involves trees from the canopy, in all likelihood would have some impact on biodiversity.

5.2 Interruption to Ecosystem Processes

Ecosystems require a suite of processes in order to function. These processes include climatic processes, primary processes (production of biomass), hydrological processes, nutrient cycling, interspecific and intraspecific interactions, movement of

organisms and natural disturbance regimes such as fire and flooding (Gleeson et al, 2012). Ecosystem processes are complex and therefore are difficult to quantify. Most development in natural environments has the potential to interrupt ecosystem processes.

Given the extent of disturbance that exists within the subject site and surrounding landscape it is unlikely that the rezoning proposal and any subsequent development will contribute significantly to further interruption of ecosystem processes.

5.3 Weed Invasion

Weed invasion has a negative impact on biodiversity. It is generally accepted that weeds are a significant threat to biodiversity as well as being an economic problem. Depending on the species, weeds can increase shading, compete with native plants for nutrients, smother native plants or chemically suppress their germination or growth through allelopathy. Invasion of native plant communities by exotic perennial grasses and invasion, establishment and spread of Lantana (*Lantana camara*) are listed in NSW as Key Threatening Processes (KTPs).

During the field survey it was noted that invasion of the habitats within the subject site by weeds is well advanced with a large assemblage of weed species recorded and the larger proportion of the habitats being dominated by exotic/weed species. In particular, four weeds of National Significance including *Asparagus aethiopicus* (Asparagus Fern), *Lantana camara* (Lantana), *Senecio madagascariensis* (Fireweed) and *Lycium ferocissimum* (African Boxthorn) are widespread across the subject site.

5.4 Other Impacts Associated with Human Activities

5.4.1 Changes in Animal Behaviour

Behavioural changes in native animals can occur as a result of the physical presence of a development or due to interaction with people at a development. There are various types of behavioural changes possible such as changes in the choice of foraging and reproductive behaviour. In some cases animals may be drawn to a development by an improved food supply associated with the presence of humans. For example, species such as the Eastern Grey Kangaroo, Brushtail Possum, Magpie, Butcherbird, Kookaburra and Noisy Miner often live in close proximity to humans because of the improved foraging opportunities. Other more secretive or shy species such as the large forest Owls and the Bush Rat are more likely to avoid areas in the vicinity of a development. In other cases modification of the habitat in the vicinity of a development such as removal of the understory to create a parkland-like setting favours particular species that can result in the absence of other species. For example, a parkland cleared site is favoured habitat of the Noisy Miner, an aggressive, cooperative breeder that will exclude many other avian species from an area. It was noted that the Noisy Miner was the most common bird recorded with the subject site during the field survey.

5.4.2 Artificial Lighting

Artificial lighting can cause disruption of foraging behaviour, increased potential for collision with structures, and disruption of reproduction and movement. The effects of artificial lighting on most Australian fauna are not fully understood, nor has it been sufficiently studied.

6. Managing Potential Impacts

The proposed land rezoning is likely to precede further activities associated with development of the site that could impact on biodiversity as discussed previously in Section 5. However, there are a number of measures that can be undertaken to manage and mitigate the potential impacts.

The recommended mitigation measures are described below in Section 6.1, 6.2, 6.3 and 6.4. Prior to initiating the mitigation measures a Vegetation Management Plan (VMP) should be prepared to define and document the actions required to implement the management of the proposed public recreation land and to detail the measures to be adopted for the restoration, protection and conservation of the public recreation land in the longer-term.

The following objectives for site management have been identified:

- To protect existing remnant native vegetation;
- Encourage regeneration of existing vegetation
- Control invasive weeds;
- To minimise the impact of proposed development on the native vegetation; and
- To perform monitoring and maintenance activities to ensure that implementation of the mitigation measures are adequate and a satisfactory restoration outcome is achieved.

6.1 Restoration of the Public Recreation Land Habitat

The proposed public recreation land lies within the upper part of an ephemeral (first order) stream that has the potential to form a vegetated habitat corridor. As it is intended to exclude the proposed public recreation land from development and essentially retain it as in situ habitat, any future mitigation measures such as revegetation and weed management should be focussed on this area. Currently the area of land within the subject site that forms the proposed public recreation land is degraded and heavily infested with weeds.

For the purposes of restoring the habitat within the proposed public recreation land a three-pronged approach should be applied that incorporates:

- Natural regeneration as detailed in Section 6.2;
- Supplementary re-planting to offset trees that are removed from other parts of the site as detailed in Section 6.3; and
- Integrated weed management as detailed in Section 6.4.

6.2 Regeneration within the Public Recreation Land

The regeneration of the habitat should be undertaken by promoting natural ecological processes under an assisted natural regeneration regime with the aim being to accelerate, rather than replace, natural successional processes by removing or reducing barriers to natural forest regeneration such as soil degradation, competition with weedy species, and recurring disturbances (e.g., fire, grazing, and timber harvesting). For the purposes of assisted natural regeneration of the habitat within the proposed public recreation land the following measures should be adopted:

- Further unnecessary disturbance of the remnant plant communities within the proposed public recreation land should be avoided;
- Undertake appropriate weed control measures as per methods described in Section 6.4;
- Allow natural regeneration of plants within the regeneration area from all strata including groundcover, understorey and canopy;
- Install temporary or permanent fencing around the proposed drainage to control access during regeneration;
- No mulching is to be carried out within the proposed public recreation land regeneration area;
- Regeneration shall be ongoing in perpetuity; and
- Control weeds and landscape maintenance in perpetuity commencing after practical completion of the primary works.

6.3 Vegetation Removal and Replanting

To facilitate the construction of infrastructure and buildings associated with future subdivision and residential development of the land within the subject site it is likely that removal of trees will be necessary. It is noted that tree removal would only be necessary in the northern part of the site as no trees have been retained on the land within the site situated on the southern side of the proposed public recreation land (ephemeral stream).

In relation to the vegetation within the subject site for the purposes of future residential development it is recommended that the following measures should be adopted:

- Where possible Koala feed tree species should be retained;
- A 1:1 tree re-planting strategy should be applied for each tree that is removed (see below);
- Each replacement tree shall be of the same species as the tree it is replacing;
- The re-planting should be undertaken in the proposed public recreation land within the subject site;
- If there is insufficient land area within the proposed public recreation land to accommodate all of the re-planting some may also be provided as street trees within the subject site;
- Plantings should be placed irregularly within the proposed public recreation land to simulate a natural plant community;
- Removal of trees within the subject site should be undertaken selectively with preference given to retaining trees of good growth form, Koala feed tree species and trees with potential to form hollows.

Note: For the purposes of the tree replacement strategy, the definition of a tree is: A perennial plant having a trunk diameter at breast height (DBH) of not less than 100 mm where DBH is the measurement of the trunk at 1.3 m above ground level.

6.4 Weed Management

As discussed in Section 5 weed invasion has the potential to impact on the local environment. In addition, as detailed in Section 5.3 some invasive or environmental weeds are identified as Key Threatening Processes (KTPs). Weeds are widespread across the subject site and dominate the plant communities therein. In the long term an integrated weed management program could be implemented. This would involve a long term approach that incorporates several weed management techniques including:

- Physical control such as hand removal, mulching, tilling and mowing;
- Chemical control through the use of appropriate herbicides;
- Biological control where available; and
- Cultural control by encouraging the competitiveness of desired species that helps to suppress weed growth by reducing access to available sunlight, nutrients and moisture.

7. Conclusion

This report has been prepared to assess the ecological impact of the proposed rezoning of land situated at the corner of Murray Road and Lambert Street Wingham.

The survey area encompasses the subject site located at Wingham, which is bounded by Mortimer Street to the north, Lambert Street to the east, Murray Road to the south and Richardson Street to the west. During the field survey two terrestrial plant communities were recorded within the survey area. These included a Spotted Gum - Grey Ironbark dry open forest community as described under the NSW Vegetation Information System (VIS) classification and a derived riparian community that could not be assigned a formal VIS classification due to the extent of modification and degradation of the plant community.

There are a number of potential impacts on biodiversity that are described in Section 5 of this report, which may occur as a consequence of the land within the subject site being rezoned. These include removal of vegetation associated with future development of the site, loss of habitat, interruption to ecosystem processes, and other impacts associated with increased human activities including changes in animal behaviour and artificial lighting. Proposed measures to mitigate the potential impacts are detailed in Section 6 of the report.

As previously discussed, the subject site is degraded and heavily infested with invasive weeds. Overall, it appears that there are no significant impediments to the proposed rezoning. In relation to further development of the subject site, it is considered that additional ecological investigation would not be warranted given the extent of the disturbance and modification to the habitats that exists. The mitigation measures proposed under Section 6 are aimed at providing an appropriate biodiversity offset that does not compromise the development potential of the subject site.

From the habitat assessment and database/literature review, it was considered that 8 threatened species as listed under the *Threatened Species Conservation Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999* could potentially utilise the habitat within the survey area.

The Section 5A Assessment appended to this report as Appendix C. concluded that the proposal has the potential to impact on some threatened species and populations. Generally however, the impacts can be mitigated by the measures outlined in Section 6 of this report.

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9. Appendix A: Flora Species List

The species of flora recorded within the survey area during the field survey are detailed in Table A.1 below.

Family	Scientific Name	Common Name
Apiaceae	<i>Centella asiatica</i>	Indian Pennywort
Apocynaceae	<i>Gomphocarpus fruticosus</i> *	Narrow Leaf Cotton Bush*
Araceae	<i>Alocasia sp.</i> *	Elephant Ear*
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella Tree*
Asparagaceae	<i>Asparagus aethiopicus</i> *	Asparagus Fern*
Asteraceae	<i>Ageratina adenophora</i> *	Crofton Weed*
	<i>Bidens pilosa</i> *	Cobbler's Pegs*
	<i>Senecio madagascariensis</i> *	Fireweed*
	<i>Sonchus oleraceus</i> *	Milk Thistle*
	<i>Taraxacum officinale</i> *	Dandelion*
Bignoniaceae	<i>Jacaranda mimosifolia</i> *	Jacaranda*
Centianaceae	<i>Centaurium erythraea</i> *	Common Centaury*
Commelinaceae	<i>Commelina cyanea</i>	Native Wandering Jew
	<i>Polia crispa</i>	Polia
	<i>Tradescantia fluminensis</i> *	Wandering Jew*
Crassulaceae	<i>Bryophyllum delagoense</i> *	Mother-of-Millions*
Cyperaceae	<i>Baumea teretifolia</i>	
	<i>Carex longibrachiat</i>	
	<i>Cyperus eragrostis</i> *	Umbrella Sedge*
Davalliaceae	<i>Nephrolepis cordifolia</i> *	Fishbone Fern*
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Common Bracken
Dicksoniaceae	<i>Calochlaena dubia</i>	Rainbow Fern
Dilleniaceae	<i>Hibbertia dentata</i>	Trailing Guinea Flower
Fabaceae (Caesalpinioideae)	<i>Senna pendula</i> var. <i>glabrata</i> *	Easter Cassia*
	<i>Senna septemtrionalis</i> *	Arsenic Bush*
Fabaceae (Faboideae)	<i>Trifolium pratense</i> *	Red Clover*
Fabaceae (Mimosoideae)	<i>Acacia implexa</i>	Hickory Wattle
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor Laurel*
Lobeliaceae	<i>Pratia purpurascens</i>	Whiteroot
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush
Myrtaceae	<i>Corymbia maculata</i>	Spotted Gum
	<i>Eucalyptus acmenoides</i>	White Mahogany
	<i>Eucalyptus moluccana</i>	Grey Box
	<i>Eucalyptus siderophloia</i>	Grey Ironbark
	<i>Eucalyptus tereticornis</i>	Forest Red Gum
	<i>Eucalyptus torelliana</i> *	Cadaga*

	<i>Melaleuca linariifolia</i>	Flax-leaved Paperbark
Ochnaceae	<i>Ochna serrulata</i> *	Micky Mouse Plant*
Oleaceae	<i>Ligustrum sinense</i> *	Small-leaf Privet*
Phormiaceae	<i>Dianella caerulea</i> var. <i>caerulea</i>	Blue Flax Lily
Phyllanthaceae	<i>Breynia oblongifolia</i>	Coffee Bush
Pittosporaceae	<i>Pittosporum undulatum</i>	Sweet Pittosporum
Plantaginaceae	<i>Plantago lanceolata</i> *	Lamb's Tongue*
Poaceae	<i>Andropogon virginicus</i> *	Whisky Grass*
	<i>Avena fatua</i> *	Wild Oats*
	<i>Briza maxima</i> *	Quaking Grass*
	<i>Chloris gayana</i> *	Rhodes Grass*
	<i>Cynodon dactylon</i>	Common Couch
	<i>Echinopogon ovatus</i>	Forest Hedgehog Grass
	<i>Eragrostis brownii</i>	Brown's Lovegrass
	<i>Festuca pratensis</i> *	Meadow Fescue*
	<i>Imperata cylindrica</i>	Blady Grass
	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass
	<i>Paspalum mandiocanum</i> *	Broadleaf Paspalum*
	<i>Paspalum urvillei</i> *	Vasey Grass*
	<i>Setaria sphacelota</i> *	South African Pigeon Grass*
	<i>Sporobolus africanus</i> *	Parramatta Grass*
	<i>Themeda australis</i>	Kangaroo Grass
	<i>Vulpia bromoides</i> *	Squirreltail Fescue*
Polygonaceae	<i>Rumex crispus</i> *	Curled Dock*
Primulaceae	<i>Lysimachia arvensis</i> *	Pimpernel*
Proteaceae	<i>Grevillea robusta</i>	Silky Oak
	<i>Hakea salicifolia</i> subsp. <i>salicifolia</i>	Willow-leaved Hakea
Pteridaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	Poison Rock Fern
Ranunculaceae	<i>Ranunculus plebeius</i>	Forest Buttercup
Solanaceae	<i>Lycium ferocissimum</i> *	African Boxthorn*
	<i>Solanum mauritianum</i> *	Tobacco Bush*
	<i>Solanum nigrum</i> *	Black-berry Nightshade*
Thymelaeaceae	<i>Pimelea linifolia</i> subsp. <i>linifolia</i>	Slender Rice-flower
Typhaceae	<i>Typha domingensis</i>	Narrow-leaved Cumbungi
Verbenaceae	<i>Lantana camara</i> *	Lantana*
	<i>Verbena incompta</i> *	Purpletop*

Table A.1: Flora species recorded within the survey area

* Indicates an introduced species

10. Appendix B: Fauna Species List

The species of fauna recorded within the survey area during the field survey are detailed in Table D.1 below.

Family	Scientific Name	Common Name
Reptilia		
Scincidae	<i>Lampropholis delicate</i>	Garden Skink
Aves		
Acanthizidae	<i>Acanthiza pusilla</i>	Brown Thornbill
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
Corvidae	<i>Corvus orru</i>	Torresian Crow
Cracticidae	<i>Cracticus tibicen</i>	Australian Magpie
Dicaeidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird
Halcyonidae	<i>Dacelo novaeguneae</i>	Laughing Kookaburra
Maluridae	<i>Malurus cyaneus</i>	Superb Fairy Wren
Meliphagidae	<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater
	<i>Philemon corniculatus</i>	Noisy Friarbird
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-thrush
Pardalotidae	<i>Pardalotus punctatus</i>	Spotted Pardalote
	<i>Pardalotus striatus</i>	Striated Pardalote
Psittacidae	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet
Rhipiduridae	<i>Rhipidura fuliginosa</i>	Grey Fantail
Mammalia		
Peramelidae	<i>Isoodon/Perameles sp.</i>	Unidentified Bandicoot

Table D.1: Fauna species recorded during the field survey

11. Appendix C: Assessments of Significance

The BioNet Atlas of NSW Wildlife database search returned one threatened species of flora and 10 threatened species of fauna recorded in a 10 km x 10 km search area around the subject site. With the exception of one record of the Koala all records were situated outside the urban areas.

The EPBC Act Protected Matters Report indicated that a total of 45 threatened species or species habitat may occur in the area with a 10 km buffer. However, 27 of these threatened species were disregarded immediately on the basis that they are aquatic or marine species whose habitat is not present within the subject site or adjacent land.

The following Assessment of Significance (Seven-Part Test) relies on the ecological assessment provided in Section 4 and 5 of this report. Based on the plant community and habitat assessment, it is considered that the land within the survey area constitutes potential habitat for one threatened species of flora, one threatened species of bird and 3 threatened species of mammal recorded in the BioNet Atlas of NSW Wildlife database and 3 threatened species of flora, one threatened bird species and 4 threatened species of mammal listed on the EPBC Act Protected Matters Report as detailed in Table C.1.

Family	Scientific Name	Common Name	NSW	Nat
PLANTAE				
Myrtaceae	<i>Eucalyptus glaucina</i>	Slaty Red Gum		V
Orchidaceae	<i>Diuris flavescens</i>	Pale Yellow Doubletail	E4	
Rubiaceae	<i>Asperula asthenes</i>	Trailing Woodruff		V
AVES				
Cacatuidae	<i>Lathamus discolor</i>	Swift Parrot	E1	E
MAMMALIA				
Dasyuridae	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E
Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V	V*
Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	
Vespertilionidae	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat		V

Table E.1: Subject species for Section 5A Assessment (see key below for listings)

Key to Threatened Species Listings – Table E.1

NSW: TSC Act Listing

Nat: EPBC Act Listing

V: Vulnerable

E: Endangered,

E1: Endangered (Schedule 1 TSC Act),

E2: Endangered (Schedule 2 TSC Act)

E4: Critically endangered (Schedule 1A TSC Act)

V*: Nationally listed Koala species is the Koala populations in Queensland, NSW and the ACT

Assessment of Significance

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

Plantae

Slaty Red Gum (*Eucalyptus glaucina*)

Slaty red Gum is a medium-sized tree to 30 m tall. The bark is smooth and mottled white to slaty grey. Adult leaves are disjunct, lanceolate, 12–18 cm long, 2–3 cm wide, green or grey-green, dull and concolorous, juvenile leaves are elliptic and blue-green with a whitish bloom. The buds are fusiform, glaucous, 8-15 mm long, 5-6 mm diameter, with a scar is present. The calyptra is conical or elongate acute, and longer than and as wide as the hypanthium. The flowers are white, or occasionally pink. Flowering occurs between August and December. The fruit is globose or ovoid, 3-5-locular, 7-10 mm long, 7-10 mm in diameter, the disc is raised and the valves are exerted.

The species is found only on the north coast of NSW and in separate locations. One location occurs near Casino where the species can be locally common. The other location is farther south from Taree to Broke, west of Maitland. Slaty Red Gum grows in grassy woodland and dry eucalypt forest on deep, moderately fertile and well-watered soils.

Slaty Red Gum is listed as vulnerable nationally under the *Environment Protection and Biodiversity Conservation Act 1999*. The habitat within the subject site may be suitable for this species. However, there are no records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the survey area. Nor was the species recorded during the field survey undertaken for this ecological assessment. On this basis it is considered that the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Pale Yellow Doubletail (*Diuris flavescens*)

The Pale Yellow Doubletail is a terrestrial (ground) orchid belonging to the Doubletail, or Donkey Orchid, group. It is a small herb with two linear, conduplicate leaves to 17 cm long arising at the base. In spring the plant produces a 20 cm flowering stem with up to six flowers, which are yellow with dark brown markings on the dorsal sepal and labellum. The flowers have the typical yellow 'donkey ear' sepals bent back at the top, and narrow, darker sepals crossed below the flower to form the "doubletail". An upper sepal projects over the flower like a veranda and has two brown markings, while the lower tongue-like petal has a slight ridged fold down its centre. The Pale Yellow Doubletail Pale flowers from September to October.

The species is known only from the Wingham-Tinonee area where it grows in grassy tall eucalypt forest with Kangaroo Grass and Blady Grass on brown clay soil.

The Pale Yellow Doubletail is listed as critically endangered in NSW under the *Threatened Species Conservation Act 1995*. There are 5 records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area. All of these records are located off the Tinonee Road approximately 6 km to the southwest of the subject site. The species was not recorded during the field survey undertaken for this ecological assessment. However, as the Pale Yellow Doubletail was not flowering at that time it is unlikely that the species would have been readily detected.

Parts of the habitat within the subject site, particularly those areas in the vicinity of the proposed public recreation land that have not been subjected to an ongoing slashing regime may be suitable for this species. As this area lies within the proposed public recreation land and is to be retained as in situ habitat it is considered that the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Trailing Woodruff (*Asperula asthenes*)

Trailing Woodruff is a decumbent perennial herb with linear, oblanceolate or narrow-elliptic leaves arranged in whorls of four around a weak stem often trailing to 30 cm long. Small white fragrant flowers arranged in terminal cymes on slender peduncles are produced in spring followed by small two-lobed fruit. The species is readily identifiable all year round despite flowering occurring only in spring.

The species is restricted to NSW where it is rare and is found in scattered locations from Bulahdelah in the south to Taree in the north, with several records from the Great Lakes area. It grows in damp sites, often along river banks.

Trailing Woodruff is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995* and nationally under the *Environment Protection and Biodiversity Conservation Act 1999*. There are no records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the survey area. Nor was the species recorded during the field survey undertaken for this ecological assessment.

The moist areas of the habitat adjacent to the ephemeral stream within the subject site may be suitable for this species. As this area lies within the proposed public recreation land and is to be retained as in situ habitat it is considered that the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Aves

Swift Parrot (*Lathamus discolor*)

The Swift Parrot is a small parrot about 25 cm long. It is bright green with red around the bill and forehead, red with a yellow edge on the throat, a blue crown and bright red patches under the wing. The species most distinguishing feature however, is its dark red, long thin tail. The Swift Parrot breeds in Tasmania during spring and summer, migrating in the autumn and winter to south-eastern Australia. In NSW it mainly occurs on the coast and south west slopes.

On the mainland the Swift Parrot inhabits areas where eucalypts are flowering profusely or where there are abundant lerp infestations. The favoured feed trees are winter flowering species including local species such as *Eucalyptus robusta* (Swamp Mahogany), *Corymbia maculata* (Spotted Gum) and *C. gummifera* (Red Bloodwood). Commonly favoured lerp infested tree species include *E. pilularis* (Blackbutt).

The Swift Parrot is listed as endangered in NSW under the *Threatened Species Conservation Act 1995* and nationally under the *Environment Protection and Biodiversity Conservation Act 1999*. There are two records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the survey area.

There is foraging habitat available to this species that contains *Corymbia maculata* (Spotted Gum); a favoured food tree in the canopy of the subject site, some which would be available in perpetuity within the proposed public recreation land. However, outside of the proposed public recreation land much of the native vegetation including trees from the canopy has been removed. On this basis it is considered that the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Mammalia

Spotted-tailed Quoll (*Dasyurus maculatus*)

The Spotted-tailed Quoll is the largest marsupial carnivore on the Australian mainland. Males are 38-76 cm long with a tail length up to 55 cm, while females are 35-45 cm long with a tail measuring up to 42 cm. The species is a rich rufous brown to dark brown above, with white spots of varying size and pale below.

The Spotted-tailed Quoll is recorded from a wide range of habitats, including rainforest, open forest, woodland, coastal heath and inland riparian forest. It occurs from the coast to the snowline and inland to the western plains. The species usually nocturnal and is an efficient predator taking prey ranging from small wallabies to insects. Den sites include hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces. The species was formerly widespread on either side of the Great Dividing Range, but its distribution is disjunct over much of its former range. Loss of habitat through land clearing, poisoning and trapping is implicated in its decline.

The Spotted-tailed Quoll is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995* and as endangered nationally under the *Environment Protection and Biodiversity Conservation Act 1999*. There are 6 records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the survey area.

This species forages across a wide range of habitats but requires suitable habitat features such as hollow-bearing trees, fallen logs, small caves and crevices for den sites. As these types of habitat features are not present within the subject site it is

unlikely that the species could utilise the habitat for breeding. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Koala (*Phascolarctos cinereus*)

The Koala is an arboreal marsupial that feeds almost exclusively on the foliage of specific Eucalypts. The species has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW, the species mainly occurs on the central and north coast areas. The Koala inhabits eucalypt woodland and forest and are known to feed on the foliage of 70 eucalypt and 30 non-eucalypt species, but typically select preferred browse species, which varies from one area to another. The species is inactive during the day, foraging and feeding by night and occupies a variable home range from less than two hectares up to several hundred hectares in size.

The Koala is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995* and the Koala (Combined populations of Queensland, New South Wales and the Australian Capital Territory) is listed as a vulnerable species nationally under the *Environment Protection and Biodiversity Conservation Act 1999*. There are 32 records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the survey area.

As discussed in Section 4.5 the subject site satisfies the criteria as potential habitat under SEPP 44 but does not meet all the criteria as critical habitat for the purposes of the EPBC Act. As it is intended to retain Koala food trees wherever possible and mitigate any removal of food trees by compensatory planting it is considered that the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Grey-headed Flying-fox (*Pteropus poliocephalus*)

The Grey-headed Flying-fox is the largest Australian bat species and is found within 200km of the eastern coast of Australia from Bundaberg in Queensland to Melbourne, Victoria. The species occurs in subtropical and temperate rainforest, tall sclerophyll forest and woodland and individuals travel up to 50km to feed on the nectar and pollen of native trees, particularly eucalypts, *Melaleuca* spp. and *Banksia* spp. and the fruits of rainforest trees and vines.

The Grey-headed Flying-fox is listed as endangered in NSW under the *Threatened Species Conservation Act 1995* and as vulnerable nationally under the *Environment Protection and Biodiversity Conservation Act 1999*. There are 496 records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the survey area.

This species could potentially utilise the habitat within the subject site for foraging purposes. However, the habitat within the site is generally unsuitable for roosting. Consequently, it is unlikely that the species would utilise the habitat within the survey area for roosting or breeding. Therefore, it is considered that the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Large-eared Pied Bat (*Chalinolobus dwyeri*)

The Large-eared Pied Bat is known from scattered locations from near Rockhampton in central Queensland to Bungonia in southern NSW. It is found in a range of habitats, including dry sclerophyll forest and woodland to the east and west of the Great Dividing Range. Isolated records from subalpine woodland above 1500 metres and at the edge of rainforest and moist eucalypt forest, suggest it may tolerate a greater range of habitats than has so far been recorded. The species daytime roosts include caves, mine tunnels and the abandoned, bottle-shaped mud nests of Fairy Martins. The combination of a relatively short, broad wing and low weight per unit area of wing is indicative of manoeuvrable flight, suggesting it probably forages for small flying insects below the forest canopy.

The Large-eared Pied Bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995* and nationally under the *Environment Protection and Biodiversity Conservation Act 1999*.

This species forages across a wide range of habitats but requires caves, mine tunnels and the abandoned, bottle-shaped mud nests of Fairy Martins for roosting. As these types of habitat features are not present in the study site it is unlikely that the species could utilise the habitat for nesting or shelter. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

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

The Koala (Combined populations of Queensland, New South Wales and the Australian Capital Territory)

This population has been listed as vulnerable under the EPBC Act as it has undergone a substantial decline over three generations due to a combination of a number of factors including loss and fragmentation of habitat, vehicle strike, disease and predation by dogs.

For the purposes of the *Interim Koala Referral Advice for Proponents* (Department of Sustainability, Environment, Water, Populations and Communities, June 2012) habitat critical to the survival of the Koala is currently considered to be areas of forest or woodland with the following attributes:

- Primary Koala food tree species comprise at least 30% of the over-storey trees;
- Primary Koala food tree species comprise less than 30% of the over-storey trees, but together with secondary food tree species comprise at least 50% of the over-storey trees;
- Primary food tree species are absent but secondary food tree species alone comprise at least 50% of the over-storey trees;

- The above qualities may be absent in a forest or woodland but other essential habitat features are present and adjacent to areas exhibiting the above qualities; or
- A relatively high density of koalas is supported, regardless of the presence of food tree species. Koala population densities vary across their range and regional data should be used to judge relative density.

NB: For the purposes of the *Interim Koala Referral Advice for Proponents*, Koala food trees are those listed in Appendix 2 of the *Recovery Plan for the Koala (Phascolarctos cinereus)* produced by the NSW Department of Environment and Climate Change, 2008.

The eucalypt species; *Eucalyptus tereticornis* (Forest Red Gum) is listed as a primary food tree species and was recorded within the survey area. Consequently, the habitat within the subject site satisfied the criteria as critical habitat with respect to food resources. However, the habitat did not satisfy the criteria for critical habitat on several points including:

- An absence of permanent water;
- The presence of dogs in the immediate vicinity of the site;
- A highly modified habitat in which the canopy has been reduced and the understorey has largely been removed;
- The surrounding landscape consists of extensive areas of urban development and cleared agricultural land; and
- No linkage to areas of suitable habitat

On this basis the action proposed is unlikely to have an adverse effect on the life cycle of this species (that constitutes an endangered population) such that a viable population of the species is likely to be placed at risk of extinction

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

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

No endangered ecological community was recorded within the subject site during the field survey.

(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.

No endangered ecological community was recorded within the subject site during the field survey.

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 habitat within the survey area has been significantly disturbed in the past with part of the assemblage of species within the canopy removed; almost all of the understory removed and the groundcover modified through vegetation management activities. The action proposed may result in removal of some trees from the canopy to facilitate future development. Therefore, in view of the existing modification and disturbance of the habitat the habitat to be removed or modified as a result of the proposed action is not considered to be significant with respect to a threatened species, population or ecological community.

(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;

It is considered that the proposed action is unlikely to fragment habitat areas or isolate habitat areas from other areas 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;

The habitat within the survey area has been significantly disturbed in the past. However, it does contain some Koala feed trees. It is intended that any Koala feed tree that is removed in the future will be offset by compensatory plantings at a ratio of 4:1. Any non-Koala feed tree removed will be offset by compensatory plantings at a ratio of 1:1 as detailed in Section 6.3 of this report. Therefore, the habitat within the subject site proposed to be removed and/or modified is not considered to be significant to the long-term survival of the aforementioned threatened species.

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

Critical habitat was not recorded within the subject site. Therefore, the action proposed is unlikely to have an adverse effect on critical habitat (either directly or indirectly).

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

There is no recovery plan or threat abatement plan relevant to the proposed action or the subject site.

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:

Key threatening processes (KTPs) are listed in Schedule 3 of the TSC Act. Those considered to be applicable to future development of the subject site once it has been rezoned are:

Clearing of Native Vegetation

The reduction of native vegetation within the subject site associated with the development of the land could be viewed as contributing to the overall incremental decline of native vegetation within the region. However, the plant communities within the subject site have previously been significantly modified. It is intended to regenerate/revegetate the land within the proposed public recreation land, which will be a considerable improvement on the current situation.. Therefore, it is considered that the proposed action does not contribute significantly to this KTP.

Anthropogenic Climate Change

The use of machinery and power tools during any future earthworks or construction activities will contribute to anthropogenic climate change through release of stored carbon from vegetation and greenhouse gas emissions associated with use of fossil fuels. However, the overall impact of the action is considered negligible in the context of other human activities in the region.

Invasion of native plant communities by exotic perennial grasses

The subject site is already heavily infested with invasive weeds. The proposed action is likely to improve the situation through the mitigation measures described in Section 6 of this report.

*Invasion, Establishment and Spread of Lantana (*Lantana camara*)*

The field survey revealed that Lantana is established and is widespread within the subject site. The proposed action in itself is unlikely to significantly contribute to this KTP. Furthermore, measures are recommended in Section 6 of this report to mitigate this KTP.