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Koala Plan of Management Proposed road works on John Oxley Drive associated with a Bulky Goods Retail Development, including a *Masters Home Improvement Store* and Subdivision to create two (2) lots at Lots 12 and 13 DP 1088869, No.18 John Oxley Drive, Port Macquarie

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Date: November 2015

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Koala Plan of Management Bulky Goods Retail Development John Oxley Drive, Port Macquarie

Section 1 Introduction

1.1 Introduction

This Koala Plan of Management (KPoM) accompanies a Development Application for a bulky goods retail development, including a *Masters Home Improvement Store* and subdivision to create two lots at Lots 12 and 13 DP 1088869, No.18 John Oxley Drive, Port Macquarie.

The development of Lots 12 and 13 DP 1088869 will require the upgrade of the adjacent road reserve to a signalised intersection and four lane road.

These road upgrade works are generally consistent with the anticipated footprint of the future upgrade of John Oxley Drive in this location, as envisaged in Port Macquarie Hastings Council's Concept Plan for the duplication of John Oxley Drive (refer Appendix KPoM D).

The subject Development Application will result in the timing of the road upgrade works being brought forward and so approval for this part of the John Oxley Drive duplication is required as part of the subject Development Application rather than as a future assessment by the Council under Part 5 of the Environmental Planning and Assessment Act, 1979.

The proposed road upgrade works will require the removal of approximately 2,500m² of vegetation that is on the eastern edge of the existing formed road, within the John Oxley Drive road reserve between its intersections with Wrights Road and Kingfisher Road. This vegetation has been assessed within the Ecological Assessment prepared by FloraFauna Consulting.

This KPoM has been prepared in relation to the 2,500m² of existing vegetation impacted by the proposed roadworks within the John Oxley Drive road reserve and the retained vegetation within the road reserve, between Wrights Road and Kingfisher Road, as shown shaded on Exhibit KPOM_02.

This KPoM has been prepared with regard to the following:

- 1. The site specific ecological reports prepared in support of the Development Application, including;
 - a. Ecological Assessment prepared by FloraFauna Consulting, August 2015.

This assessment has been undertaken in relation to the eastern side of the John Oxley Drive road corridor between Wrights Road and Kingfisher Road, where vegetation clearing adjacent the eastern edge of the formed road will be required to facilitate the duplication of John Oxley Drive, incorporating a signalised entry into the development site.

The assessment is attached as Appendix KPOM_A.

b. Addendum II to Ecological Assessment Report prepared by FloraFauna Consulting, 22 September, 2015.

This Addendum Report quantifies the number of Koala food trees and hollow bearing trees that will require removal to facilitate the duplication of John Oxley Drive and the signalisation of the driveway entry.

Accordingly, the Report supersedes the following sections of the August 2015 Ecological Assessment:

- i. Section 5.3.3: Hollow-bearing trees;
- ii. Appendix C Flora Species List; and
- iii. Appendix D Hollow-bearing tree assessment forms.

The assessment is also attached as Appendix KPOM_A.

c. Flora and Fauna Assessment, Peter Parker Environmental Consultants Pty Ltd.

This assessment has been undertaken in relation to Lots 12 and 13 DP 1088869.

The assessment includes a search of the Office of Environment and Heritage wildlife atlas over the past five years, from May 2010 to May 2015. This period was identified as it followed the major habitat modification that was undertaken with the construction of the Oxley Highway bypass

The assessment is attached as Appendix KPOM_B.

d. Koala atlas records

This additional search, which identifies Koala records since 2000 and shows koala records in March, 2010 and September, 2008.

This search is contained in Appendix KPoM_E.

2. The Port Macquarie-Hastings Koala Habitat & Population Assessment, Biolink Ecological Consultants, June 2013.

This draft report was prepared for Port Macquarie-Hastings Council and was reported to the Ordinary Council meeting of 20 November, 2013; however the report has not been placed on public exhibition.

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- 3. Consultation, including:
 - Port Macquarie-Hastings Council Natural Resources officers with respect to the future duplication of the John Oxley Drive road corridor and the Landowner contribution to future vegetation compensatory works that would have been required as part of the approval of the overall duplication works (see Section 1.3.1); and
 - b. Ms Cheyne Flanagan, supervisor, Koala Preservation Society (see Section 1.3.2); and
- 4. Relevant legislation and policy guidelines, including;
 - a. SEPP No.44 Koala Habitat Protection;
 - b. The Director's Guidelines as set out in Section 2.2 of Circular No. B35 (Department of Urban Affairs and Planning, 22 March, 1995);
 - c. The Recovery Plan for the Koala (NPWS November 2008);
 - d. The National Koala Conservation and Management Strategy 2009-2014 (Department of the Environment, Water, Heritage and the Arts);
 - e. The EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (Department of the Environment, 2014); and
 - f. Matters of National Environmental Significance Significant impact guidelines 1.1, Environment Protection and Biodiversity Conservation Act 1999 (Department of the Environment).

1.2 The Site

The site is known as Lots 12 and 13 DP 1088869, No.18 John Oxley Drive, Port Macquarie and part John Oxley Drive road corridor, as outlined below:

- Lot 12 4.574ha;
- Lot 13 2,561m²; and
- John Oxley Drive road corridor between Wrights Road and Kingfisher Road. The eastern side of the John Oxley Drive road corridor contains an unconstructed vegetated area of 2ha. The proposed roadworks in John Oxley Drive will result in the removal of 2,500m² of that vegetation.

A copy of DP 1088869 is included at Appendix KPoM_C.

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The proposed bulky goods retail development will be contained within Lots 12 and 13. The duplication of John Oxley Drive incorporating the proposed signalised intersection at the development entry will be wholly contained within the existing John Oxley Drive road reserve.

The works associated with the upgrade of John Oxley Drive form part of Council's current Concept Plan for the duplication of John Oxley Drive (refer Appendix KPoM D).

This KPoM has been prepared in relation to the 2,500m² of existing vegetation impacted by the proposed roadworks within the John Oxley Drive road reserve and the retained vegetation within the road reserve, between Wrights Road and Kingfisher Road (as shown shaded on Exhibit KPOM_02).

Exhibit KPoM_1 provides details of the locality of the site and its context.

1.3 Consultation

1.3.1 Port Macquarie-Hastings Council

Council are currently preparing a draft Concept Plan for the duplication of John Oxley Drive, between Wrights Road and The Ruins Way (see Appendix KPoM_D).

The works associated with the upgrade of John Oxley Drive as part of the subject development have been designed to be consistent with the Council Concept Plan.

Consultation with Council's Natural Resources staff during the preparation of this Plan has confirmed that compensatory planting within the John Oxley Drive road reserve adjoining the road upgrade works is not favoured given its status as an arterial road reserve.

The proponent will secure the works associated with undertaking offsite vegetation compensatory plantings and their ongoing maintenance through the establishment of a financial bond, determined in accordance with Council policy for works undertaken on Council property.

The Development Application for the proposed bulky goods development is made under Part 4 of the Environmental Planning and Assessment Act 1979, thus triggering the requirement for assessment under SEPP 44 Koala Habitat Protection and the preparation of this Plan. Should the development not proceed and Council undertakes the road upgrade works in accordance with their concept plan, an assessment of the proposed John Oxley Drive roadworks under Part 5 of the Act will be required at that stage.

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1.3.2 Koala Preservation Society

Consultation with the Koala Preservation Society (KPS) has been undertaken in relation to Koala activity generally in the locality and to the proposed Management Actions included at Section 4.2 to the Plan.

The KPS has advised that the area the subject of this Plan forms the western edge of a large home range for approximately 6 – 8 Koalas that includes the hospital precinct, the remnant vegetation adjacent the Oxley Highway (north of the Wrights Road roundabout to the racecourse area), the Lake Road industrial area and adjacent vegetation, the Kingfisher Road residential precinct and the Lake Innes Nature Reserve (see Exhibit KPOM_01).

The proposed Management Actions at Section 4.2 have been reviewed by the KPS.

1.4 Ecological Assessments

Two separate ecological reports, including an Addendum Report, were prepared to accompany the Development Application submission.

1. Lots 12 and 13 - Flora and Fauna Assessment (Peter Parker Environmental Consultants Pty Ltd) (Appendix KPOM_B):

This survey found the following in relation to Lots 12 and 13:

- The existing vegetation communities comprises the following:
 - o Tall sparse woodland -

Three (3) tallowwoods (*Eucalyptus microrys*), nine (9) swamp mahogany (*Eucalyptus robusta*) and five (5) forest redgum, (*Eucalyptus tereticornis*) are scattered throughout the site;

Other woody vegetation comprises of introduced native and exotic trees; and

Four (4) large aspen (*Populus tremula*) planted in a row in the northern part of the site

o Landscaped areas and grassland -

Understorey vegetation is comprised predominantly of exotic species, including introduced grasses, shrubs and ground covers.

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Swampy areas to the west of the site are dominated by swamp rice grass (*Leersia hexandra*) and dryer areas by the exotic Parramatta grass (*Sporobolus indicus var. capensis*)

- The site does not support threatened plants or endangered ecological communities;
- Two (2) hollow-bearing trees were recorded, scoring 10.5 and 11 under Councils hollow-bearing tree protocol;
- No threatened fauna species (reptile, frog, bird, mammal) were recorded during field surveys;
- A seven part test was undertaken in relation to the threatened species that are known to occur in the locality and this assessment concluded that the proposed development is unlikely to have a significant effect on threatened species or endangered ecological communities;
- In relation to SEPP 44 the assessment concluded that the site qualifies as Potential Koala Habitat on the basis that Koala food trees comprise greater than 15% of the existing tree canopy; and
- On the basis that there was no evidence of Koala presence on site (e.g. scats or scratches under Schedule 2 trees), the assessment concluded the site did not include Core Koala Habitat.
- 2. John Oxley Drive road corridor Ecological Assessment (FloraFauna Consulting, August, 2015):

This report was prepared in relation to the eastern side of John Oxley Drive between Wrights Road and Kingfisher Road and the vegetation proposed to be removed as part of the proposed roadworks within the area edged by an orange dashed line on Exhibit KPoM _01 and 02, within the John Oxley Drive road corridor.

The proposed duplication and upgrade of the adjacent John Oxley Drive incorporating the proposed signalised intersection to the development will require the removal of vegetation from within the John Oxley Drive road reserve. At this location the John Oxley Drive road reserve has a width of approximately 100m. The proposed road upgrade and new intersection treatment will require the removal of approximately 2,500m² of vegetation.

This survey found the following in relation to the John Oxley Drive road corridor:

- The floristic data gathered during the flora survey suggests that the vegetation within the study area and on the adjacent land within the unformed parts of the road reserve consists of a patch of remnant forest that is highly disturbed. There is a significant assemblage of exotic species including several environmental weeds in the understorey and groundcover and the influence of edge effect was clearly evident;
- Thirteen (13) hollow-bearing trees were recorded;
- Two species listed on Schedule 2 of SEPP 44 including *Eucalyptus microcorys* (Tallowwood) and *Eucalyptus tereticornis* (Forest Red Gum) were recorded within the study area and within the adjacent habitat located within the road reserve;
- The two Schedule 2 species comprise more than 15 % of the total number of trees in the upper or lower strata of the tree component within the habitat and therefore the habitat satisfies the criteria for 'Potential Koala Habitat' for the purposes of SEPP 44;
- Two relatively old Koala scats were observed at the base of a tree within the study area. There was also disturbance of bark on the trunks of several trees within the study area, which were consistent with the types of marks produced by the claws of Koalas when climbing trees;
- The habitat within the study area and adjacent land within the John Oxley Drive road reserve comprises a relatively narrow strip of remnant vegetation that essentially runs through a developed residential and commercial landscape.
- There are food resources available to the Koala within the road reserve, however due to its narrow linear shape and position in the landscape these food resources are limited in any one part of the road reserve. Therefore, it is unlikely that a population of the Koala could rely on these food resources over a sustained period;
- Aerial imagery indicates that the remnant vegetation within the road reserve forms part of an extensive vegetated corridor that provides connectivity between areas of Koala habitat to the north, east and south. This is likely to be important in providing a means by which Koalas are able to move between areas of otherwise disjunct habitat through the developed landscape;
- In this context the habitat within the study area would be important to the species survival as a linkage to areas of known Core Koala habitat;

- The footprint of the upgrade work within the road reserve (2,500m²) represents a relatively small part of the remnant vegetation within the road reserve. Furthermore, it is unlikely that the functioning of the remnant vegetation within the road reserve as a wildlife corridor will be significantly affected by the proposed works;
- A seven part test was undertaken in relation to the threatened species that are known to occur in the locality;
- Given the existing highly modified state of the habitat within the study area (edge effect and weed invasion), its relatively small scale and position in the landscape it is unlikely that the proposed upgrading work within the John Oxley Drive road reserve will impact significantly on threatened species and populations.
- 3. Addendum II to Ecological Assessment Report (FloraFauna Consulting, 22 September, 2015):

This Addendum Report quantifies the number of Koala food trees and hollow bearing trees that will require removal to facilitate the duplication of John Oxley Drive and the signalisation of the driveway entry.

Accordingly, the Report supersedes the following sections of the August 2015 Ecological Assessment:

- Section 5.3.3: Hollow-bearing trees;
- Appendix C Flora Species List; and
- Appendix D Hollow-bearing tree assessment forms.

The Addendum Report confirms the following:

- That a total of ten (10) Koala food trees and seven (7) hollowbearing trees (two of which are also Koala food trees) are within the area identified by the dashed orange line (i.e.; 15 trees); and
- That an additional two (2) Koala food trees and four (4) hollow-bearing trees (one of which is a Koala food tree) are located adjacent the area identified by the dashed orange line and may be impacted by the proposed road works within the road reserve (i.e.; 5 trees).

Therefore with reference to Section 4.2.4 of this Plan, the proposed compensatory measures will relate to twelve (12) Koala food trees.

An extract of the Koala food tree and hollow-bearing tree mapping (Figure 3.1, page 9), is provided below –

Koala Plan of Management Bulky Goods Retail Development John Oxley Drive, Port Macquarie





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DATE	DESCRIPTION
2.08.2015	ISSUED FOR INFORMATION
8.08.2015	ISSUED FOR DEVELOPMENT APPLICATION

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Section 2 Relevant Legislation

2.1 State Environmental Planning Policy 44 – Koala Habitat Protection (SEPP 41)

SEPP 44 commenced operation on 13 February, 1995.

The aim of SEPP 44 is ... "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 their current trend of population decline by:

- a) Requiring the preparation of plans of management before development consent can be granted in relation to areas of core Koala habitat;
- b) By encouraging the identification of areas of core Koala habitat;
- c) By encouraging the inclusion of areas of core Koala habitat in environment protection zones."

SEPP 44 defines core Koala habitat as ... "an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population".

Potential Koala Habitat (PKH) has been confirmed by both ecological assessments, within Lots 12 and 13 and the John Oxley road reserve.

In relation to the remnant vegetation within the John Oxley Drive road reserve it was considered likely that it functions as a wildlife corridor, linking areas of known Core Koala Habitat (CKH). This conclusion included the following considerations:

- Two species of Schedule 2 Koala food trees were recorded within the road reserve;
- The Atlas of NSW Wildlife database search returned 981 records of the Koala within a 10km x 10km search area and confirms that the local Koala population occurs across a wide area throughout the Port Macquarie-Hastings Local Government Area;
- Two relatively old scats were observed at the base of a Tallowwood tree within the study area;
- Koala scratch marks were observed on the trunks of several trees;

- The existing food resources are limited and therefore it is unlikely that a population of Koala could rely on these resources for an extended period; and
- That the duplication of John Oxley Drive as part of Councils Concept Plan between The Ruins Way and Wrights Road will further impact on this food resource.

Accordingly, as a precautionary approach, a Koala Plan of Management is proposed.

Clause 11(3) of SEPP 44 requires that a plan of management is to be prepared in accordance with the Director's Guidelines as set out in Section 2.2 of Circular No. B35 (Department of Urban Affairs and Planning, 22 March, 1995).

Section 3 of this KPoM contains the provisions as required by the Guidelines.

2.2 Threatened Species Conservation Act 1995 (TSC Act)

The Koala is listed as a vulnerable species pursuant to Part 1 Schedule 2 of the TSC Act. The Ecological Assessment by FloraFauna Consulting contains the seven part test required pursuant to Section 5A of Environmental Planning & Assessment Act 1979 (EP&A Act).

This assessment concludes that the proposed development is unlikely to cause a significant impact on the Koala.

2.3 Environmental Protection & Biodiversity Conservation Act 1999 (EPBC Act)

On the 2 May, 2012, the koala populations in Queensland, New South Wales and the Australian Capital Territory were listed as vulnerable under the EPBC Act.

In 2014 the Department of Environment issued the *EPBC Act Referral Guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)* (the Guidelines).

With reference to the subject development proposal, the Guidelines confirm the following in relation to assessments of potential impact, with regard to a coastal context:

- That the interim recovery objectives within the coastal geographic context is to;
 - Protect and conserve large, connected areas of koala habitat, particularly large, connected areas that support koalas that are:

- Of sufficient size to be genetically robust / operate as a viable sub-population OR
- free of disease or have a very low incidence of disease OR
- breeding.
- Maintain corridors and connective habitat that allow movement of koalas between large areas of habitat.
- With reference to Table 4, on the basis of koala evidence (+2), the on-site vegetation that includes Tallowwoods and Forest Red Gums (+2), the separation from Kooloonbung Creek Nature Reserve (0), proximity to a major road (0) and the recovery value offered by the vegetated link (+2), the habitat score for the site can be considered to be 6;
- With reference to Figure 2, on the basis that less than 2 ha of habitat that is on the edge of a patch is to be cleared and the habitat score is lower due to the proximity to the John Oxley Drive (vehicle strikes), it can be concluded that the proposed development will not adversely affect habitat critical to the survival of the Koala;
- That there are two key considerations to be made in deciding whether the proposal will have a significant impact;
 - Adversely affecting habitat critical to the survival of the koala; and/or
 - Interfering substantially with the recovery of the koala through the introduction or exacerbation of key threats in areas of habitat critical to the survival of the koala.

Comment:

The proposed Management Actions of this KPoM will ensure the following:

- 1. That habitat critical to the survival of the koala will not be adversely affected by the proposed development, as:
 - > A relatively small area of habitat is to be removed; and
 - The clearing will occur on the edge of a patch that adjoins an existing arterial road, causing minimal fragmentation and ensuring that the linkage functions are retained.

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- 2. That any potential key threats can be suitably mitigated through the adoption of the Management Actions set out at Section 4, including.
 - The potential key threats are to be mitigated by the Management Actions at Section 4 to this Plan, for the full extent of vegetation within the road reserve, between Wrights Road and Kingfisher Road, including;
 - Eradication of feral animals (existing fox dens);
 - Weed and bush regeneration works;
 - Koala fencing at the road edge to minimise the potential of vehicle strike;
 - Various signage to warn motorists and pedestrians that Koalas are active in the area and the importance of the vegetated road link to the local Koala population;
 - Site management during the construction phase of the roadworks;
 - Monitoring the success of the above measures for the period of the construction phase;
 - Compensatory Offset Planting on the Offsite Land; and
 - The Landowner will secure the works associated with undertaking the vegetation compensatory plantings (Offset Plantings) at the Offsite Land and their ongoing maintenance for a 3 year Management Period through the establishment of a financial bond, determined in accordance with Council policy for works undertaken on Council property.

The proposed development will, as outlined above, mitigate all major key threats to ensure the proposed development does not have potential to have a significant impact on an *Important Population* of Koalas nor will it result in impacts on *Habitat Critical to the Survival of the Koala*.

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Section 3 The Guidelines

Sections 3 and 4 of this Plan address the Director General's Guidelines for the preparation of individual site specific Koala Plans of Management, as set out in Section 2.2 of Circular No. B35 (Department of Urban Affairs and Planning, 22 March, 1995).

3.1 Objectives of the Plan

The objectives of this Koala Plan of Management (KPoM) are to:

- 1. Maintain Koala usage of the adjacent vegetated road reserve;
- 2. Identify potential threats that impact on Koalas and instigate strategies that mitigate the potential impacts of these threats; and
- 3. Ensure effective implementation and monitoring of this KPoM.

3.2 Estimate of Population Size and Regional Distribution of Koalas

The following estimate of Koala population size and regional distribution has been compiled based on the following sources:

- 1. Flora and Fauna Survey prepared by FloraFauna Consulting, August 2015;
- 2. Flora and Fauna Survey prepared by Peter Parker Environmental Consultants, May 2015;
- 3. The Port Macquarie-Hastings Koala Habitat and Population Assessment, June 2013, Biolink Ecological Consultants; and
- 4. Personal communication with Ms Cheyne Flanagan, supervisor, Koala Preservation Society.

In relation to the Local Government area generally the following is noted:

- The current population of Koala across the Port Macquarie Hastings LGA is estimated at approximately 2,000;
- Approximately 66% of that population exist on the eastern side of the Pacific Highway with the most significant and largest population located around the northern margins of Lake Innes (PMHC Koala Habitat and Population Assessment 2013).

In relation to the site the following is noted:

- Due to the narrow linear shape and position in the landscape, the food resources are limited and it is unlikely that a population of the Koala could rely on these food resources over a sustained period;
- In this context the importance of the habitat is as a linkage and its connectivity to areas to the north, south and east; and
- The on-site resource is likely important for transient members of the Koala population as they move through the habitat linkage adjoining John Oxley Drive.
- 3.3 Identification of Preferred Feed Tree Species and Extent of Resource

Preferred feed tree species

The following list of preferred feed tree species in the PMH Local Government Area has been identified from the following sources:

- The Area 13 Koala Plan of Management and Area 14 Koala Plan of Management (Biolink Ecological Consultants is the author of both Plans);
- 2. The Port Macquarie-Hastings Koala Habitat and Population Assessment, June 2013, Biolink Ecological Consultants; and
- 3. The Recovery Plan for the Koala (DECC 2008).

The preferred feed tree species for the PM-H LGA are:

- Eucalyptus robusta (Swamp Mahogany);
- Eucalyptus microcorys (Tallowwood);
- > Eucalyptus tereticornis (Forest Red Gum); and
- > Eucalyptus propingua (Small Fruited Grey Gum).

Extent of resource on site

The Swamp Mahogany and Tallowwood have been identified within the study area. The habitat within the study area (and adjacent land within the John Oxley Drive road reserve) comprises a relatively narrow strip of remnant vegetation that essentially runs through a developed residential and commercial landscape.

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3.4 Alternate Available Habitat and Identification of Linkages

Aerial imagery indicates that the remnant vegetation within the road reserve forms part of a vegetated corridor that provides connectivity between areas of Koala habitat to the north, east and south.

The areas to the west, including the lands that will be developed for the bulky goods precinct, do not contain significant areas of alternate Koala habitat, promoting Koala movements from the site towards the east and onto the Kooloonbung Creek Nature Reserve.

Kooloonbung Creek Nature Reserve covers an area of approximately 52 ha, stretching from the Port Macquarie CBD and south into the Lake Innes Nature Reserve.

3.5 Identification of Major Threatening Processes

The following identifies the impacts that have potential to interfere with the recovery of the Koala, as identified in the *EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory*), Department of Environment, 2014.

1. Dog attacks

An action leads to an increase in dog attacks in habitat critical to the survival of the koala to a level that is likely to result in multiple, ongoing koala mortalities.

Comment

The proposed mitigation measure is *signage and education*. Given the proximity to residential areas and the use of the road reserve by pedestrians, dog attack is the greatest threat to the local Koala population (KPS, pers. comm).

2. Vehicle strikes

An action leads to an increase in vehicle-strikes in habitat critical to the survival of the koala to a level that is likely to result in multiple, ongoing koala mortalities.

Comment

The proposed mitigation measures include Koala proof fencing for the full width of John Oxley Drive between Wrights Road and Kingfisher road, together with signage to alert drivers entering Wrights Road and Kingfisher Road of Koalas in the area.

Prior to the deviation of the Oxley Highway koala mortalities and injuries from vehicle strike was high. Vehicle strike on John Oxley Drive has since been reduced, with no fatalities recorded since completion of the deviation (KPS, pers. comm).

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3. Disease

An action facilitates the introduction or spread of disease or pathogens to habitat critical to the survival of the koala, for example Chlamydia or Phytophthora cinnamomi, which are likely to significantly reduce the reproductive output of koalas or reduce the carrying capacity of the habitat.

Comment

The subject land is within a public road reserve and therefore the proposed mitigation measure is signage and education, including the contact numbers for the Port Macquarie Koala hospital should adjacent residents become aware of a Koala in distress.

4. Barriers to dispersal and fragmentation

An action creates a barrier to movement to, from or within habitat critical to the survival of the koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the koala.

Comment

The land the subject of this Plan provides part of a linkage within the John Oxley Drive road reserve. The John Oxley Drive carriageway already forms a barrier to the westerly movement of koalas from the subject land.

The proposed clearing of vegetation as part of the widening of John Oxley Drive, reduces the width of the existing linkage but does not create a barrier to the movement of koalas through the landscape to the north, east and south of the subject land.

The proposed mitigation measures include compensatory Offset Planting on the Offsite Land and maintenance of The Site and Offsite Land for a 3 year Management Period.

5. Habitat degradation

An action results in a change to water quality or quantity that degrades habitat critical to the survival of the koala to the extent that the carrying capacity of the habitat is reduced in the long-term.

Comment

The proposed road upgrade works will include stormwater management that will ensure the health of the adjacent remnant vegetation within the road reserve. Additionally it is proposed to improve the remnant vegetation through weed eradication works.

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Section 4 Management Actions

This section contains details of the management actions proposed to be implemented to achieve the stated objectives of this Plan:

- 1. Maintain Koala usage of the adjacent vegetated road reserve;
- 2. Identify potential threats that impact on Koalas and instigate strategies that mitigate the potential impacts of these threats; and
- 3. Ensure effective implementation and monitoring of this KPoM.

4.1 Definitions

Establishment Period

Means the period commencing when the development under DA 2015/600 is commenced and ending when the Establishment Works are completed.

Establishment Works

Means the works set out in Section 4.2, to commence when the development commences. The Establishment Works must be completed prior to acceptance of the roadworks having achieved practical completion.

Management Period

In relation to The Site the Management Period means a period of 3 years post Establishment Works, or until the new arterial road is constructed, whichever occurs first.

In relation to the Offsite Lands, the Management Period means a period of 3 years post Establishment Works.

Management Works

Means the works to be carried out by the proponent during the Management Period and secured by a bond in accordance with Council policy for roadworks on Council property.

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Offset Planting

Means the habitat compensation that includes a replacement rate of 6:1 for the twelve (12) Koala food trees removed from within The Site and the framework planting (over and mid storey species) to be undertaken on the Offsite Land (see Appendix KPoM_F - PMHC Offsite Land location and Offset Planting guide). The Offset Planting is to be undertaken as part of the Establishment Works and completed to Councils satisfaction.

The works associated with the Offset Planting, Establishment and Management, is to be secured by a bond in accordance with Councils policy for works on Council property.

Offsite Land

Means the Council property to be used for Offset Planting, being an area of 0.7 ha at Lot 14 DP 1139180 (see Appendix KPoM_F - PMHC Offsite Land location and Offset Planting guide).

The Site

Means the land area the subject of this Plan comprising the existing vegetated area of the John Oxley Drive road reserve bound by the existing John Oxley Drive road pavement to the west, existing residential allotments to the east, Wrights Road to the south and Kingfisher Road to the north.

4.2 Management Actions

The performance criteria to be achieved together with detail of the required management action are set out in the following sections. The *EPBC Act Referral Guidelines for the Vulnerable Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)* (Department of Environment, 2014) has been reviewed in the formulation of the management actions.

4.2.1 Dog attacks

Performance criteria to be achieved:

a. That there is no increase in koala fatalities from dog attacks within The Site.

Mitigation measures:

The following mitigation measures are to be implemented:

1. The following permanent signage is to be erected adjacent the informal walking track between Kingfisher and Wrights Roads as

part of the Year 1 Establishment Works, as shown on Exhibit KPoM_02:

- i. General information signage, including;
 - Information regarding the koala and the importance of the habitat link for the koala;
 - The contact details for Port Macquarie-Hastings Council and the Port Macquarie Koala Hospital; and
 - Directions to ensure that all stray / feral dogs are to be reported to Port Macquarie-Hastings Council for compliance enforcement under Companion Animals Act 1998.
- ii. Pedestrian signage "Koalas are active in the area, Please keep your dog on a leash";

4.2.2 Feral animals

Performance criteria to be achieved:

a. That potential threat from feral animals is removed and there are nil koala injuries or fatalities from feral animals within The Site.

Mitigation measures:

Existing fox dens have been recorded in the road reserve. The following mitigation measures are to be implemented:

- 1. Fox eradication is to be undertaken as part of the Year 1 Establishment Works.
- 2. Ongoing fox control during the 3 year Management Period is to be undertaken on an as needs basis, if new fox activity is detected.

4.2.3 Vehicle strikes

Performance criteria to be achieved:

a. That there is no increase in koala fatalities from vehicle strikes adjacent the Site.

Mitigation measures:

The following mitigation measures are to be implemented:

1. Installation of floppy top koala fencing adjacent the upgraded portion of John Oxley Drive, between Wrights Road and Kingfisher Road, to assist in directing Koala movement to the north, south and east as shown on Exhibit KPoM_02.

To ensure the effectiveness of the koala proof fencing to redirect Koalas away from John Oxley Drive, the fencing is to extend along the Wrights Road and Kingfisher Road frontages until it meets with the existing informal pedestrian pathway, as shown on Exhibit KPOM_02 (KPS, pers. comm).

The fencing is to be erected prior to the commencement of works in John Oxley Drive as part of the Year 1 Establishment Works and then maintenance of the integrity of the fence during the 3 Year Management Period.

2. The following permanent signage is to be erected adjacent Wrights Road and Kingfisher Road as part of the Year 1 Establishment Works, as shown on Exhibit KPoM_02:

"Drive slow. Koalas are active in the area".

4.2.4 Habitat improvement works / fragmentation

Performance criteria to be achieved:

- a. That the retained habitat within The Site is maintained and improved, including.
 - A 95% reduction in invasive weed projected foliage cover p.a; and
 - No mature plants, seed and propagule set after the Establishment Works.
- b. That Offset Planting is undertaken on the Offsite Lands as part of the Year 1 Establishment Works.

Mitigation measures:

The following mitigation measures are to be implemented:

- 1. Bush regeneration works, including weeding, shall be undertaken within The Site as part of the Year 1 Establishment Works.
- 2. Offset Planting on the Offsite Lands to be undertaken as part of the Year 1 Establishment Works and maintenance to be undertaken during the 3 Year Management Period.
- 3. A Council approved bush regeneration contractor is to undertake the Offset Planting and maintenance during the 3 Year Management Period.

4.2.5 Construction phase management

Performance criteria to be achieved:

a. That there are no koala fatalities from on-site works (tree removal, landform contouring and road construction) associated with the development of the site.

Mitigation measures:

The following mitigation measures are to be implemented:

1. Pre-clearing checks

Prior to clearing existing trees and carrying out construction works on site, the area is to be inspected for the presence of koalas by a member of the Koala Preservation Society. If a koala is present, clearing should be halted until the koala has been moved by its own accord. If after three days the koala is still present, than steps should be taken to remove the animal further into the vegetation that will be retained.

Where possible, tree removal should avoid the Koala breeding season (July-December).

2. Tree head retention

All tree heads from felled Koala food trees from the John Oxley Drive road reserve (The Site) and Lots 12 and 13 DP 1088869 are to be separated out and retained for use by the KPS.

3. Temporary fencing

Temporary fencing is to be erected to isolate the road construction area at the beginning of the Establishment Period.

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Section 5 Monitoring and Reporting

A Monitoring Report (MR) is to be prepared by the proponent, in consultation with PMHC and a member of the Koala Preservation Society. The MR is to be provided to Council at the commencement of the Establishment Works and then on an annual basis during the 3 Year Management Period.

The MR is to include results of the following:

- Koala activity levels in the road reserve ;
- Reports of any Koala observations or interactions by the local residents;
- Reports of any Koala injuries;
- Recommendations to address issues of concern for the Koala on the site;
- Monitoring of the koala proof fence every 6 months or after heavy wind storms; and
- Confirmation of the condition of the Koala food tree Offset Plantings and recommendations with respect to any replacement plantings.

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APPENDIX A – KPOM_A – Ecological Assessment, FloraFauna Consulting



Ecological Assessment EA-2015-2807

Proposed Masters Retail Development (18 John Oxley Drive Port Macquarie) Road Reserve Biodiversity Survey

Prepared for: CVC Mezzanine Finance Pty Ltd

PO Box 3212 West Kempsey NSW 2440

Phone: (02) 6566 0975 Mobile: 0429 727 010 mail@florafauna.com.au www.florafauna.com.au ABN: 22 167 601 074

Report Title:	Road Reserve Biodiversity Survey
Project:	Proposed Masters Retail Development
Property:	Lot 12 & 13 DP 1088869 18 John Oxley Drive Port Macquarie
Client:	CVC Mezzanine Finance Pty Ltd
Report No:	EA-2015-1205
Draft/Final:	Final – 31 August 2015

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.

All information contained within this report are prepared for the exclusive use of the client and with respect to the land described herein and are not to be used for any other purpose or by any other person or entity. No reliance should be placed on the information contained in this report for any purposes other than those stated herein.

	Grad. Dip. DBPA M. Wld. Mgt. (Habitat)
Signed: Date:	31 August 2015

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1. Executive Summary

This report describes the ecological assessment in relation to the development of Lots 12 and 13 DP 1088869 for a bulky goods retail development, including a Masters Home Improvement Store, which will require the upgrade of the adjacent road reserve to a signalised intersection. These upgrade works will require the removal of approximately 2,500 m² of vegetation that is on the eastern edge of the existing formed road, within the John Oxley Drive road reserve). Accordingly, additional ecological assessment has been undertaken to include that part of the John Oxley Road reserve that will provide access to the site.

The Port Macquarie-Hastings Council (PMHC) vegetation mapping indicates that the vegetation across the study area and adjacent vegetated land within the road reserve is classified as Blackbutt shrubby moist forest community. The floristics data gathered during the flora survey suggests that the vegetation within the study area and on the adjacent land within the unformed parts of the road reserve consisted of a patch of remnant forest that was highly disturbed. There was a significant assemblage of exotic species including several environmental weeds in the understorey and groundcover and the influence of edge effect was clearly evident. The assemblage of species recorded during the flora survey was not consistent with the PMHC vegetation community description, which could at least in part be attributed to the aforementioned disturbance but may also be a consequence of the site's proximity to nearby swamp forest communities and the presence of a table drain within the study area adjacent to the edge of the existing formed road surface.

Thirteen (13) hollow-bearing trees were recorded within the study area during the habitat assessment as detailed in Appendix E of this report. To facilitate the necessary upgrading of John Oxley Drive, all of these hollow-bearing trees would need to be removed. The measures to mitigate removal of the hollow-bearing trees including a tree removal strategy and nest box strategy are detailed in Section 7 of this report.

Two species listed on Schedule 2 of SEPP 44 including *Eucalyptus microcorys* (Tallowwood) and *Eucalyptus tereticornis* (Forest Red Gum) were recorded within the study area and within the adjacent habitat located within the road reserve. These species comprised more than 15 % of the total number of trees in the upper or lower strata of the tree component within the habitat, therefore the habitat satisfies the criteria for 'Potential Koala Habitat' for the purposes of SEPP 44. Two relatively old Koala scats were observed at the base of a tree within the study area. There was also disturbance of bark on the trunks of several trees within the study area, which were consistent with the types of marks produced by the claws of Koalas when climbing trees. This was evident mostly on the trunks of some individuals of *Eucalyptus microcorys* (Tallowwood). Given the evidence recorded during the Koala survey there seems little doubt that the species utilises the habitat within the study area.

The habitat within the study area and adjacent land within the John Oxley Drive road reserve comprises a relatively narrow strip of remnant vegetation that essentially runs through a developed residential and commercial landscape. There are food resources available to the Koala within the road reserve, however due to its narrow linear shape

and position in the landscape these food resources are limited in any one part of the road reserve. Therefore, it is unlikely that a population of the Koala could rely on these food resources over a sustained period. Aerial imagery indicates that the remnant vegetation within the road reserve forms part of an extensive vegetated corridor that provides connectivity between areas of Koala habitat to the north, east and south. This is likely to be important in providing a means by which Koalas are able to move between areas of otherwise disjunct habitat through the developed landscape. In this context the habitat within the study area would be important to the species survival and likely constitutes part of a wider area of core Koala habitat.

The footprint of the upgrade work within the road reserve occupies approximately 2,500 m² of land in which all the vegetation will be removed. This represents a relatively small part of the remnant vegetation within the road reserve. Furthermore, it is unlikely that the functioning of the remnant vegetation within the road reserve as a wildlife corridor will be significantly affected by the proposed works. An off-site offset planting strategy is proposed to mitigate removal of Koala food trees and a Koala Plan of Management is also proposed that will incorporate suitable fencing to reduce the risk of vehicle strike on Koalas in the vicinity of the development site.

From the habitat assessment and database/literature review, it was considered that twenty-five (25) threatened species of fauna as listed under the *Threatened Species Conservation Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999* could potentially utilise the habitat within the study area to a limited extent. The Section 5A Assessment appended to this report as Appendix F concluded that the proposed action has the potential to impact on a number of threatened species and populations. Given the existing highly modified state of the habitat within the study area (edge effect and weed invasion), its relatively small scale and position in the landscape and the recommended mitigation measures it is unlikely that the proposed upgrading work within the John Oxley Drive road reserve will impact significantly on threatened species and populations. The measures to mitigate the impact on biodiversity are outlined in Section 7 of this report.

2. Glossary of Terms and Acronyms

AABR: Australian Association of Bush Regenerators

Abundance: Means a quantification of the population of the species or community

Affected species: Means subject species likely to be affected by the proposal

AHD: Australian height datum

APZ: Asset protection zone (for bushfire protection purposes)

Assessment guidelines: Means assessment guidelines issued and in force under Section 94A of the *Threatened Species Conservation Act 1995* or, subject to Section 5C of the *Fisheries Management Act 1994*

CAVS: Census of Australian Vertebrates

Conservation status: Is regarded as the degree of representation of a species or community in formal conservation reserves

Critical habitat: The area declared to be critical habitat under Part 3 of the *Threatened Species Conservation Act 1995*

DBH: Diameter at breast height being the measurement of the tree trunk at 1.3 m above ground level

DCP: Port Macquarie-Hastings Development Control Plan 2013

DECC: Department of Environment, Conservation and Climate Change

Development: The erection of a building on that land, the carrying out of work in, on, over or under that land, the use of that land or of a building or work on that land, and the subdivision of that land

Endangered ecological community: An ecological community specified in Part 1 of Schedule 1 of the *Threatened Species Conservation Act 1995*

Endangered population: A population specified under Part 1 of Schedule 1 of the *Threatened Species Conservation Act 1995*

Endangered species: a species listed under Schedule 1 of the *Threatened Species Conservation Act 1995*

EP&A Act: Environmental Planning and Assessment Act, 1979

EPBC Act: Environment Protection and Biodiversity Conservation Act 1999

Field survey: Means on the ground flora and fauna assessment

Habitat: An area or areas occupied, or periodically or occasionally occupied by a species, population or ecological community and includes any abiotic component

Key Threatening Process: Is a threatening process listed under the *Threatened Species Conservation Act 1995*

LEP: Port Macquarie-Hastings Local Environmental Plan 2011

Locality: the area within a 5 km radius of the study area

NPW Act: National Parks and Wildlife Act 1974

OEH: NSW Office of Environment and Heritage

PBP: Planning for Bushfire Protection 2006
PCT: NSW Plant Community Type classification

PMHC: Port Macquarie-Hastings Council

PMST: Protected matters search tool

REF: Review of Environmental Factors

Recovery and threat abatement plan: A plan to promote the recovery of threatened species, population or an ecological community with the aim of returning the species, population, or ecological community to a position of viability in nature

ROTAP: Rare or threatened Australian plant

SEPP: State Environmental and Planning Policy

Subject Site: The identified land (Lot(s) and DP(s)

Study area: The geographic extent of the ecological assessment (may be the subject site or a portion of it)

Threatened species: A species specified in Part 1 or 4 of Schedule 1 or in Schedule 2 of the *Threatened Species Conservation Act 1995*

Threatening process: Means a threatening process that threatens, or could potentially threaten, the survival or evolutionary development of a species, population or ecological community

TSC Act: Threatened Species Conservation Act 1995

UIA: Urban Investigation Area

VIS: NSW Vegetation Information System (classification database)

VMP: Vegetation Management Plan

Vulnerable species: A species listed under Schedule 2 of the *Threatened Species Conservation Act 1995* or when a fish, listed under the *Fisheries Management Act 1994*.

3. Introduction

3.1 Background

FloraFauna Consulting has been engaged by CVC Mezzanine Finance Pty Ltd to prepare an ecological assessment report to assess the potential impacts on biodiversity associated with a proposed bulky goods retail development, including a Masters Home Improvement Store and subdivision to create two (2) lots at Lots 12 and 13 DP 1088869, No.18 John Oxley Drive, Port Macquarie. The development of this site will require the upgrade of the adjacent road reserve to a signalised intersection. These upgrade works will require removal of vegetation from approximately 2,500 m² of land within the John Oxley Drive road reserve on the eastern edge of the existing formed road. Accordingly, additional ecological assessment has been undertaken to include that part of the John Oxley Road reserve that will provide access to the site.

3.2 Locality

The study area is situated within the John Oxley Drive road reserve immediately south of the roundabout at the intersection of the newly realigned Oxley Highway, Wrights Road and John Oxley Drive. The locality is part of the township of Port Macquarie. Residential development and the Port Macquarie Base Hospital are located to the north of the study area. Further northward lies the Port Macquarie Race Club with residential and commercial development occupying the land beyond that. Situated to the east of the study area is residential development that adjoins the Port Macquarie industrial area as well as an expanse of undeveloped land containing natural habitat. To the south the land has been developed for residential purposes that incorporates both large lot residential and general residential subdivisions. This area has seen significant development in recent times. To the west of the study area is the John Oxley Drive road reserve and the adjacent land that forms the proposed Masters development site. Adjoining the southern boundary of the Masters site is a residential complex with areas of open space, the Oxley Highway road reserve and residential development further to the west. The map at Figure 3.1 shows the location of the study area within the locality.



Figure 3.1: Locality map showing the relative location of the study area (shown red)

3.3 Study Area

The study area comprised an area of land within the John Oxley Drive road reserve of approximately 1.1 hectare in size of which 2,500 m² contains remnant vegetation. The study area is situated immediately south of the roundabout at the intersection of the Oxley Highway, Wrights Road and John Oxley Drive and extending southward to the

corner of Kingfisher Road. This location is adjacent to the proposed bulky goods retail development site comprising Lots 12 and 13 in DP 1088869, No.18 John Oxley Drive Port Macquarie. The relative position of the study area and the surrounding landscape are shown in Figure 3.2.



Figure 3.2: Aerial image of the study area and surrounding landscape

The study area comprised part of the undeveloped land within the road reserve containing remnant native vegetation that is earmarked for removal as part of the John Oxley Drive upgrade works.

3.4 Proposed Development

The proposed development involves the upgrading of part of the John Oxley Drive road reserve associated with the development of the adjacent land at Lots 12 and 13 in DP 1088869, No.18 John Oxley Drive Port Macquarie. The Site Master Plan prepared by King and Campbell showing the proposed bulky goods retail development site and the extent of the associated works within the road reserve is appended to this report as Appendix A.

3.5 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.

3.6 Objectives of the Report

The objectives of the ecological assessment are to:

- Describe the ecological characteristics of the study area 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;
- 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.

4. Survey Methodology

4.1 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.

4.2 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 Port Macquarie-Hastings Council (PMHC) vegetation community mapping. For clarity a description based on observations recorded during the field survey has also been provided.

Unless otherwise stated, tree growth stage descriptions used in this document are adapted from Jacobs, M.R. (1955) *Growth Habits of the Eucalypts*, Woodgate et al, 1994, *A Study of Old-growth Forests of East Gippsland*, and the Joint Old Growth Forest Project (JOGFP), 1996 as is currently utilised by the NSW Environmental Protection Agency (EPA) for the purposes of old growth forest field verification. Table 4.1 sets out the growth stages adopted for this document:

Jacobs (1955) Growth Stages	Woodgate et al (1994) Growth Stages	Amalgamated Major Growth Stages
Juvenile		
Sapling	Sapling	Regrowth
Pole	Pole	
Mature	Early-mature	Mature
	Mature	
	Late-mature	Senescing
Overmature	Overmature	

Table 4.1: Relationship between growth stage classifications used in this document

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).

4.3 Literature Review

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

- Detail Survey Plan prepared by King and Campbell, Project No. 5350, Drawing No. 5350s_Exhibit_Detail, dated May 2015;
- Site Master Plan prepared by King and Campbell, Project No. 5350, Drawing No. 5350P_Exhibits; and
- Port Macquarie-Hastings Local Environmental Plan 2011 (LEP).

4.4 Desktop Assessment

The desktop assessment involved database searches as summarised in Table 4.1 were undertaken on 19 August 2015 and 22 August 2015.

Database	Source	
eSPADE – NSW Soil and Land Information	NSW Government Office of Environment and Heritage	
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 4.1: Database Searches

4.4.1 eSPADE - NSW Soil and Land Information

The eSPADE database was searched to investigate any soil survey sites in the vicinity of the study area that could provide soil and landscape information relevant to the study area. This was validated by a review of the relevant soil landscape map produced by the NSW Department of Land and Water Conservation (now part of NSW OEH).

4.4.2 Atlas of NSW Wildlife

The Atlas of NSW wildlife database was searched to inform of threatened species records within a 10 x 10 km (default) search area around the study area. This information was used to determine:

- The threatened species recorded;
- The proximity of any threatened species records to the study area; and
- If a population of a threatened species such as the Koala is indicated.

4.4.3 EPBC Act Protected Matters Search Tool

The Protected Matters Search Tool (PMST) was utilised to generate a report that provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act around the study area employing a 10 km buffer.

i. Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the nominated area within the 10 km buffer.

ii. Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the EPBC Act that may relate to the nominated area within the 10 km buffer. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

4.5 Field Survey

An investigation of the study area was undertaken between 20 August 2015 and 23 August 2015 for the purpose of conducting an assessment of the flora, fauna and habitat as detailed below.

4.5.1 Flora Survey

Because of the relatively small size of the study area and disturbed condition of the habitat therein, the assessment of the flora was conducted using the random meander method after Cropper (1993). The following tasks were undertaken:

- Identification of the plant communities;
- Assessment of the species assemblage within the canopy and determination of the percentage each of the recorded species constituted to assist with identification of the plant communities and the Koala assessment;
- Identification of species and populations;
- Targeted survey of threatened species identified in the database search where suitable habitat exits;
- Spatial distribution of the vegetation in the survey area;
- Assessment of the vegetation's condition; and
- Determination of the vegetation's conservation significance.

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 metres above ground level.

4.5.2 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 including locating and mapping all hollow-bearing trees within the study area;
- 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).

4.5.3 Fauna Assessment

The ecological assessment incorporated a fauna survey that focussed on identifying the distribution and abundance of threatened fauna species known or likely to use the habitats in the study area. An assessment of the occurrence or likely occurrence of any threatened fauna species, endangered fauna populations or their habitats, in the study areas was also conducted. Several hollow-bearing trees were observed within the study area, which will be impacted by the proposed development. Therefore, the fauna assessment incorporated specific survey methods to assess these habitat features. The fauna survey comprised the following aspects.

i. Habitat Search

The habitat within the study area was searched for a minimum of 30 minutes on two separate days.

ii. Diurnal Bird Survey

A diurnal bird survey employing the standardised search method after Watson (2007) was conducted in which a results-based stopping rule was applied with sampling continuing until two or less previously unencountered species were recorded in a forty minute period. In addition, opportunistic species sightings were recorded continuously while undertaking other aspects of the ecological assessment.

iii. Scats and Signs

The entire site was searched for scats and signs including trees for disturbance of bark and scratch marks on the trunks.

iv. Koala Habitat Assessment and Survey

A Koala habitat assessment and survey was conducted as detailed under Section 4.6 of this report.

v. Stag Watch

Stag watch of was conducted by observing potential roost hollows surveyed hollowbearing trees located in the vicinity of the proposed dwelling for 30 minutes prior to sunset and 60 minutes following sunset on two separate nights.

vi. Spotlighting

Spotlighting utilising a VariSpot variable 5~100 watt quartz halogen handheld spotlight primarily to target arboreal species including the Yellow-bellied Glider and Squirrel Glider was conducted on two separate nights. The survey involved observing all habitat strata including the canopy and understorey for arboreal fauna and the ground and terrestrial strata for terrestrial fauna along a walking transect through the study area.

vii. Bat Ultrasonic Echolocation Detection

The ultrasonic echolocation detection survey was conducted utilising a single Wildlife Acoustics EM3+ Echo Meter over two (2) separate nights beginning at dusk for a minimum of 4 hours per night. The most suitable time to conduct bat surveys is between October and March when bats are active. However, the mild conditions with relatively warm nights and moderate humidity experienced on site during the current study potentially afforded suitable conditions to conduct an ultrasonic echolocation detection survey.

The region-based guide to the echolocation calls of Microchiropteran Bats; *Bat Calls of New South Wales* (Pennay et al 2001) was used for the analysis of call identification. Records obtained from the Atlas of NSW Wildlife (OEH, 2015) as well as distributional information provided in relevant literature including *Australian Bats* (Churchill, 2008), *A Field Guide to the Mammals of Australia* (Menkhorst and Knight, 2004) and *The Mammals of Australia* (Strahan, 1998) were used to determine the potential for the occurrence of species within the study area.

The Microchiropteran Bat calls recorded during the survey were forwarded to Anna McConville of Echo Ecology, a specialist fauna call identification consultancy for identification. The Echo Ecology analysis is provided in the results.

4.6 Koala Habitat Assessment and Survey

4.6.1 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." The ecological assessment included a SEPP 44 Koala Habitat Assessment including the following points of consideration:

- Local Government Area (LGA) listing under Schedule 1 of SEPP 44;
- Determination of 'Potential Koala Habitat'; and
- Determination of 'Core Koala Habitat'.

Potential Koala Habitat is defined as:

"Areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 % of the total number of trees in the upper or lower strata of the tree component."

For the purposes of SEPP 44 – 'Potential Koala Habitat', trees within the study area were surveyed as detailed in Section 4.5.1 of this report to determine the proportion of Koala feed trees as listed in Schedule 2 of SEPP 44 that were present in the upper and lower strata of the tree component. The tree species listed under Schedule 2 of SEPP 44 are provided in Table 4.2.

Scientific Name	Common Name
Eucalyptus tereticornis	Forest Red Gum
Eucalyptus microcorys	Tallowwood
Eucalyptus punctata	Grey Gum
Eucalyptus viminalis	Ribbon or Manna Gum
Eucalyptus camaldulensis	River Red Gum
Eucalyptus haemastoma	Broad-leaved scribbly gum
Eucalyptus signata	Scribbly Gum
Eucalyptus albens	White Box
Eucalyptus populnea	Bimble Box or Poplar Box
Eucalyptus robusta	Swamp Mahogany

Table 4.2: SEPP 44 Schedule 2 Koala feed tree speciesCore Koala Habitat is defined as:

"An area of land with a resident population of Koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population)."

For the purposes of determining the presence of Core Koala habitat, a search of the Atlas of NSW Wildlife database for Koala records was undertaken in conjunction with a search of the habitat during the site investigation for direct Koala sightings. This was supported by a Spot Assessment Technique (SAT) survey (a search for Koala scats), which was modified to include all trees as the study area was relatively small and

contained only a relatively small number of trees. The modified SAT survey was conducted in conjunction with a search for other indicators such as scratch markings on trees.

4.6.2 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 Department of the Environment has prepared *EPBC Act referral guidelines for the vulnerable Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)* (the Guidelines), which are designed to assist proponents in deciding whether a proposed action is likely to have a significant impact on the Koala. The objectives of the Guidelines are to:

- Promote avoidance and mitigation of impacts on the Koala;
- Promote a clear, consistent and transparent approach for making decisions on whether an action is likely to result in a significant impact on the Koala;
- Promote streamlined decision-making and approval processes; and
- Promote the recovery of the Koala.

The Guidelines advise that for the most up-to-date report of whether the Koala may occur in the project area, always use the Department's Protected Matters Search Tool (PMST).

For the purposes of determining significant impacts under the EPBC Act, the distribution of the Koala has been split into two contexts (the inland and the coastal). These contexts exhibit different climatic and ecological attributes and therefore each have different considerations with regard to habitat critical to the survival of the Koala and the significance of impacts on the species. To separate the coastal and inland geographic contexts the Guidelines uses the 800 mm per annum rainfall isohyet. As the study area receives more than 800 mm of rainfall per annum it falls within the coastal context. The attributes of the coastal context applicable to the study area are provided in Table 4.3 below:

Attributes	Applicable to Coastal Geographic Context	
Koala Habitat	 Large, connected areas of native vegetation, including in forests and woodlands where logging has altered tree species composition; Small, isolated patches of native vegetation in rural or urban areas; Windbreaks and narrow areas of native vegetation along riparian areas or linear infrastructure; and Isolated food and/or shelter trees (i.e. on farm lands, in suburban streetscapes, parks and yards). 	
Primary threats	 Loss, fragmentation and degradation of habitat including dispersal habitats; Mortality due to vehicle strikes, dog attacks and disease; and High-intensity fire. 	
Interim recovery objective	 Protect and conserve large, connected areas of Koala habitat, particularly large, connected areas that support Koalas that are: Of sufficient size to be generally robust/operate as a viable subpopulation; or Free of disease or have a very low incidence of disease; or Breeding. Maintain corridors and connective habitat that allow movement of Koalas between large areas of habitat. 	

Table 4.3: Koala attributes – coastal context (Draft EPBC Act referral guidelines for the vulnerable Koala (combined populations of Queensland, NSW and the ACT)

If the PMST indicates that the Koala or its habitat is known to or may occur within an area, a Koala survey and habitat assessment is necessary to establish whether habitat critical to the survival of the species occurs in the area as detailed below.

i. Koala Survey and Habitat Assessment

Appropriate surveys should be undertaken prior to making an assessment of the proposed action or submitting a referral to the Department to gather adequate information on the following attributes:

- Koala presence (and potentially abundance or density);
- Vegetation composition;
- Habitat connectivity;
- Existing threats to Koalas; and
- Recovery value.

The Guidelines advise that the following methodology should be adopted when undertaking a Koala survey and Koala habitat assessment for the purposes of the EPBC Act:

a) Desktop Survey

A desktop survey was undertaken that included a search of Koala records in the Atlas of NSW Wildlife database and the EPBC Act Protected Matters Search Tool. To assist with the assessment of habitat quality, habitat size, habitat connectivity and Koala occurrence, aerial imagery of the study (impact) area was examined. Information regarding the intensity of existing threats to the Koala in the area was also gathered.

b) Field (On-ground) Survey

An 'on-ground' survey was undertaken. As the study area was relatively small and contained a small number of trees it was possible to undertake a search of the entire habitat within the study area during the field survey. For the purposes of the EPBC Act, the Koala survey of the study area involved a diurnal search for direct Koala sightings. This was supported by a Spot Assessment Technique (SAT) survey (Phillips and Callaghan, 2011) that was modified to include all trees located within the study area in conjunction with a search for other indicators such as scratch markings on trees.

ii. Koala Habitat Assessment Tool

Habitat critical to the survival of the Koala is considered to be habitat that is important for the long-term survival and recovery of the species. The Guidelines contain a Koala habitat assessment tool to assist in determining the sensitivity, value and quality of the impact area and whether it contains habitat critical to the survival of the species. The Koala habitat assessment tool categorises five primary Koala habitat attributes including Koala occurrence, vegetation composition, habitat connectivity, existing threats and recovery value.

Each habitat attribute is scored between zero and two and the scores are added together to give a total out of 10, providing an indication of the overall value of habitat in the impact area. An impact area that scores five or more under the habitat assessment tool for the Koala is deemed to contain habitat critical to the species survival and may require referral to the Department of the Environment, subject to the assessment protocol set out in Figure 2 of the Guidelines (assessing adverse effects on habitat critical to the survival of the Koala). An extract of the Koala habitat assessment tool relevant to the study area (coastal) is provided in Table 4.4 below:

Attribute	Score	Coastal Criteria	
Koala	2 (High)	Evidence of one or more Koalas within the last 2 years.	
occurrence	1 (Medium)	Evidence of one or more Koalas within 2 km of the edge of the impact area within the last 5 years.	
	0 (Low)	None of the above.	
Vegetation composition	2 (High)	Has forest or woodland with 2 or more known Koala food tree species in the canopy; or 1 food tree species that alone accounts for >50 % of the vegetation in the relevant strata.	
	1 (Medium)	Has forest or woodland with only 1 species of known Koala food tree present in the canopy.	
	0 (Low)	None of the above.	
Habitat	2 (High)	Area is part of a contiguous landscape \geq 500 ha.	
connectivity	1 (Medium)	Area is part of a contiguous landscape < 500 ha, but \ge 300 ha.	
	0 (Low)	None of the above.	
Key existing threats	2 (High)	Little or no evidence of Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence; or Areas which score 0 for Koala occurrence and have no dog or vehicle threat present.	
	1 (Medium)	Evidence of infrequent or irregular Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence; or Areas which score 0 for Koala occurrence and are likely to have	
	0 (Low)	Evidence of frequent or regular Koala mortality from vehicle strike or dog attack in the study area at present, or Areas which score 0 for Koala occurrence and have a significant dog or vehicle threat present.	
Recovery value	2 (High)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context (see Table 4.3).	
	1 (Medium)	Uncertainty exists as to whether the habitat is important for achieving the interim recovery objectives for the relevant context (see Table 4.3).	
	0 (Low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context (see Table 4.3).	

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The study (impact) area was assessed in accordance with the Koala habitat assessment tool – coastal criteria as detailed in Table 4.4.

4.7 Survey Timing and Weather Conditions

The initial survey, which incorporated the flora survey, habitat assessment, habitat search, diurnal bird survey, scats and other signs search and Koala habitat assessment and survey was conducted on 20 August 2015. Night survey work incorporating stag watching, spotlighting and Bat ultrasonic echolocation detection was conducted on 22 and 24 August 2015. Weather conditions at the time were relatively mild with no rainfall recorded. The maximum and minimum temperatures at Port Macquarie during the survey period are detailed in Table 4.5.

Date	Maximum Temp (C)	Minimum Temp (C)
20.08.2015	20	9
22.08.2015	24	14
24.08.2015	26	16

Table 4.5: Temperature ranges during survey period

4.8 Survey Limitations

Ecological surveys are limited in their capacity to document all of the species of flora and fauna likely or actually occurring at a given site. There are numerous factors that will influence whether a species is detected or not, including climatic and seasonal conditions, the issue of migratory species movements, availability of shelter and food resources, and how readily a species is observed or otherwise recorded given the cryptic nature of some species making them difficult to detect. The absence of a species from survey results does not necessarily indicate that the species is not present. Similarly, there are limitations applicable to the interpretation of records held in databases for the presence or absence of a species at a site. For instance, the Atlas of NSW Wildlife is a database of limited available information and it should not be assumed that the absence of records indicates that a species is not present. Therefore, in order to address these limitations the habitat components of the study area have been assessed to help predict those species likely to occur within the study area based on habitat preferences.

4.9 Significance Assessments

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

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). 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).

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 study 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 4.1) to determine whether or not suitable

habitat exists within the subject site. This is a conservative approach that is likely to include cryptic species as well those that are otherwise difficult to detect.

5. Results

5.1 Soil Landscape

The NSW soil and land information (eSPADE) website administered by the NSW Office of Environment and Heritage was consulted to investigate soil survey sites in the vicinity of the study area. The eSPADE search indicated a soil survey site located nearby on the land immediately north of the study area, which contained comparable soil and similar remnant vegetation. The survey site (reference no. 1000335) was used to generate a soil profile report. The extract of the soil profile report is appended to this report as Appendix B. The soil profile summary is provided below.

5.1.1 Soil Survey Site Details:

Site Location: Approximately 4950 metres east of Pacific Highway;

<u>Map Reference:</u> MGA Grid Reference: Zone 56, Easting 487874, Northing 6520095 KEMPSEY (9435) 1:100,000 sheet;

<u>Profile Details:</u> Survey (1004386), Profile 14, collected from a pit by Karen Flack on 21 March 2003;

<u>Physiography:</u> Swamp complex with nil rock outcrop; Slope 1 % (estimated), elevation 3 metres, local relief extremely low (<9 metres), run-on is low, run-off is none;

<u>Vegetation/Land Use:</u> Swamp complex, with limited clearing at the site, used for improved pasture, with urban and improved pasture in the general area;

Surface Condition: Expected to be hardsetting when dry, groundcover 100 %;

Erosion/Land Degradation: No salting evident;

<u>Soil Hydrology:</u> Profile is slowly permeable, free water at 0.13 metres below soil surface.

5.1.2 Soil Landscape Map Description

The soil landscape map identified the soil within the study area as a Thrumster landscape, which describes the soils as being deep (>300 cm), well-drained Krasnozems and Euchrozems, with some Laterites on crests.

5.1.3 Field Observations of Soil

During the field survey exposed areas of soil within the study area were assessed. These observations of undisturbed areas indicated a layer of leaf litter and other organic material over a brown silty clay soil, which was consistent with soil landscape mapping.

5.2 Flora

5.2.1 Port Macquarie-Hastings Council Vegetation Mapping

The Port Macquarie-Hastings Council (PMHC) vegetation mapping indicates that the vegetation across the study area and adjacent vegetated land within the road reserve is classified as a PMVC-023 Blackbutt shrubby moist forest community. The PMHC vegetation community description is provided below:

Vegetation Formation	Wet Sclerophyll Forests
Sub-formation	Shrubby
Class	North Coast Wet Sclerophyll Forests
Floristic Type	Eucalyptus pilularis
Structure	Eucalyptus pilularis - Glochidion ferdinandi - Imperata cylindrica

Community Description:

Canopy

A tall to extremely tall open forest dominated by *Eucalyptus pilularis* (Blackbutt). Common associates include: *Eucalyptus microcorys* (Tallowwood), and *Corymbia intermedia* (Pink Bloodwood), less commonly *Eucalyptus acmenoides* (White Mahogany), *Eucalyptus siderophloia* (Grey Ironbark), *Eucalyptus propinqua* (Small-fruited Grey Gum) and *Syncarpia glomulifera* (Turpentine), some of which may become locally dominant in response to local edaphic (soil) variables and/or disturbance. Other species that occur include: *Eucalyptus resinifera* (Red Mahogany) and *Lophostemon confertus* (Brush Box).

<u>Understorey</u>

Dominated or co-dominated by saplings of the overstorey species, *Allocasuarina torulosa* (Forest Oak) and, or *Allocasuarina littoralis* (Black She-oak) growing in association with *Acacia floribunda* (White Sally), *Acacia maidenii* (Maidens Wattle), *Acacia melanoxylon* (Blackwood), *Exocarpos cupressiformis* (Cherry Ballart), *Duboisia myoporoides* (Corkwood), *Trema tomentosa var. aspera* (Poison Peach), *Callistemon salignus* (Willow Bottlebrush), *Persoonia stradbrokensis, Dodonaea triquetra* (Large-leaf Hop-bush), *Billardiera scandens* (Hairy Apple Berry), *Glochidion ferdinandi* (Cheese Tree), *Breynia oblongifolia* (Coffee Bush), *Cordyline stricta* (Narrow-leaved Palm Lily), *Indigofera australis* (Austral Indigo), *Pittosporum revolutum* (Rough-fruit Pittosporum), *Polyscias sambucifolia* (Elderberry Panax) and other species.

<u>Groundcover</u>

Mid-high dominated by a range of grass-like plants, scattered herbs and ferns that seems dependent on time since fire, the longer the time since fire the more ferns and the less graminoids there are present as the understorey tree layer becomes closed. The more dominant species include *Imperata cylindrica* (Blady Grass), *Pteridium esculentum* (Common Bracken), *Themeda triandra* (Kangaroo Grass), *Lomandra longifolia* (Spinyheaded Mat-rush) and other species.

Climbing Plants (vines and lianas) include *Hibbertia scandens* (Climbing Guinea-flower), *Dioscorea transversa* (Native Yam), *Eustrephus latifolius* (Wombat Berry), *Geitonoplesium cymosum* (Scrambling Lily), *Hardenbergia violacea* (False Sarsaparilla), *Kennedia rubicunda* (Dusky Coral Pea), *Pandorea pandorana* (Wonga Wonga Vine), *Parsonsia straminea* (Common Silkpod), *Rubus moluccanus* (Molucca Bramble), *Rubus parviflorus* (Native Raspberry), *Stephania japonica* (Snake Vine) and *Tylophora paniculata* (Thin-leaved Tylophora).

5.2.2 Field Observations

i. Structural Characteristics

The structural characteristics of the vegetation within the study area indicated a (remnant) tall open forest formation.

ii. Floristics

The vegetation within the study area and on the adjacent land within the unformed parts of the road reserve consisted of a patch of remnant forest that was highly disturbed. There was a significant assemblage of exotic species in the understorey and groundcover and the influence of edge effect was clearly evident. The assemblage of species recorded during the flora survey was not consistent with the PMHC vegetation community description, which could at least in part be attributed to the aforementioned disturbance but may also be a consequence of the site's proximity to nearby swamp forest communities and the presence of a table drain within the study area adjacent to the edge of the existing formed road surface.

In the canopy the principal species included *Eucalyptus pilularis* (Blackbutt) and *Eucalyptus microcorys* (Tallowwood). Associates in the canopy included *Corymbia intermedia* (Pink Bloodwood) and *Eucalyptus siderophloia* (Grey Ironbark). In the lower lying southern parts of the site *Eucalyptus tereticornis* (Forest Red Gum) and to a lesser extent *Melaleuca quinquenervia* (Broad-leaved Paperbark) were recorded in the canopy.

The principal species in the understorey included immature individuals of species from the canopy, *Allocasuarina torulosa* (Forest Oak), *Breynia oblongfolia* (Coffee Bush), *Lantana camara* (Lantana), *Senna pendula* var. *glabrata* (Easter Cassia) and *Platylobium formosum* (Handsome Flat Pea). Other common species recorded in the understorey included *Cinnamomum camphora* (Camphora Laurel), *Ochna serrulata* (Micky Mouse Plant), *Polyscias sambucifolia* (Elderberry Panax), *Glochidion ferdinandi* (Cheese Tree), *Acacia maidenii* (Maiden's Wattle), *Acacia longifolia* subsp. *sophorae* (Coastal Wattle), *Acacia longissima* (Long-leaf Wattle), *Acacia irrorata* subsp. *Irrorata* (Green Wattle), *Cordyline stricta* (Narrow-leaved Palm Lily), *Indigofera australis* (Austral Indigo), *Pittosporum revolutum* (Rough-fruit Pittosporum), *Pittosporum undulatum* (Sweet Pittosporum), *Lomatia silaifolia* (Slender Rice Flower), *Persoonia stradbrokensis*, *Jacaranda mimosifolia* (Jacaranda) and *Syagrus romanzoffiana* (Cocos Palm). In the moister parts of the site along the table drain *Callistemon salignus* (Willow Bottlebrush) was recorded.

In the absence of a natural fire regime the understorey also contained an assemblage of species commonly associated with rainforest including *Anopterus macleayanus* (Macleay Laurel), *Synoum glandulosum* subsp. *glandulosum* (Scentless Rosewood), *Jagera pseudorhus* var. *pseudorhus* (Foambark Tree), *Dysoxylum fraserianum* (Rosewood) and *Cupaniopsis anacardioides* (Tuckeroo).

The dominant species of the groundcover were *Imperata cylindrica* (Blady Grass) and *Paspalum mandiocanum* (Broadleaf Paspalum). Other common species in the

groundcover included, Lomandra longifolia (Spiny-headed Mat-rush), Pteridium esculentum (Common Bracken), Entolasia stricta (Wiry Panic), Asparagus aethiopicus (Asparagus Fern), Ageratum houstonianum (Blue Billygoat Weed), Dianella caerulea (Blue Flax-lily), and Hibbertia aspera (Rough Guinea Flower). In the table drain species with a preference for moist conditions such as Persicaria decipiens (Slender Knotweed), Commelina cyanea (Native Wandering Jew), Juncus continuus, Ageratina adenophora (Crofton Weed), Cyperus eragrostis (Umbrella Sedge) and Eleocharis equisetina were recorded. The margins were dominated by various exotic species, many of which are listed as weeds including Paspalum urvillei (Vasey Grass), Chloris gayana (Rhodes Grass), Sporobolus africanus (Parramatta Grass), Andropogon virginicus (Whisky Grass), Bidens pilosa (Cobbler's Pegs), Rubus fruticosus aggregate (Blackberry) and Ipomoea cairica (Coastal Morning Glory).

Several species of climbing plants including both native and exotic species were recorded within the study area during the flora survey. The more common of these included *Pandorea pandorana* subsp. *Pandorana* (Wonga Wonga Vine), *Eustrephus latifolius* (Wombat Berry), and *Geitonoplesium cymosum* (Scrambling Lily), *Parsonsia straminea* (Common Silkpod), *Marsdenia rostrata* (Milk Vine), *Araujia sericifera* (Moth Vine), *Passiflora subpeltata* (White Passionflower), *Rubus moluccanus* var. *trilobus* (Molucca Bramble), *Smilax australis* (Lawyer Vine) and *Cissus antarctica* (Water Vine).

The complete list of flora species recorded within the study area is appended to this report as Appendix C. The following images show the general condition of the plant communities and habitat within the study area at the time of field survey.



Figure 5.1: View of the western margin of the study area



Figure 5.2: View of the study area adjacent to the development site



Figure 5.3: View of the northern end of the study area



Figure 5.4: View of the southern end of the study area



Figure 5.5: View of the vegetation within the middle part of the study area



Figure 5.6: View of the table drain within the study area

5.2.3 Threatened Flora – Targeted Search

The Atlas of NSW Wildlife database search indicated forty-two (42) records of eleven (11) species of threatened flora listed under the TSC Act within a 10 km x 10 km (default) search area. The protected Matters Search Tool report indicated that nine (9) threatened species listed under the EPBC Act or their habitat may occur within a 10 km search area. The details of the threatened species of flora returned in the database searches are provided in Table 5.1 below.

Species and Listing	Habitat and Distribution	Potential Occurrence	
	Apocynaceae		
Cynanchum elegans (White-flowered Wax Plant) EPBC Act	Rare, recorded from rainforest gullies scrub and scree slopes; from the Gloucester district to the Wollongong area and inland to Mt Dangar	Unlikely	
Casuarinaceae			
Allocasuarina defungens (Dwarf Heath Casuarina) EPBC Act & TSC Act	In Nabiac area and farther north in the North Coast region; Grows mainly in tall heath on sand, but can also occur on clay soils and sandstone; Also extends onto exposed nearby-coastal hills or headlands adjacent to sandplains	Unlikely	
Euphorbiaceae			
Chamaesyce psammogeton (Sand Spurge) TSC Act	Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (<i>Spinifex sericeus</i>) and Prickly Couch (<i>Zoysia macrantha</i>)	Unlikely	

Fabaceae (Caesalpinioideae)			
<i>Senna acclinis</i> (Rainforest Cassia) TSC Act	Grows on the margins of subtropical, littoral and dry rainforests, north from the Wollongong area.	Unlikely	
	Fabaceae (Faboideae)		
<i>Sophora tomentosa</i> (Silverbush) TSC Act	Grows on sea shores (coastal dunes) north from Port Macquarie; not common	Unlikely	
	Juncaginaceae		
<i>Maundia triglochinoides</i> TSC Act	Grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients; North from Sydney	Unlikely	
	Myrtaceae		
<i>Eucalyptus nicholii</i> (Narrow-leaved Black Peppermint) TSC Act	Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock; Restricted and uncommon	Unlikely	
<i>Melaleuca biconvexa</i> (Biconvex Paperbark) EPBC Act & TSC Act	Generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects	Unlikely	
	Orchidaceae		
<i>Cryptostylis hunteriana</i> (Leafless Tongue-orchid) EPBC Act	Grows in swamp-heath on sandy soils, chiefly in coastal districts, south from the Gibraltar Range; The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>)	Unlikely	
<i>Dendrobium melaleucaphilum</i> (Spider Orchid) TSC Act	Occurs in coastal districts and nearby ranges, From Queensland to the lower Blue Mountains; In NSW, it is currently known from seven recent collections; Grows frequently on <i>Melaleuca</i> <i>styphelioides</i> , less commonly on rainforest trees or on rocks	Unlikely	
<i>Oberonia titania</i> (Red-flowered King of the Fairies) TSC Act	Occurs in littoral and subtropical rainforest and paperbark swamps, but it can also occur in eucalypt-forested gorges and in mangroves	Unlikely	
Phaius australis (Lesser Swamp-orchid) EPBC Act	Grows in Paperbark swamps & in swampy sclerophyll forest, on the coast, at or near sea level; reported north from Lake Cathie, but chiefly north from the Evans Head	Unlikely	
	Orobanchaceae		
Euphrasia arguta EPBC Act	Grows in grassy areas near rivers, recorded from Bathurst to Walcha area (possibly extinct)	Unlikely	

Poaceae				
Arthraxon hispidus (Hairy-joint Grass) EPBC Act	Occurs over a wide area in south-east Queensland and on the northern tablelands and north coast of NSW; uncommon; grows in rainforest	Unlikely		
	Rubiaceae			
Asperula asthenes (Trailing Woodruff) TSC Act	Occurs only in NSW; Found in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens/Wallis Lakes area; Grows in damp sites often along river banks	Unlikely		
Rutaceae				
<i>Acronychia littoralis</i> (Scented Acronychia) EPBC Act & TSC Act	Occurs in transition zones between littoral rainforest and swamp sclerophyll forest, between littoral rainforest and coastal cypress pine communities; and margins of littoral rainforest; Usually within 2 km of the coast on sandy soils	Unlikely		
Santalaceae				
<i>Thesium australe</i> (Austral Toadflax) EPBC Act	Grows in grassland or woodland, often in damp sites; Widespread but rare	Unlikely		

Table 5.1: Threatened flora returned in database searches

Based on the habitat assessment and the habitat requirements of the threatened species of flora listed in Table 5.1, it is unlikely that potential habitat was present within the study area for any of the listed species. As the study area was relatively small it was possible to undertake a comprehensive flora survey of the whole of the habitat during which all of the listed threatened species were considered. No threatened species of flora were recorded within the study area during the current study.

5.3 Habitat Assessment

5.3.1 General

As previously discussed in Section 5.2, the study area was located within a section of the John Oxley Drive road reserve in which a highly disturbed remnant Blackbutt shrubby moist forest community occurred. The remnant vegetation incorporated a canopy composed of trees in the early-mature, mature and late-mature growth stages after Woodgate et al (1994) and included several hollow-bearing trees. The understorey and groundcover comprised an assemblage of native and exotic species, including various species listed as environmental weeds.

5.3.2 Habitat Features

In addition to the hollow-bearing trees, which are considered separately under Section 5.3.3, the study area contained other habitat features including significant quantities of fallen timber and an ephemeral stream formed by a table drain that entered the study area via a piped drain at the eastern margin in the southern part of the site then ran along the western boundary adjacent to the formed roadway.

5.3.3 Hollow-bearing Trees

Twenty-three (23) trees containing visible hollows were recorded during the habitat assessment, however the mapping indicates that nine (9) of these trees are situated on the road reserve outside the study area and one tree appears to be situated at the eastern boundary of the study area as indicated in Figure 5.7.



Figure 5.7: Hollow-bearing trees recorded during the habitat assessment

The details of the hollow-bearing trees surveyed during the habitat assessment are summarised in Table 5.2.

Tree No.	Species	DBH (cm)	Height (m)	Notes
1	Eucalyptus pilularis	145	30	>5 hollows; >100 mm; Nesting Rainbow Lorikeets
2	Eucalyptus pilularis	43	25	>5 hollows; <50 mm
3	Eucalyptus pilularis	81	30	2-4 hollows; >50 mm
4	Eucalyptus pilularis	101	30	2-4 hollows; >50 mm
5	Eucalyptus pilularis	82	30	1 hollow; <50 mm
6	Eucalyptus pilularis	96	35	>5 hollows; >100 mm; Nesting Rainbow Lorikeets
7	Eucalyptus microcorys	119	30	>5 hollows; >50 mm; Hollows mostly low down
8	Eucalyptus microcorys	90	30	>5 hollows; >100 mm
9	Unknown stag	42	15	2-4 hollows; >100 mm; Fox den (adjacent)
10	Eucalyptus pilularis	117	30	>5 hollows; >100 mm; Nesting Rainbow Lorikeets
11	Eucalyptus pilularis	60	15	2-4 hollows; <50 mm; Tee has significant lean
12	Eucalyptus microcorys	84	30	2-4 hollows; <50 mm
13	Eucalyptus microcorys	93	30	2-4 hollows; <50 mm
14	Eucalyptus pilularis	117	35	2-4 hollows; <50 mm
15	Eucalyptus pilularis	96	35	>5 hollows; >50 mm
16	Unknown stag	46	8	1 hollow; >100 mm; Hollow in trunk
17	Eucalyptus microcorys	57	20	2-4 hollows; >50 mm; Disturbed bark
18	Eucalyptus siderophloia	80	20	>5 hollows; <50 mm; Tree has significant lean and is senescent
19	Eucalyptus pilularis	65	30	>5 hollows; >50 mm
20	Unknown stag	111	30	>5 hollows; >100 mm; Tree at road edge
21	Eucalyptus pilularis	83	30	2-4 hollows; >100 mm; Tree has significant lean
22	Unknown stag	80	5	1 hollow; >100 mm; Hollow in trunk
23	Corymbia intermedia	56	15	1 hollows; >50 mm; Hollow in termitarium

Table 5.2: Summary of surveyed hollow-bearing trees

The details and completed PMHC hollow-bearing tree assessment forms for the twelve (12) trees within the study area and the tree situated on the study area boundary are appended to this report as Appendix D.

5.4 Fauna

5.4.1 Habitat Search

One species; *Lampropholis delicata* (Dark-flecked Garden Skink) was observed within the study area during the habitat search. Several species were also recorded based on scats and other signs as detailed in Section 5.5.3.

5.4.2 Diurnal Bird Survey

Twenty (20) avian species were recorded during the diurnal bird survey. These were all common species, none of which is listed as threatened under the TSC Act or EPBC Act. The avian species recorded within the study area during the diurnal bird survey are listed in Table 5.3.

Family	Scientific Name	Common Name
Acanthizidae	Acanthiza pusilla	Brown Thornbill
	Gerygone olivacea	White-throated Gerygone
	Sericornis frontalis	White-browed Scrubwren
Alcedinidae	Dacelo novaeguineae	Laughing Kookaburra
Artamidae	Cracticus tibicen	Australian Magpie
Campephagidae	Coracina novaehollandiae	Black-faced Cuckoo-shrike
Cacatuidae	Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo
Climacteridae	Cormobates leucophaea	White-throated Treecreeper
Meliphagidae	Anthochaera chrysoptera	Little Wattlebird
	Caligavis chrysops	Yellow-faced Honeyeater
	Lichmera indistincta	Brown Honeyeater
	Manorina melanocephala	Noisy Miner
	Meliphaga lewinii	Lewin's Honeyeater
	Philemon corniculatus	Noisy Friarbird
Monarchidae	Grallina cyanoleuca	Magpie-lark
Pachycephalidae	Pachycephala pectoralis	Golden Whistler
Pardalotidae	Pardalotus striatus	Striated Pardalote
Petroicidae	Eopsaltria australis	Eastern Yellow Robin
Psittacidae	Trichoglossus haematodus	Rainbow Lorikeet
Rhipiduridae	Rhipidura fuliginosa	Grey Fantail

Table 5.3: Avian species recorded during the diurnal bird survey

5.4.3 Scats and Signs Survey

Several scats were recorded within the study area during the survey. Some of these were identified as those of a species of macropod. The most likely species was considered to be the Eastern Grey Kangaroo based on the size of the scats. The

species was also observed on nearby land. The scats of an unidentified species of deer were also recorded within the study area. It is noted that both Red Deer and Fallow Deer are common in the area and that herbivory and environmental degradation caused by feral deer is listed in NSW under Schedule 3 of the TSC Act as a key threatening process. Two Fox dens that appear to be in use as well at least two others that appear to be abandoned were recorded within the study area during the scats and signs survey. It is noted that predation by the European Red Fox is listed in NSW under Schedule 3 of the TSC Act as a key threatening process. An image of one of the active Fox dens is shown at Figure 5.8.



Figure 5.8: Fox den located within the study area

Two relatively old Koala scats were observed at the base of a tree within the study area. The tree was identified as *Eucalyptus microcorys* (Tallowwood). There was also disturbance of bark on the trunks of several trees within the study area. This was evident mostly on the trunks of some individuals of *Eucalyptus microcorys* (Tallowwood). The signs of Koala activity within the study area is discussed further in the Koala habitat assessment and survey results under Section 5.7. An example of the disturbed bark observed on the trunk of *Eucalyptus microcorys* within the study area is shown at Figure 5.9.



Figure 5.9: Disturbed bark on the trunk of a Tallowwood

There were also scratch marks recorded on the trunk of the only individual of *Eucalyptus propinqua* (Small-fruited Grey Gum), recorded within the study area. However, the species of fauna that made these scratch marks could not be determined with any certainty. Several potential species have been recorded in the vicinity of the study area including the Koala, Common Brushtail Possum, Sugar Glider, Squirrel Glider and Yellow-bellied Glider. The scratch marks observed on the trunk of *Eucalyptus propinqua* within the study area is shown in Figure 5.10.



Figure 5.10: Scratch marks on the trunk of a Small fruited Grey Gum

The species of fauna identified by scats and signs within the study area are summarised in Table 5.4.

Family	Species	Common Name
Mammalia		
Phascolarctidae	Phascolarctos cinereus	Koala
Macropodidae	Macropus giganteus	Eastern Grey Kangaroo
Canidae	Vulpes vulpes*	Fox*
Cervidae	Cervus sp.*	Unidentified Deer*

 Table 5.4: Species of (non-avian) fauna recorded during the scats and signs search

 * Indicates an introduced species

5.4.4 Stag Watching

Stag watching confirmed that Rainbow Lorikeets were utilising hollows for nesting in several surveyed hollow-bearing trees including trees number 1, 6 and 10. No other species were recorded during the stag watching.

5.4.5 Spotlight Survey

No species of fauna were detected during the spotlight survey.

5.4.6 Bat Ultrasonic Echolocation Detection

Several species of Microchiropteran Bats were recorded within the study area by ultrasonic echolocation detection including two (2) species that could be identified confidently by Echo Ecology as detailed in Table 5.5.

Family	Species	Common Name
Vespertilionidae	Chalinolobus gouldii	Gould's Wattled Bat
	Miniopterus australis	Little Bentwing-bat

Table 5.5: Microchiropteran Bats recorded with confidence within the study area

One of these species; *Miniopterus australis* (Little Bentwing-bat) is listed as vulnerable in NSW under Schedule 2 of the TSC Act.

There was a further eleven (11) species of Microchiropteran Bats that potentially occurred within the study area during the survey but could not be confidently identified. The species of Microchiropteran Bat that could not be identified with confidence but could potentially occur within the study area based on the Echo Ecology analysis are shown below in Table 5.6.

Family	Species	Common Name
Molossidae	Mormopterus (Micronomus) norfolkensis	East coast Freetail-Bat
	Mormopterus (Ozimops) ridei	Eastern Free-tailed Bat
Vespertilionidae	Chalinolobus morio	Chocolate Wattled Bat
	Falsistrellus tasmaniensis	Eastern False Pipistrelle
	Mormopterus (Micronomus) norfolkensis	East Coast Free-tailed Bat
	Mormopterus (Ozimops) ridei	Eastern Free-tailed Bat
	Scoteanax rueppellii	Greater Broad-nosed Bat
	Scotorepens orion	Eastern Broad-nosed Bat
	Vespadelus pumilus	Eastern Forest Bat
	Vespadelus troughtoni	Eastern Cave Bat
	Vespadelus vulturnus	Little Forest Bat

Table 5.6: Microchiropteran Bats recorded without confidence within the study area

Four (4) of the Microchiropteran Bats species recorded without confidence are listed as vulnerable in NSW under Schedule 2 of the TSC Act including:

- Falsistrellus tasmaniensis
 (Eastern False Pipistrelle)
- Mormopterus (Micronomus) norfolkensis (East
- Scoteanax rueppellii
- Vespadelus troughtoni

- (East coast Freetail-bat); (Greater Broad-nosed Bat); and
- (Eastern Cave Bat).

It should be noted that the survey was undertaken outside the survey period recommended by the Guidelines (October – March) and although conditions up to and including the time of the survey had been relatively warm and mild, there is the possibility that some species of Microchiropteran Bats were inactive. The detailed Bat call identification report prepared by Echo Ecology is appended to this report as Appendix E.

5.4.7 Threatened Species

One threatened species of Microchiropteran Bat; *Miniopterus australis* (Little Bentwing-bat) was recorded with confidence within the study area during the ultrasonic echolocation detection survey. Additionally four (4) other threatened species of Microchiropteran Bats species were recorded without confidence, including *Falsistrellus tasmaniensis* (Eastern False Pipistrelle), *Mormopterus (Micronomus) norfolkensis* (East coast Freetail-bat), *Scoteanax rueppellii* (Greater Broad-nosed Bat) and *Vespadelus troughtoni* (Eastern Cave Bat). No other threatened species of fauna was recorded within the study area during the current study. There are a number of Atlas of NSW Wildlife records of threatened species within the 10 km x 10 km search area around the study area. These species have been included for consideration under the Assessment of Significance (7 Part Test) appended to this report as Appendix F.

5.5 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 10 kilometre buffer was undertaken to identify the matters of NES that may occur in, or may relate to the site.

5.5.1 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:	3
Threatened Species:	55
Migratory Species:	64

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

The three (3) threatened ecological communities listed in the Protected Matters Search Tool report are detailed below:

- Littoral Rainforest and Coastal Vine Thickets of Eastern Australia;
- Lowland Rainforest of Subtropical Australia Critically Endangered; and
- Subtropical and Temperate Coastal Saltmarsh Vulnerable.

None of these plant communities were recorded within the study area during the field survey.

5.5.2 Other Matters Protected by the EPBC Act

Commonwealth Land :	6
Commonwealth Heritage Places:	None
Listed Marine Species:	81
Whales and other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves (Terrestrial):	None
Commonwealth Reserves (Marine):	None
State and Territory Reserves:	9
Regional Forest Agreements:	1
Invasive Species:	39
Nationally Important Wetlands:	1
Key Ecological Features (Marine):	None

With respect to the thirty-nine (39) invasive species returned in the Protected Matters Search, three (3) avian and seven (7) mammalian species are considered to have

potential to occur within or utilise the habitat within the study area. The Protected Matters report also lists seventeen (17) plants under Invasive Species (excluding two (2) duplications), which includes some of the 20 weeds 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. Six (6) plant species listed as weeds of National Significance were recorded within the study area during the field survey, including *Asparagus aethiopicus* (Asparagus Fern), *Asparagus plumosus* (Climbing Asparagus Fern), *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush), *Lantana camara* (Lantana), *Rubus fruticosus* aggregate (Blackberry) and *Senecio madagascariensis* (Fireweed). The weeds and other invasive species that are known or are considered to have potential to occur within the study area are listed in Table 5.7.

Scientific Name	Common Name	
Plantae (Weeds)		
Anredera cordifolia	Madeira Vine	
Asparagus aethiopicus*	Asparagus Fern*	
Asparagus plumosus*	Climbing Asparagus Fern*	
Chrysanthemoides monilifera subsp. Rotundata*	Bitou Bush*	
Lantana camara*	Lantana*	
Rubus fruticosus aggregate*	Blackberry*	
Senecio madagascariensis*	Fireweed*	
Aves		
Acridotheres tristis	Indian Myna	
Passer domesticus	House Sparrow	
Streptopelia chinensis	Spotted Turtle-dove	
Mammalia		
Canis lupus familiaris	Domestic Dog	
Felis catus	Domestic Cat	
Cervus spp.*	Feral Deer*	
Mus muclus	House Mouse	
Oryctolagus cuniculus	European Rabbit	
Rattus rattus	Black Rat	
Vulpes vulpes*	Red Fox*	

 Table 5.7: Invasive species known or potentially could occur within the study area

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

5.6 Koala Habitat Assessment and Koala Survey

5.6.1 SEPP 44

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

Strictly speaking, the study area (within the John Oxley Drive road reserve) lies outside the land to which the relevant development application has been made (i.e. Lot 12 and Lot 13 in DP 1088869, 18 John Oxley Drive Port Macquarie) and the land is not under
the same ownership. As it was not be possible to undertake a Koala habitat assessment across the whole of the land within the road reserve both in terms of its extant and access constraints, the decision was taken to confine the Koala habitat assessment and survey to the land within the defined study area as detailed in Section 3.3 of this report and to extend it to the adjoining land within the road reserve only if the Koala habitat assessment and survey within the study area proved inconclusive. Based on the information gathered during the Koala habitat assessment and survey of the study area it was concluded that extending the survey further would not be necessary.

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

"Areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 % of the total number of trees in the upper or lower strata of the tree component."

Two species listed on Schedule 2 of SEPP 44 including *Eucalyptus microcorys* (Tallowwood) and *Eucalyptus tereticornis* (Forest Red Gum) were recorded within the study area and within the adjacent habitat located within the road reserve. These species comprised more than 15 % of the total number of trees in the upper or lower strata of the tree component within the habitat, therefore the habitat satisfies the criteria for 'Potential Koala Habitat' for the purposes of SEPP 44.

It is also noted that the PMHC vegetation mapping shows that the vegetated areas within the road reserve across the wider area are mapped as Blackbutt shrubby moist forest in which *Eucalyptus microcorys* (Tallowwood) is a common associate. Therefore, it is reasonable to conclude that generally the habitat within the vegetated parts of the road reserve across the wider area would satisfy the criteria for 'Potential Koala Habitat' for the purposes of SEPP 44.

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

"An area of land with a resident population of Koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population."

The Atlas of NSW Wildlife database search returned 981 records of the Koala within a 10 km x 10 km search area around the study area. This indicates that there is a significant population of the species present in the area. The locations of the Koala records within the search area from the Atlas of NSW Wildlife (OEH, 2015) are shown in Figure 5.11.



Figure 5.11: Locations of Koala records (red markers) within the default search area. (Source: Atlas of NSW Wildlife – OEH)

The Atlas records indicate that a local Koala population occurs across a wide area throughout the greater Port Macquarie area. As discussed previously in Section 5.5.3 two relatively old Koala scats were observed at the base of a tree within the study area. The tree was identified as *Eucalyptus microcorys* (Tallowwood). There was also disturbance of bark on the trunks of several trees within the study area, which were consistent with the types of marks produced by the claws of Koalas when climbing trees. This was evident mostly on the trunks of some individuals of *Eucalyptus microcorys* (Tallowwood). The location of the Koala scats observed within the study area is shown in Figure 5.12.



Figure 5.12: Location of Koala scats within the study area

Given the evidence recorded during the Koala survey there seems little doubt that the species utilises the habitat within the study area. The habitat within the study area and adjacent land within the road reserve comprises a relatively narrow strip of remnant vegetation that essentially runs through a developed residential and commercial landscape. There are food resources available to the Koala within the road reserve, however due to its narrow linear shape and position in the landscape these food

resources are limited in any one part of the road reserve. Therefore, it is unlikely that a population of the Koala could rely on these food resources over a sustained period.

When the John Oxley Drive road reserve is viewed in aerial imagery it can be seen that the remnant vegetation therein forms part of an extensive vegetated corridor that provides connectivity between areas of Koala habitat to the north, east and south. This is likely to be important in providing a means by which Koalas are able to move between areas of otherwise disjunct habitat through the developed landscape. In this context the habitat within the study area is likely to be important to the species survival and likely constitutes part of a wider area of core Koala habitat. In this regard a precautionary approach has been taken and therefore, for the purposes of SEPP 44 the preparation of a Koala plan of management (KPoM) is recommended.

5.6.2 EPBC Act

For the purposes of the EPBC Act a desktop survey, 'on-ground' (field) survey and habitat assessment (utilising the habitat assessment tool) were undertaken.

i. Desktop Survey

The Atlas of NSW Wildlife database search returned 981 records of the Koala within a 10 km x 10 km search area around the study area. This indicates that there is a significant population of the species present in the area. The locations of the Koala records within the search area from the Atlas of NSW Wildlife (OEH, 2015) are shown previously in Figure 5.11. The Atlas records indicate that a local Koala population occurs across a wide area throughout the greater Port Macquarie area. The EPBC Act Protected Matters Search Tool advises that the Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) or the species habitat is known to occur in the area. Aerial imagery shows that the remnant vegetation within the John Oxley Drive road reserve forms part of an extensive vegetated corridor that provides connectivity between areas of Koala habitat to the north, east and south. This is likely to be important in providing a means by which Koalas are able to move between areas of otherwise disjunct habitat through the developed landscape.

ii. On-ground (Field) Survey

The entire habitat within the study area was investigated. This included searching the site for actual Koala sightings as well as conducting a modified SAT survey which involved searching for Koala scats at the base of all trees within the study area and looking for other indicators such as scratch markings on tree trunks. Two relatively old Koala scats were observed at the base of a tree within the study area. The tree was identified as *Eucalyptus microcorys* (Tallowwood). There was also disturbance of bark on the trunks of several trees within the study area, which were consistent with the types of marks produced by the claws of Koalas when climbing trees. This was evident mostly on the trunks of some individuals of *Eucalyptus microcorys* (Tallowwood). The location of the Koala scats observed within the study area is shown in Figure 5.12.

iii. Koala Habitat Assessment

The Koala habitat assessment tool score is detailed in Table 5.8.

Attribute	Coastal Criteria	Score
Koala occurrence	Atlas of NSW Wildlife Koala records within 5 km	2
Vegetation composition	Has forest or woodland with 2 or more known Koala food tree species in the canopy; <i>Eucalyptus microcorys</i> and <i>Eucalyptus tereticornis</i>	2
Habitat connectivity	Study area is not part of a contiguous landscape (The site is within a corridor providing linkage)	0
Key existing threats	Evidence of frequent or regular Koala mortality from vehicle strike or dog attack in the study area at present; or Areas which score 0 for Koala occurrence and have a significant dog or vehicle threat present.	0
Recovery value	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context (see Table 4.3).	2
	Total	6

Table 5.8: Koala habitat assessment (coastal criteria)

The Koala habitat assessment tool score of 6 indicates that the habitat within the study area may contain habitat critical to the species survival for the purposes of the EPBC Act and therefore triggers additional actions under the Guidelines as detailed below.

iv. Assessing adverse effects on habitat critical to the survival of the Koala (Figure 2 of the Guidelines)

Applying Figure 2 of the Guidelines:

- Koala habitat assessment tool (habitat) score of 6 the habitat within the study area is deemed to contain habitat critical to the survival of the Koala;
- The land to be cleared within the study area contains known Koala food trees;
- The amount of land to be cleared under the current proposal is < 2 hectares.

Based on the assessment under Figure 2 of the Guidelines, as the amount of proposed clearing is less than 2 hectares referral to the Minister for adversely affecting habitat critical to the survival of the Koala is not recommended.

v. Assessing potential for substantial interference with the recovery of the Koala (Section 8 of the Guidelines)

The following impacts (as detailed in Section 8 of the Guidelines) are considered likely to substantially interfere with the recovery of the Koala:

- Increasing Koala fatalities in habitat critical to the survival of the Koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities;
- Increasing Koala fatalities in habitat critical to the survival of the Koala due to vehicle-strikes to a level that is likely to result in multiple, ongoing mortalities;

- Facilitating the introduction or spread of disease or pathogens to an area, for example *Chlamydia* or *Phytophthora cinnamomi*, to habitat critical to the survival of the Koala that are likely to significantly reduce the reproductive output of female Koalas or reduce the carrying capacity of the habitat;
- Creating a barrier to movement to, between or within habitat critical to the survival of the Koala that is likely to result in a long-term reduction in genetic fitness or access to access to habitat critical to the survival of the Koala;
- Changing hydrology which degrades habitat critical to the survival of the Koala to the extent that the carrying capacity of the habitat is reduced in the longterm.

The Guidelines advise that where impacts such as those outlined above are likely to occur, avoidance and mitigation measures should be put in place to reduce the residual impact of the action. This should be done at the planning and design stage of a project. It is also important that appropriate monitoring and maintenance arrangements are put in place so that mitigation measures are effective for the life of the impacts. Evaluating the mitigation measures over time may also allow for better and more cost-effective mitigation measures to be pursued in the future.

Note: The mitigation of impacts which may interfere with the recovery of the Koala only applies to impact areas which score 5 using the habitat assessment tool, as these areas are considered likely to be important for the long-term survival of the species.

The mitigation measures for the aforementioned impacts and the standards for the mitigation measures and what residual impacts are likely to be significant (and therefore require referral to the Department of the Environment) as detailed in Section 8 of the Guidelines are provided in Section 7 of this report.

5.7 Significance Assessments

From the habitat assessment and database/literature review, it was considered that twenty-five (25) 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 study area. The Section 5A Assessment is appended to this report as Appendix F.

6. Potential Impacts on Biodiversity

The proposed development involves the upgrading of part of the John Oxley Drive road reserve associated with the development of the adjacent land at Lots 12 and 13 in DP 1088869, No.18 John Oxley Drive Port Macquarie. The study area comprised an area of land within the John Oxley Drive road reserve of approximately 1.1 hectares in size, immediately south of the roundabout situated at the intersection of the Oxley Highway, Wrights Road and John Oxley Drive and extending southward to the corner of Kingfisher Road. This location is adjacent to the proposed bulky goods retail development site comprising Lots 12 and 13 in DP 1088869, No.18 John Oxley Drive Port Macquarie. The potential impacts on biodiversity associated with the proposed development are detailed below.

6.1 Vegetation Removal

To facilitate the upgrading of John Oxley Drive adjacent to the proposed Masters development site it will be necessary to remove all the vegetation from within the study area, including several Koala food trees and thirteen (13) hollow-bearing trees.

6.2 Interruption to Ecosystem Processes

Ecosystems require a suite of biotic and abiotic processes in order to function properly. 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 difficult to quantify. Most development in natural environments has the potential to interrupt ecosystem processes.

6.3 Weed Invasion

Weed invasion could potentially have a negative impact on biodiversity in the future. 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. The habitat within the study area is heavily infested with a large assemblage of invasive weeds and other exotic species. Several weeds of national significance including *Asparagus aethiopicus* (Asparagus Fern), *Asparagus plumosus* (Climbing Asparagus Fern), *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush), *Lantana camara* (Lantana), *Rubus fruticosus* aggregate (Blackberry) and *Senecio madagascariensis* (Fireweed). It is noted that the majority of the vegetation within the study area will be removed to facilitate the proposed upgrading of John Oxley Drive. It is also noted that the invasion of native plant communities by *Chrysanthemoides monilifera* (Bitou Bush and Boneseed) and the invasion, establishment and spread of *Lantana camara* (Lantana) are listed in NSW under Schedule 3 of the TSC Act as a Key Threatening Processes.

6.4 EPBC Act Koala Guideline Referral Considerations

Potential Substantial Interference with the Recovery of the Koala (Section 8 of the Guidelines)

The following impacts as detailed in Section 8 of the *EPBC Act referral guidelines for the vulnerable Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory* are considered likely to substantially interfere with the recovery of the Koala:

- Increasing Koala fatalities in habitat critical to the survival of the Koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities;
- Increasing Koala fatalities in habitat critical to the survival of the Koala due to vehicle-strikes to a level that is likely to result in multiple, ongoing mortalities;
- Facilitating the introduction or spread of disease or pathogens to an area, for example *Chlamydia* or *Phytophthora cinnamomi*, to habitat critical to the survival of the Koala that are likely to significantly reduce the reproductive output of female Koalas or reduce the carrying capacity of the habitat;
- Creating a barrier to movement to, between or within habitat critical to the survival of the Koala that is likely to result in a long-term reduction in genetic fitness or access to access to habitat critical to the survival of the Koala;
- Changing hydrology which degrades habitat critical to the survival of the Koala to the extent that the carrying capacity of the habitat is reduced in the long-term.

The referral guidelines advise that where such impacts are likely to occur, avoidance and mitigation measures should be put in place to minimise the residual impact of the action. This should be done at the planning stage of a project. Appropriate monitoring and maintenance arrangements should be put in place so that mitigation measures are effective for the life of the impacts. Evaluating the mitigation measures over time may also allow for better and more cost-effective mitigation measures to be pursued in the future.

6.5 Other Impacts Associated with Human Activities

6.5.1 Changes in Animal Behaviour

Behavioural changes in species of native fauna can occur as a result of the physical presence of a development or due to interaction with humans at the site of 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 like the Eastern Grey Kangaroo, Brushtail Possum, Magpie, Pied Butcherbird, Kookaburra and Noisy Miner often live in close proximity to humans because of the improved foraging opportunities. Other more secretive or cryptic 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 Noisy Miner,

an aggressive, cooperative breeder that will exclude many other avian species from an area. Such conditions are present within part of the study area and the Noisy Miner established in the general area. It is noted that aggressive exclusion of birds by the Noisy miner (*Manorina melanocephala*) is listed in NSW under Schedule 3 of the TSC Act as a Key Threatening Process.

6.5.2 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.

7. Managing Potential Impacts

7.1 Vegetation

The vegetation across a large proportion of the land within the study area will need to be removed as part of the upgrading of John Oxley Drive necessary to facilitate the proposed Masters development.

Any upgrading works of the road reserve located on the land within the study area will require removal of all the vegetation therein including several Koala food trees and thirteen (13) hollow-bearing trees. The details of the hollow-bearing trees proposed to be removed are summarised in Table 7.1.

Tree ID	Species	HBT Assessment Score	Notes
5	Eucalyptus pilularis	13	
7	Eucalyptus microcorys	17	Hollows mostly low
8	Eucalyptus microcorys	18	
9	Unknown stag	7.5	
10	Eucalyptus pilularis	18	
11	Eucalyptus pilularis	15	Tree has lean
12	Eucalyptus microcorys	14.5	
13	Eucalyptus microcorys	14.5	
15	Eucalyptus pilularis	17	Disturbed bark on trunk
16	Unknown stag	7	Single hollow in trunk
18	Eucalyptus siderophloia	13	Lean and senescent
20	Eucalyptus pilularis	18	Road edge
23	Corymbia intermedia	10	Termitarium hollow

Table 7.1: Summary of hollow-bearing trees located within the study area
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Specific mitigation measures to manage the impacts on biodiversity including a tree removal strategy and nest box strategy are detailed below.

7.1.1 Koala Food Tree Removal

Removal of Koala food trees within the study area shall be mitigated as follows:

- All Koala food trees within the study area shall be located by stadia survey to determine the precise number and species that will be impacted;
- Compensatory tree planting shall be undertaken for each Koala food tree to be removed at a ratio of four (4) replacement trees for every one (1) tree removed;
- Each replacement Koala food tree shall be of the same species as the tree it is replacing; and
- The compensatory planting should be undertaken within the preferred offset site at Thrumster as directed by Council.

<u>Note</u>: Given the uncertainty with respect to Council's ultimate works within the John Oxley Drive road corridor, Council have confirmed that their preferred option for any

compensatory planting should be undertaken on an offsite offset area at Thrumster (Area 13) that is owned by Council.

7.1.2 Hollow-bearing Tree Removal

Any hollow-bearing trees approved for removal shall be removed as follows:

- A qualified Ecologist shall be present on site during removal of all hollowbearing trees;
- All hollow-bearing trees are to be left in place until at least 48 hours after all other trees and vegetation located within 25 metres of the hollow-bearing tree has been removed;
- Once the other trees and vegetation have been removed from around a hollowbearing tree, the hollow-bearing tree is to be bumped on the side at least twice per day, using the on-site clearing equipment or other appropriate means, to encourage any resident fauna to depart the tree;
- The bumping is to be repeated at one minute intervals over a period of at least 5 minutes immediately prior to the felling of the tree;
- During the bumping the Contractor is to take precautions to ensure that there is no risk of personal injury or equipment damage from falling limbs.
- Hollow-bearing trees are to be felled on to stockpiles of previously felled timber or other material to soften the impact of felling;
- Immediately following the felling of a hollow-bearing tree the Ecologist is to properly inspect the tree for signs of fauna occupation. If hollows cannot be viewed over their full length, then they are to be sectioned carefully to enable a full inspection of the hollow. When the Ecologist is satisfied the tree is free of fauna, the tree can be removed;
- An inventory of the number and size of all tree hollows shall be maintained in order to determine the number and type of nest boxes to be provided in the nest box strategy;
- Where fauna is found within a hollow of the felled hollow-bearing tree all work within 25 metres of the fauna shall cease until it has moved away of its own volition or is captured for later release; and
- The Ecologist will need to make a judgement call in some instances as to whether fauna found within a hollow of a felled hollow-bearing tree should be left to move away of its own volition or should be captured for later release or placed into care with a member of FAWNA NSW Inc.

7.1.3 Captured Fauna

Where tree hollows or other habitat features are found to contain species of fauna that did not leave the area prior to removal of the vegetation and are subsequently captured for their welfare and protection, the following specifications shall apply:

- Fauna captured shall be kept in a dark environment prior to release in retained vegetation at dusk on the day of capture;
- In the event that fauna are injured during the process, the animals are to be taken to the nearest veterinarian for treatment prior to release; and
- Any injured fauna should be immediately taken to veterinarian for treatment.

7.1.4 Nest Box Strategy

The nest box strategy shall incorporate the following measures:

- Nest boxes shall be provided at a ratio of 2 nest boxes for each tree hollow to be removed as determined by the tree hollow inventory;
- Nest boxes shall be installed in mature trees that do not currently contain hollows, located clear of any development footprint;
- Nest boxes will be manufactured to reduce the likelihood of occupation by feral animals such as the Common Myna and Honey Bee according to industry standards;
- Nest boxes are to be installed in trees (both rough-barked and smooth-barked eucalypts) that do not already have hollows;
- A 40 mm to 50 mm thick layer of wood shavings is to be placed in the base of nest boxes to simulate decaying hollows and provide extra insulation;
- All nest boxes will be attached to the tree using the *Habisure* system, which involves:
 - A length of 3.15 mm plastic-coated soft fencing wire passed through the nest box and around the tree trunk;
 - The wire must be folded into at least four folds about 60 mm tall and 15 mm apart at the sides of the box to allow for tree growth;
 - Where the wire is in contact with the tree trunk or branch it must be threaded through a length of garden hose to protect the tree;
 - Where possible the wire around the tree should pass over a branch behind the trunk, although nest boxes can be installed directly on a straight-stemmed tree; and
 - Nest boxes will be positioned on the north-west to east sector of tree trunks to avoid hot afternoon sun and the predominant aspect of severe storms.
- It is recommended that nest boxes that could be utilised by Rainbow Lorikeets and Scaly-breasted Lorikeets not be installed and that preference be given to installing nest boxes suitable for Microchiropteran Bats.

7.2 Weed Management

As discussed previously in Section 5, the majority of the land within the study area contains highly disturbed remnant Blackbutt shrubby moist forest in which a large assemblage of exotic species of flora including several invasive environmental weeds are established. Removal of all the vegetation from within the study area shall be necessary to allow for upgrading works within the road reserve to proceed. Therefore, the issue of weed invasion within the study area will be addressed. However, the remainder of the remnant vegetation on the adjacent land within the road reserve is in a similar condition and the weed invasion is only likely to worsen over time. Therefore, it is recommended that consideration be given to an integrated weed management program across the remnant vegetation within the road reserve generally. 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 supress weed growth by reducing access to available sunlight, nutrients and moisture.

It is noted that the measures to mitigate the impacts of weed invasion of remnant vegetation across the land within the road reserve are outside the scope of this ecological assessment and the current development proposal.

7.3 Koala Plan of Management

If the upgrading of the road reserve proceeds as either part of the proposal for the development of Lots 12 and 13 under Part 4 of the EP&A Act in which a Koala Plan of Management is required, or as a REF under Part 5 of the EP&A Act by Council, then the following mitigation measures should be included:

- Off-site offset planting for Koala food trees removed as detailed under Section 7.1.1 of this report (this being consistent with the Area 13 KPOM); and
- Floppy top fencing adjacent to the John Oxley Drive roadway, between Wrights Road and Kingfisher Road.

7.4 EPBC Act Koala Guideline Referral Considerations

(Section 8 of the Guidelines - Mitigation Measures)

As per the Guidelines, where impacts such as those outlined in Section 6.5 are likely to occur, mitigation measures should be put in place to reduce the residual impact of the action. This should be done at the planning and design stage of a project. The following tables from the Guidelines provide guidance on the mitigation of these impacts and whether residual impacts are likely to be significant and therefore require referral to the Department. Each table includes mitigation standards for various mitigation measures. Not all measures will be relevant for all types of actions and their appropriateness should be considered on a site-specific basis. Multiple mitigation measures may be relevant and proponents should consider whether a combination of measures will be necessary.

The mitigation measures rated high in in the following tables are considered the most desirable for mitigating the particular impact. Without one or some of the standards, mitigation measure may not be considered effective. The effectiveness of some mitigation measures is unproven so their effectiveness is considered low. These measures may still be important in contributing to the overall reduction of impacts on the koala. If proponents wish to apply mitigation measures other than those identified below, evidence that they are equally effective in achieving the mitigation objectives should be provided.

7.4.1 Dog Attack

i. Likely Significant Impact:

An action leads to an increase in dog attacks in habitat critical to the survival of the Koala to a level that is likely to result in multiple, ongoing Koala mortality.

ii. Mitigation Measures

Mitigation Measures	Mitigation Standards	Effectiveness
Dog proof and Koala proof fencing	 Dog proof and Koala proof fencing along boundaries or premises or estates (fencing should be designed to serve both functions); or dog proof fencing with Koala furniture to allow Koalas to escape yards; and Fences are a minimum 3 m high; and Have a minimum 50 cm wide scratch panelling installed along the length of the outer side of the fence (for Koala proof fencing), and A fully-funded agreement is in place with a relevant organisation or authority for the maintenance and monitoring of the fencing in perpetuity. 	High
Dog control strategy	 Dog control carried out using a method that is known to be effective in comparable circumstances (i.e. may include shooting, poison baiting etc.) and by a qualified professional; and The timing and level of effort of dog control is appropriate to the circumstances and the desired outcomes; and Dog control is carried out for the duration of the impact. 	Moderate
Signage and education	• A community engagement program involving interpretive signs, social media, fact sheets and community presentations, to raise awareness and minimise threats	Low

iii. Residual Impact Likely to require Referral

- Dog attacks in habitat critical to the survival of the Koala increase to a level that is likely to result in multiple, ongoing Koala mortalities;
- The standards of the mitigation measure are not met;
- The action involves the use of other, unproven, mitigation measures and or standards; and
- The likelihood of multiple, ongoing annual Koala fatalities from dog attack remains.

7.4.2 Vehicle Strike

i. Likely Significant Impact:

An action leads to an increase in vehicle-strikes in habitat critical to the survival of the Koala to a level that is likely to result in multiple, ongoing Koala mortalities.

ii. Mitigation Measures

Mitigation Measures	Mitigation Standards	Effectiveness
Koala proof fencing	 Koala proof fencing along entire extent of infrastructure; and Be a minimum 1.8 m high; and Be 3 m from any retained trees or plantings and be clear of all overhanging branches; and Have a minimum 50 cm wide scratch panelling installed along the length of the fence; and A fully-funded agreement is in place with a relevant organisation or authority for the maintenance and monitoring of the fencing in perpetuity; and Be used in conjunction with fauna underpasses/overpasses. 	High
Koala land bridge	 Designed in a manner equivalent to or better than that described below; and Placed at appropriate and regular locations, based on an understanding of local Koala movements; and Designed with an appropriately deep soil bed, vegetated and enhanced with habitat features (e.g. logs, rocks); and Fencing in place to guide Koalas to the land bridge(s) (at least 100 m either side of the land bridge entrance; and A fully-funded agreement is in place with a relevant organisation or authority for the maintenance and monitoring of the infrastructure in perpetuity. 	Moderate
Koala underpasses	 Placed at appropriate and regular locations, based on an understanding of local Koala movements; and Include above water dry longitudinal benches; and Designed according to best practice principles; and Be no more than 40 m in length; and Be a minimum 2.4 m in height and width, and Have a low-flow channel incorporated in the design; and Fencing in place to guide Koalas to the underpass(es) (at least 100 m on either side of the underpass entrance); and A fully-funded agreement is in place with a relevant organisation or authority for the maintenance and monitoring of the infrastructure in perpetuity. 	Moderate
Road design	 Priority given to road tunnelling maintaining natural overpasses; and Viaducts and bridges; and Inclusion of escape mechanisms i.e. climbing poles along road corridor; and Wide breakdown lane buffers; and There is significant loss of habitat critical to the survival of the Koala (Section 7 of the Guidelines). 	Low
Speed limits and signage	 60 km/h on all roads through or adjacent to habitat critical to the survival of the Koala during dawn and dusk and at night; and Road signage to alert drivers of Koala crossings. 	Low
Research	 Improve understanding of the effectiveness of mitigation infrastructure designed to avoid or minimise the risk of Koala vehicle strike. 	

iii. Residual Impact Likely to require Referral

- Vehicle-strikes in habitat critical to the survival of the Koala increase to a level that is likely to result in multiple, ongoing Koala mortalities;
- The standards of the mitigation measure are not met; or
- The action involves the use of other, unproven, mitigation measures and or standards.

7.4.3 Facilitating Introduction or Spread of Disease or Pathogens

i. Likely Significant Impact:

An action facilitates the introduction or spread of disease or pathogens to habitat critical to the survival of the Koala, for example *Chlamydia* or *Phytophthora cinnamomi*, which are likely to significantly reduce the reproductive output of Koalas or reduce the carrying capacity of the habitat.

Mitigation Measures	Mitigation Standards	Effectiveness
Translocation quarantine procedure for Chlamydia and Koala retrovirus	 All Koalas to be translocated must initially be kept separate from others and must undergo a standardised and thorough veterinary health examination to detect any clinical evidence of communicable disease or infection; and A procedure must be in place for Koalas which are found to be affected by disease (i.e. treatment prior to release); and Monitoring of the release site during and after translocation in order to detect disease outbreaks; and Quarantine and biosecurity procedures are maintained throughout the life of the action's impact 	High
Biosecurity and hygiene procedure for <i>Phytophthora</i> <i>cinnamomi</i> and Myrtle Rust	 Enforce biosecurity procedures for all persons and vehicles that may carry vegetation pathogens known to affect Koala food trees; and Monitor the adjacent habitat in order to identify disease occurrence; and Quarantine and biosecurity procedures are maintained throughout the life of the action's impact 	High
Community education program	• Program targets communities near Koala habitat and includes information about Koala and vegetation diseases and how to reduce the risk of accidental spread.	Low

ii. Mitigation Measures:

iii. Residual Impact Likely to require Referral:

- The action is still likely to facilitate the spread of or introduce disease or pathogens to habitat critical to the survival of the Koala, which is likely to significantly reduce the reproductive output of Koalas, or reduce the carrying capacity of the habitat;
- The standards of the mitigation measure are not met; or
- The action involves the use of other, unproven, mitigation measures and or standards; and
- There is significant loss of habitat critical to the survival of the Koala (Section 7 of the Guidelines).

7.4.4 Barriers to Dispersal

i. Likely Significant Impact:

An action creates a barrier to movement to, from or within habitat critical to the survival of the Koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the Koala.

ii. Mitigation Measures:

Mitigation Measures	Mitigation Standards	Effectiveness
Koala underpasses	 Placed at appropriate and regular locations, based on an understanding of local Koala movements; and Include above water, dry longitudinal benches; and Designed according to best practice principles; and Be no more than 40 m in length; and Be a minimum 2.4 m in height and width, and Have a low-flow channel incorporated in the design; and Fencing in place to guide Koalas to the underpass(es) (at least 100 m on either side of the underpass entrance); and A fully-funded agreement is in place with a relevant organisation or authority for the maintenance and monitoring of the infrastructure in perpetuity. 	Moderate
Koala land bridge	 Designed in a manner equivalent to or better than that described below; and Placed at appropriate and regular locations, based on an understanding of local Koala movements; and Designed with an appropriately deep soil bed, vegetated and enhanced with habitat features (e.g. logs, rocks, water body); and Fencing in place to guide Koalas to the land bridge(s) (at least 100 m on either side of the underpass entrance); and A fully-funded agreement is in place with a relevant organisation or authority for the maintenance and monitoring of the infrastructure in perpetuity. 	Moderate
Vegetation retention	 Retention of the structure and floristic diversity of middle and understorey vegetation (where trees must be removed); or Retention of Koala food trees; and Retention of corridor(s) of at least 100 m width. Corridors greater than 300 m wide can be considered to have a higher effectiveness. 	Moderate

iii. Residual Impact Likely to Require Referral:

- A barrier is created to, from or within habitat critical to the survival of the Koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the Koala;
- The standards of the mitigation measure are not met; and
- There is significant loss of habitat critical to the survival of the Koala (Section 7 of the Guidelines).

7.4.5 Degradation of habitat critical to the survival of the Koala through hydrological change

i. Likely Significant Impact:

An action results in a change to water quality or quantity that degrades habitat critical to the survival of the Koala to the extent that the carrying capacity of the habitat is reduced in the long-term.

ii. Mitigation Measures:

Mitigation Measures	Mitigation Standards	Effectiveness
Water Management Plan	 The action has a Water Management Plan (WMP); and The WMP (at a minimum) meets the following criteria (whichever are relevant): Decisions are based on a detailed and thorough understanding of the surface and subsurface water catchment(s); and Appropriate limits are set for aquifer or surface water drawdown; and Procedures are in place to ensure that any drilling hydraulic fracturing fluids that will be used are unlikely to cause significant chemical contamination of groundwater; and Engineering design minimises the risk that the quantity of water available to habitat critical to the survival of the Koala will not be significantly outside the range of natural variation; and Controls are in place to minimise the risk of affecting recharge of groundwater (i.e. creating impermeable surfaces); and Engineering design and controls are in place to minimise the risk of increasing the height of groundwater where groundwater poses a salinity risk; and Monitoring program is detailed for the life of the action for surface and/or groundwater, with triggers for management intervention and corrective actions. 	Moderate

iii. Residual Impact Likely to require Referral:

- The carrying capacity of habitat critical to the survival of the Koala is still likely to be reduced in the long-term; and
- There is significant loss of habitat critical to the survival of the Koala (Section 7 of the Guidelines).

7.5 Changes in Animal and Artificial Lighting

Due to the extent of existing development in proximity to the study area there is currently a significant human presence in the general area that is potentially impacting on some more sensitive species. It is also noted that artificial lighting is already in play due to the existing residential and commercial development and the associated infrastructure in proximity to the study area. Therefore, it is considered unlikely that the proposed development will contribute significantly to changes in animal behaviour or to impacts associated with artificial lighting. No specific recommendations are made in relation to these impacts given the relatively small scale of the proposed development and the extent of the human presence that currently exists in the surrounding area.

8. Conclusion

This report has been prepared to assess the potential impacts on biodiversity associated with a proposed bulky goods retail development, including a Masters Home Improvement Store and subdivision to create two (2) lots at Lots 12 and 13 DP 1088869, No.18 John Oxley Drive Port Macquarie. The development of this site will require the upgrade of the adjacent road reserve to a signalised intersection. These upgrade works will require removal of vegetation from approximately 2,500 m² of land within the John Oxley Drive road reserve on the eastern edge of the existing formed road. Accordingly, additional ecological assessment has been undertaken to include that part of the John Oxley Road reserve that will provide access to the site.

The Port Macquarie-Hastings Council (PMHC) vegetation mapping indicates that the vegetation across the study area and adjacent vegetated land within the road reserve is classified as Blackbutt shrubby moist forest community. The floristics data gathered during the flora survey suggests that the vegetation within the study area and on the adjacent land within the unformed parts of the road reserve consisted of a patch of remnant forest that was highly disturbed. There was a significant assemblage of exotic species including several invasive environmental weeds in the understorey and groundcover and the influence of edge effect was clearly evident. The assemblage of species recorded during the flora survey was not consistent with the PMHC vegetation community description, which could at least in part be attributed to the aforementioned disturbance but may also be a consequence of the site's proximity to nearby swamp forest communities and the presence of a table drain within the study area adjacent to the edge of the existing formed road surface.

Thirteen (13) hollow-bearing trees were recorded within the study area during the habitat assessment as detailed in Appendix E of this report. To facilitate the necessary upgrading of John Oxley Drive, all of these hollow-bearing trees would need to be removed. The measures to mitigate removal of the hollow-bearing trees including a tree removal strategy and nest box strategy are detailed in Section 7 of this report.

Two species listed on Schedule 2 of SEPP 44 including *Eucalyptus microcorys* (Tallowwood) and *Eucalyptus tereticornis* (Forest Red Gum) were recorded within the study area and within the adjacent habitat located within the road reserve. These species comprised more than 15 % of the total number of trees in the upper or lower strata of the tree component within the habitat, therefore the habitat satisfies the criteria for 'Potential Koala Habitat' for the purposes of SEPP 44. Two relatively old Koala scats were observed at the base of a tree within the study area. There was also disturbance of bark on the trunks of several trees within the study area, which were consistent with the types of marks produced by the claws of Koalas when climbing trees. This was particularly apparent on the trunks of some individuals of *Eucalyptus microcorys* (Tallowwood). Given the evidence recorded during the Koala survey there seems little doubt that the species utilises the habitat within the study area.

The habitat within the study area and adjacent land within the John Oxley Drive road reserve comprises a relatively narrow strip of remnant vegetation that essentially runs through a developed residential and commercial landscape. There are food resources

available to the Koala within the road reserve, however due to its narrow linear shape and position in the landscape these food resources are limited in any one part of the road reserve. Therefore, it is unlikely that a population of the Koala could rely on these food resources over a sustained period. Aerial imagery indicates that the remnant vegetation within the road reserve forms part of an extensive vegetated corridor that provides connectivity between areas of Koala habitat to the north, east and south. This is likely to be important in providing a means by which Koalas are able to move between areas of otherwise disjunct habitat through the developed landscape. In this context the habitat within the study area would be important to the species survival and likely constitutes part of a wider area of core Koala habitat. The footprint of the upgrade work within the road reserve occupies approximately 2,500 m² of land in which all the vegetation will be removed. This represents a relatively small part of the remnant vegetation within the road reserve. In addition, it is unlikely that the functioning of the remnant vegetation within the road reserve as a wildlife corridor will be significantly affected by the proposed works. An off-site offset planting strategy is also proposed to mitigate removal of Koala food trees and a Koala Plan of Management is also proposed that will incorporate suitable fencing to reduce the risk of vehicle strike on Koalas in the vicinity of the development site.

One threatened species of Microchiropteran Bat; *Miniopterus australis* (Little Bentwing-bat) was recorded with confidence within the study area during the ultrasonic echolocation detection survey. It is noted that this species is a cave obligate and does not utilise tree hollows for roosting. Additionally four (4) other threatened species of Microchiropteran Bats species were recorded without confidence, including *Falsistrellus tasmaniensis* (Eastern False Pipistrelle), *Mormopterus (Micronomus) norfolkensis* (East coast Freetail-bat), *Scoteanax rueppellii* (Greater Broad-nosed Bat) and *Vespadelus troughtoni* (Eastern Cave Bat). Two of these species; the Eastern False Pipistrelle and the Greater Broad-nosed Bat are regarded as hollow-dependant. No other threatened species of fauna was recorded within the study area during the current study.

From the habitat assessment and database/literature review, it was considered that twenty-five (25) threatened species of fauna as listed under the *Threatened Species Conservation Act 1995* and *Environment Protection and Biodiversity Conservation Act 1999* could potentially utilise the habitat within the study area to a limited extent. The Section 5A Assessment appended to this report as Appendix F concluded that the proposed action has the potential to impact on a number of threatened species and populations. Given the existing highly modified state of the habitat within the study area (edge effect and weed invasion), its relatively small scale and position in the landscape and the recommended mitigation measures it is unlikely that the proposed upgrading work within the John Oxley Drive road reserve will impact significantly on threatened species and populations. The measures to mitigate the impact on biodiversity are outlined in Section 7 of this report.

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10. Appendix A: Site Master Plan



Source: King and Campbell

11. Appendix B: Soil Profile Report

12 & 13//1088869, 18 John Oxley Drive Port Macquarie

8/22/2015		Soll Essentials Report
	00.00 - 00.13 m	(>100/10x10cm) roots (1-2mm). Coarse fragments are very few (< 2%), other, fine gravel (2-6 mm), pans are not evident. Layer notes are topsoil; abrupt (5-20 mm) boundary to
	Layer 2 00.13 - 00.24 m	fine medium silty clay with weak pedality, many (25-100/10x10cm) roots (<1mm), many (25- 100/10x10cm) roots (1-2mm), field pH is 5.8. Coarse fragments are very few (< 2%), other, fine gravel (2- 6 mm), pans are not evident. Layer notes are compressive strength 100 - 150 kPa Alluvial lab bulk density 1.36 DVV/m3; clear (20-50 mm) boundary to
	Layer 3 00.24 - 00.90 m	sandy clay with moderate pedality, common (10-25/10x10cm) roots (<1mm), common (10-25/10x10cm) roots (1-2mm), field pH is 5.4. Coarse fragments are very few (< 2%), other, fine gravel (2-6 mm), pans are not evident. Layer notes are compressive strength 100 - 150 kPa Alluvial Lab bulk density 1.35 DVV/m3; clear (20-50 mm) boundary to
	Layer 4 00,90 - 01,60 m	medium heavy clay with weak pedality, common (10-25/10x10cm) roots (<1mm), common (10- 25/10x10cm) roots (1-2mm), field pH is 5.7. Coarse fragments are common (10-20%), not identified, gravel (6-20 mm), pans are not evident. Layer notes are compressive strength 150 kPa Alluvial Lab bulk density 1.23 DVV/m3; clear (20-50 mm) boundary to
	Layer 99	layer continues
	LABORATORY TE No lab data available	STS:
	For information on laboratory to	est data and units of measure, please see <u>Soil survey standard test methods</u>
	Sol essentials report	To contact us emat <mark>isols@environment.nsw.gov.au</mark> © Office of Environment and Heritage (OEH)
http://www.environment.nsw.gov.au/e5	padeWebapp/report/SoilReport.aspx?	reporttype=1&profileid=71343

12. Appendix C: Flora Species List

The species of flora recorded within the study area are detailed in Table C.1 below.

Family	Species	Common Name
Adiantaceae	Adiantum hispidulum	Rough Maidenhair
Apiaceae	Centella asiatica	Indian Pennywort
Apocynaceae	Araujia sericifera*	Moth Vine*
	Gomphocarpus physocarpus*	Narrow-leaved Cotton Bush*
	Marsdenia rostrata	Milk Vine
	Parsonsia straminea	Common Silkpod
Araliaceae	Polyscias sambucifolia	Elderberry Panax
	Schefflera actinophylla*	Umbrella Tree*
Arecaceae	Syagrus romanzoffiana*	Cocos Palm*
Asparagaceae	Asparagus aethiopicus*	Asparagus Fern*
	Asparagus plumosus*	Climbing Asparagus Fern*
Asteliaceae	Cordyline stricta	Narrow-leaved Palm Lily
Asteraceae	Ageratina adenophora*	Crofton Weed*
	Ageratum houstonianum*	Blue Billygoat Weed*
	Bidens pilosa*	Cobbler's Pegs*
	Chrysanthemoides monilifera subsp. rotundata*	Bitou Bush*
	Cirsium vulgare*	Spear Thistle*
	Eclipta prostrata	
	Osteospermum fruticosum*	Shrubby Daisy-bush*
	Senecio madagascariensis*	Fireweed*
	Sonchus oleraceus*	Common Sowthistle*
	Taraxacum officinale*	Dandelion*
	Vernonia cinerea var. cinerea	
Athyriaceae	Deparia petersensii subsp. congrua	Japanese Lady Fern
Bignoniaceae	Jacaranda mimosifolia*	Jacaranda*
	Pandorea pandorana subsp. pandorana	Wonga Wonga Vine
Casuarinaceae	Allocasuarina torulosa	Forest Oak
	Casuarina glauca	Swamp Oak
Commelinaceae	Commelina cyanea	Native Wandering Jew
Convolvulaceae	Ipomoea cairica*	Coastal Morning Glory*
Cupressaceae	Callitris macleayana	Stringybark Pine
Cyperaceae	Carex appressa	Tall Sedge
	Cyperus eragrostis*	Umbrella Sedge*
	Eleocharis equisetina	
	Gahnia clarkei	Tall Saw-sedge
	Lepidosperma laterale	Variable Sword-sedge
Dennstaedtiaceae	Pteridium esculentum	Bracken
Dicksoniaceae	Calochlaena dubia	Rainbow Fern
Dilleniaceae	Hibbertia aspera	
	Hibbertia scandens	Climbing Guinea Flower
Ericaceae	Leucopogon juniperinus	Prickly Beard-heath
Escalloniaceae	Anopterus macleayanus	Macleay Laurel

Fabaceae (Caesalpinioideae)	Senna pendula var. glabrata*	Easter Cassia*
Fabaceae	Glycine clandestina	Twining Glycine
(Faboideae)	Glycine microphylla	Small-leaf Glycine
	Platylobium formosum	Handsome Flat Pea
	Hardenbergia violacea	False Sarsaparilla
	Indigofera australis	Australian Indigo
	Jacksonia scoparia	Dogwood
	Kennedia rubicunda	Dusky Coral Pea
	Tephrosia grandiflora*	
Fabaceae	Acacia floribunda	White Sally
(Mimosoideae)	Acacia implexa	Hickory Wattle
	Acacia irrorata	Green Wattle
	Acacia longissima	Long-leaf Wattle
	Acacia maidenii	Maiden's Wattle
Iridaceae	Moraea sp.*	Moraea*
Juncaceae	Juncus continuus	
Lauraceae	Cassytha pubescens	Devil's Twine
	Cinnamomum camphora*	Camphor Laurel*
Lobeliaceae	Pratia purpurascens	Whiteroot
Lomandraceae	Lomandra longifolia	Spiny-headed Mat-rush
	Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush
Luzuriagaceae	Eustrephus latifolius	Wombat Berry
	Geitonoplesium cymosum	Scrambling Lily
Malaceae	Pyracantha crenulata*	Nepal Firethorn*
Meliaceae	Dysoxylum fraserianum	Rosewood
	Melia azedarach	White Cedar
	Synoum glandulosum subsp. glandulosum	Scentless Rosewood
Myrsinaceae	Ardisia crenata*	Coralberry*
Myrtaceae	Callistemon salignus	Willow Bottlebrush
	Corymbia intermedia	Pink Bloodwood
	Eucalyptus microcorys	Tallowwood
	Eucalyptus pilularis	Blackbutt
	Eucalyptus propinqua	Small-fruited Grey Gum
	Eucalyptus siderophloia	Grey Ironbark
	Eucalyptus tereticornis	Forest Red Gum
	Melaleuca linariifolia	Flax-leaved Paperbark
	Melaleuca quinquenervia	Broad-leaved Paperbark
	Tristaniopsis laurina	Water Gum
Ochnaceae	Ochna serrulata*	Mickey Mouse Plant*
Orchidaceae	Cryptostylis subulata	Large Tongue Orchid
Oxalidaceae	Oxalis corniculata*	Creeping Oxalis*
Passifloraceae	Passiflora edulis*	Common Passionfruit*
	Passiflora subpeltata*	White Passionflower*
Phormiaceae	Dianella caerulea	Blue Flax Lily
Phyllanthaceae	Breynia oblongifolia	Coffee Bush
	Glochidion ferdinandi	Cheese Tree
Pittosporaceae	Billardiera scandens	Hairy Apple Berry
	Pittosporum revolutum	Rough Pittosporum

	Pittosporum undulatum	Sweet Pittosporum
Poaceae	Andropogon virginicus*	Whisky Grass*
	Capillipedium spicigerum	Scented-top Grass
	Chloris gayana*	Rhodes Grass*
	Cynodon dactylon	Common Couch
	Digitaria parviflora	Small-flowered Finger Grass
	Entolasia marginata	Bordered Panic
	Entolasia stricta	Wiry Panic
	Imperata cylindrica	Blady Grass
	Oplismenus aemulus	Basket Grass
	Ottochloa gracillima	Slender Shade Grass
	Paspalum dilatatum*	Paspalum*
	Paspalum mandiocanum*	Broadleaf Paspalum*
	Paspalum urvillei*	Vasey Grass*
	Pennisetum clandestinum*	Kikuyu Grass*
	Setaria sphacelata*	South African Pigeon Grass*
	Sporobolus africanus*	Parramatta Grass*
Plantaginaceae	Plantago lanceolata*	Lamb's Tongues*
Polygonaceae	Muehlenbeckia gracillima	Slender Lignum
	Persicaria decipiens	Slender Knotweed
Proteaceae	Banksia integrifolia subsp. integrifolia	Coastal Banksia
	Grevillea robusta	Silky Oak
	Hakea salicifolia subsp. salicifolia	
	Lomatia silaifolia	Crinkle Bush
	Persoonia levis	Broad-leaved Geebung
Rhamnaceae	Alphitonia excelsa	Red Ash
Rosaceae	Rubus fruticosus sp. agg.*	Blackberry complex*
	Rubus moluccanus var. trilobus	Molucca Bramble
	Cupaniopsis anacardioides	
Sapindaceae	Dodonaea triquetra	Large-leaf Hop-bush
	Jagera pseudorhus var. pseudorhus	Foambark Tree
Smilacaceae	Smilax australis	Lawyer Vine
Solanaceae	Solanum mauritianum*	Wild Tobacco Bush*
Strelitziaceae	Strelitzia Nicolai*	Giant Strelitzia*
Thymelaeaceae	Pimelea linifolia subsp. linifolia	Slender Rice Flower
	Wikstroemia indica	Bootlace Bush
Ulmaceae	Trema tomentosa var. aspera	Native Peach
Verbenaceae	Lantana camara*	Lantana*
	Verbena bonariensis*	Purpletop*
Violaceae	Viola hederaceae	Ivy-leaved Violet
Vitaceae	Cissus antarctica	Water Vine
Zingiberaceae	Alpinia caerulea	Native Ginger

Table C.1: Flora species recorded within the study area

* Indicates an introduced species

13. Appendix D: HBT Assessment Forms

	Port Macquarie – Hastings Council Hollow-bearing tree assessment		
	LGA/Project: John Oxley. Drive (road reserve - Masters)		
	Date 20: 8:20:5 Easting: 152:875 Northing: 731:4539.11. Datum: GDA		
	Tree NO: 5		
	Height (m): .3.0 DBH (cm): .8.2 DBH <u>Score</u>		
	Number of visible hollows:		
	Hollow Size (variable: 1 or more):		
	In situ < 30m > 30m Score J J J		
	Longevity:		
	TOTAL SCORE: 13		
	Evidence of existing use		
	Recommendation(s):		
	Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis		
	PORT MACQUARIE HASTINGS		

Port Macq	uarie – Hastings Council
Hollow-	bearing tree assessment
LGA/Project: John Oxley	Drive (road reserve - Masters)
Date29:2:2015 Easting: (52.8	74979 Northing: -31:453991 Datum: GDA
Tree species (if known): Eug. Tree No: 7	Alive Dead Score
Height (m): . <u>30</u>	DBH (cm): . <i>1.19</i>
Number of visible hollows:	>5 2-4 0-1 Score 3
Hollow Size (variable: 1 or mo	re): >100mm >50mm <50mm Score 2
Habitat Proximity:	In situ < 30m > 30m Score
Longevity:	High Medium Low Score
TOTAL SCORE: 17	
Evidence of existing use	Vo
Recommendation(s):	
Explanatory Notes: Hollow-bearing trees (HBTs) are a significant factor affecting biodiversi more quantitative and ecologically otherwise currently applied. As adve	n important element in the Australian landscape and a ty values. This assessment sheet is intended to provide a meaningful approach to the ranking of HBTs than is ocated by Gibbons & Lindenmayer (2002), the emphasis
	DORT MAC

Port Macquarie – Hastings Council		
Hollow-bearing tree assessment		
LGA/Project: John Oxley Drive (read reserve - Masters).		
Date29:8:20:5 Easting:/52:874.998 Northing:-3(:454:(67. Datum: GDA		
Tree No. 8		
Height (m): <u>30</u> DBH (cm): <u>90</u> <u>DBH</u> <u>Score</u> <u>3</u>		
Number of visible hollows:		
Hollow Size (variable: 1 or more):		
Habitat Proximity: In situ < 30m > 30m Score		
Longevity:		
TOTAL SCORE: 18		
Evidence of existing use		
Recommendation(s):		
Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis		
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	Port Macquarie – Hastings Council		
	Hollow-bearing tree assessment		
	(GA/Project: John Oxley Drive (road reserve - Masters)		
	Date 20-8 2015 Easting: 152-875033 Northing: -3(-454-189 Datum: GAA		
	Tree species (if known): (Jakaowa - Stab Alive Dead Score		
	Tree No. 9		
	Height (m): DBH (cm):		
	>5 2 - 4 0 -1 Score V / -5		
	Hollow Size (variable: 1 or more):		
	Habitat Proximity:In situ< 30m> 30mScoreV3		
	Longevity:		
	TOTAL SCORE: 7.5		
	Evidence of existing use		
	Recommendation(s):		
	Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis		
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Port Macquarie – Hastings Co	ouncil
Hollow-bearing tree assessme	ent
LGA/Project: John Oxley Drive Croad reserv	ie - Masters)
Date29: 8:29/5 Easting: 152-: 8.7.4.8.7 Northing: -31:41	4.321. Datum: GDA
Tree species (if known): Eucalyptus pilulacis	Alive Dead Score
Height (m): <u>30</u> DBH (cm): <u>//7</u>	DBH Score 3
Number of visible hollows:	0-1 Score 3
Hollow Size (variable: 1 or more):	nm <50mm Score
Habitat Proximity:	> 30m Score 3
Longevity:	Low Score
TOTAL SCORE: 18	
Evidence of existing use	
Recommendation(s):	
Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the significant factor affecting biodiversity values. This assessment s more quantitative and ecologically meaningful approach to th otherwise currently applied. As advocated by Gibbons & Linden	Australian landscape and a heet is intended to provide a e ranking of HBTs than is mayer (2002), the emphasis
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Port Macquarie	e – Hastings Council
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Hollow-bearing	ng tree assessment
LGA/Project: John Oxley Drive	Croad reserve-Masters)
Date 29: 8:20:15 Easting: 152. :8.7.486	8 Northing:-31:459426. Datum: GDA
Tree species (if known): Eucalypt Tree Nº11	Alive Dead Score
Height (m):!5 DBH (cm):6.9 DBH Score 1.5
Number of visible hollows:	>5 2-4 0-1 Score / /·5
Hollow Size (variable: 1 or more):	>100mm >50mm <50mm Score
Habitat Proximity:	In situ < 30m > 30m Score
Longevity:	High Medium Low Score
TOTAL SCORE: 11.5	
Evidence of existing use	
Recommendation(s):	
Explanatory Notes: Hollow-bearing trees (HBTs) are an impo significant factor affecting biodiversity value more quantitative and ecologically meani otherwise currently applied. As advocated	rtant element in the Australian landscape and a is. This assessment sheet is intended to provide a ngful approach to the ranking of HBTs than is by Gibbons & Lindenmayer (2002), the emphasis
	No.

Hollow	-bearing tree assessment
LGA/Project: John Oxley	Drive (road reserve - Masters)
/ Date29:8:20:5 Easting:152:18	74834 Northing: 31:454428. Datum: GDA
Tree species (if known): Exer Tree Nº 12	alyptus microcarys Alive Dead Score
Height (m): 30	DBH (cm): .8.4 DBH Score
Number of visible hollows:	> 5 2 - 4 0 - 1 Score
Hollow Size (variable: 1 or mo	ore): >100mm >50mm <50mm Score
Habitat Proximity:	<i>In situ</i> < 30m > 30m Score ✓ 30m 23
Longevity:	High Medium Low Score
TOTAL SCORE: 14.5	
Evidence of existing use	
Recommendation(s):	
	~
Explanatory Notes: Hollow-bearing trees (HBTs) are a significant factor affecting biodiversi more quantitative and ecologically otherwise currently applied. As adv	an important element in the Australian landscape and a ity values. This assessment sheet is intended to provide a / meaningful approach to the ranking of HBTs than is vocated by Gibbons & Lindenmayer (2002), the emphasis

Port Macquarie – Hastings Council
Hollow-bearing tree assessment
I GAIPmient: John Dales Drive (road receive - Masters)
Date 20-8-2015 Easting: 152-874938 Northing: -31-954451 Datum 60A
Tree species (if known): Futal with an arrange Alive Dead Score
Tree Nº 13
Height (m): 30 DBH (cm): 73 DBH Score
> 5 2 - 4 0 - 1 Score V / - 5
Hollow Size (variable: 1 or more):
Habitat Proximity:
Longevity:
TOTAL SCORE: 14-5
Evidence of existing use
Recommendation(s):
Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis
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l oft indeque	
Hollow-be	earing tree assessment
LGA/Project: Venn.U.Kit.y.Dl.	
Date49:8:49.5 Easting: 15:4:8.15	47.7 Northing: ->1.4-3454 Datum: G2.A
Tree species (if known): Zucaly Tree No. 15	Alive Dead Score
Height (m): .3.5 DE	BH (cm): DBH Score
Number of visible hollows:	> 5 2 - 4 0 - 1 Score 3
Hollow Size (variable: 1 or more)): >100mm >50mm <50mm Score 2
Habitat Proximity:	In situ < 30m > 30m Score
Longevity:	High Medium Low Score
TOTAL SCORE: 17	
Evidence of existing use	
Recommendation(s):	
Explanatory Notes: Hollow-bearing trees (HBTs) are an in significant factor affecting biodiversity v more quantitative and ecologically m otherwise currently applied. As advoca	mportant element in the Australian landscape and a values. This assessment sheet is intended to provide a eaningful approach to the ranking of HBTs than is ated by Gibbons & Lindenmayer (2002), the emphasis
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Port Macquarie – Hastings Council
Hollow-bearing tree assessment
LGA/Project: John Oxley Drive (road reserve - Masters)
Date29: 8:2015 Easting: 152: 879.853 Northing: 31:454.739. Datum: GDA
Tree species (if known): Un known - Stag Alive Dead Score
Height (m): DBH (cm): DBH Score
> 5 2 - 4 0 - 1 Score Number of visible hollows: 0 0
Hollow Size (variable: 1 or more):
Habitat Proximity:
Longevity:
TOTAL SCORE: 7
Evidence of existing use $\mathcal{N} arrho$
Recommendation(s):
Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis
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Port	Macquari	e – Hast	ings C	ouncil		
ŀ	lollow-beari	ng tree a	ssessme	ent		
LGA/Project: John O	xley Driv	e (rog	d.reser	ve-M	lasters	.)
Date 29: & 2015 Easting	: 152 87474	9 Northir	ng:-31.4	55015	Datum:	GÌA
Tree species (if known) Tree No. 18): Eventyptu	v tiderog	hlaia	Alive D	ead Sco 3	ore
Height (m): .2.9	DBH	(cm): <i>8</i> .	0	DBH Score 1.5		
Number of visible hollo	ws:	> 5	2 - 4	0 -1	Score 3	
Hollow Size (variable: 1	1 or more):	>100n	nm >50	mm <5	0mm Sc	core t
Habitat Proximity:		In situ	< 30m	> 30m	Score 3]
Longevity:		High	Medium	Low	Score 7.5	
TOTAL SCORE:	13					
Evidence of existing us	e No					
Recommendation(s):						
Explanatory Notes: Hollow-bearing trees (HBT: significant factor affecting bi more quantitative and eco otherwise currently applied.	s) are an impo iodiversity value logically mean As advocated	ortant elem es. This ass ingful appr by Gibbon	ent in the sessment s oach to th s & Linder	Australiar sheet is int ne ranking nmayer (20	landscap ended to p of HBTs 002), the e	e and a provide a than is emphasis
						0
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Port Mac	quarie – Hast	ings Co	ouncil		
Hollow	w-bearing tree a	ssessme	ent		
LGA/Project: John Oxley	Drive (roce	1.nesem	e - M	lasters)	
Date 29. 8:2015 Easting: 1.52.	.879.527 Northin	ig:-31-4	5385	Datum: GD	A
Tree species (if known): Ex. Tree No. 20	calyptus pilulai	túr. 🛛	Alive D	ead Score	
Height (m): .30	DBH (cm): ///		DBH Score 3		
Number of visible hollows:	>5	2 - 4	0 -1	Score 3	
Hollow Size (variable: 1 or m	nore):	nm >50r	mm <5	0mm Score 3	-
Habitat Proximity:	In situ	< 30m	> 30m	Score 3	
Longevity:	High	Medium	Low	Score 3	
TOTAL SCORE: 18					
Evidence of existing use	No				
Recommendation(s):					

Explanatory Notes: Hollow-bearing trees (HBTs) are significant factor affecting biodiver more quantitative and ecological otherwise currently applied. As a	an important eleme sity values. This ass lly meaningful appro dvocated by Gibbons	ent in the essments bach to th s & Linden	Australian heet is int e ranking mayer (20	landscape a ended to prov of HBTs th 02), the emp	nd a ide a an is hasis
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	Port Macquarie – Hastings Council					
	Hollow-bearing tree assessment					
	LGA/Project: John Oxley Drive (road reserve - Masters)					
	Date29:8:2015 Easting:152:874.527 Northing:-31:4553:3. Datum: G&A.					
	Tree Nº 23					
	Height (m): <u>15</u> DBH (cm): <u>56</u>					
	Number of visible hollows:					
	Hollow Size (variable: 1 or more):					
	In situ< 30m> 30mScoreV33					
	Longevity:					
	TOTAL SCORE: 10					
	Evidence of existing use Hallow in termitarium					
	Recommendation(s):					
	Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis					
	PORT MACQUARIE HASTINGS					
88-78 8	GEORGEORY GEORGEORY GEOR					

14. Appendix E: Echolocation Analysis Report





Bat Call Analysis Port Macquarie, NSW

This report has been prepared to document the analysis of digital ultrasonic bat echolocation calls received from a third party. The data was not collected by the author and as such no responsibility is taken for the quality of data collection or for the suitability of its subsequent use.

This report was authored by

filler.

Dr Anna McConville PhD, B.Env.Sc.

Job Reference: BC_FF3 30 August 2015

ECH	HO Port Macquarie, NSW
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Table List Figure	3-1: Results of bat call analysis (number of passes per site per night)
Table List Figure Figure	3-1: Results of bat call analysis (number of passes per site per night)



Bat Call Analysis Port Macquarie, NSW

1.0 INTRODUCTION

This report has been commissioned by FloraFauna Consulting to analyse bat echolocation call data (EM3, Wildlife Acoustics) collected from Oxley Hwy, Port Macquarie, NSW. Data was provided electronically to the author. This report documents the methods involved in analysing bat call data and the results obtained only.

2.0 METHODS

The identification of bat echolocation calls recorded during surveys was undertaken using AnalookW (Version 4.1t) software. The identification of calls was undertaken with reference to Pennay *et al.* (2004) and through the comparison of recorded reference calls from north-eastern NSW. Reference calls were obtained from the NSW database and from the authors personal collection.

Each call sequence ('pass') was assigned to one of five categories, according to the confidence with which an identification could be made, being:

- Definite Pass identified to species level and could not be confused with another species
- Probable Pass identified to species level and there is a low chance of confusion with another species
- Possible Pass identified to species level but short duration or poor quality of the pass increases the chance of confusion with another species
- Species group Pass could not be identified to species level and could belong to one of two or more species. Occurs more frequently when passes are short or of poor quality
- Unknown Either background 'noise' files or passes by bats which are too short and/or of poor quality to confidently identify.

Call sequences that were less than three pulses in length were not analysed and were assigned to 'Unknown' and only search phase calls were analysed. Furthermore, some species are difficult to differentiate using bat call analysis due to overlapping call frequencies and similar shape of plotted calls and in these cases calls were assigned to species groups.

The total number of passes (call sequences) per unit per night was tallied to give an index of activity.

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Bat Call Analysis Port Macquarie, NSW

It should be noted that the activity levels recorded at different sites may not be readily able to be compared. Such comparisons are dependent on many variables which need to be carefully controlled during data collection and statistically analysed. Influential variables include wind, rain, temperature, duration of recording, season, detector and microphone sensitivity, detector placement, weather protection devices etc.

2.1 Characteristics Used to Differentiate Species

Miniopterus australis was differentiated from *Vespadelus pumilus*, by characteristic frequency or the presence of a down-sweeping tail on pulses. Call sequences which had a majority of pulses containing an up-sweeping tail were assigned to *Vespadelus pumilus*.

Chalinolobus gouldii was differentiated from other species by the presence of curved, alternating call pulses.

3.0 RESULTS

A total of 73 call sequences were recorded, of which 15 call sequences were able to be analysed (ie were not 'noise' files or bat calls of short length). Of the bat calls, five call sequences (33 %) were able to be confidently identified (those classified as either definite or probable identifications) to species level (Table 3-1). Species recorded confidently within the site include:

Addition	ally, the following bat species potentially of	ccurred within the site, but could no
confiden	tly identified (those calls classified as poss	ible or as a species group):
•	Chalinolobus morio	(Chocolate wattled bat)
•	Falsistrellus tasmaniensis	(Eastern falsistrelle)
•	Mormopterus (Micronomus) norfolkensis	(East coast free-tailed bat)
•	Mormopterus (Ozimops) ridei	(Eastern free-tailed bat)
•	Scoteanax rueppellii	(Greater broad-nosed bat)
•	Scotorepens orion	(Eastern broad-nosed bat)
•	Vespadelus pumilus	(Eastern forest bat)
•	Vespadelus troughtoni	(Eastern cave bat)
•	Vespadelus vulturnus	(Little forest bat)
t should	be noted that additional bat species may	be present within the site but were
ecorded	by the detectors and habitat assessment s	should be used in conjunction with th
esults to	determine the likelihood of occurrence of	other bat species.

Bat Call Analysis

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15. Appendix F: Assessments of Significance

F1.1 Listed Threatened Species

Threatened species listed under the *Threatened Species Conservation Act 1995*, which have been recorded within the default 10 km x 10 km search area around the study area are shown below in Table F.1. Note the list excludes flora species, which have been considered separately under Section 5.2.3 of this report, aquatic avian species as well as all estuarine and marine species of fauna.

Species	Habitat and Distribution	Potential Occurrence
	Amphibia	
<i>Crinia tinnula</i> (Wallum Froglet)	Found in a range of habitats, usually associated with acidic swamps on coastal sand plains	Unlikely
<i>Litoria aurea</i> (Green & Golden Bell Frog)	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.)	Unlikely
Ptilinopus magnificus (Wompoo Fruit-Dove)	Occurs in or near rainforest, low elevation moist eucalypt forest and brush box forests	Unlikely
Lophoictinia isura (Square-tailed Kite)	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses; Is a specialist hunter of passerines; Appears to occupy large hunting ranges of more than 100km2	Possible
Burhinus grallarius (Bush Stone-curlew)	found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania; In the south-east it is either rare or extinct throughout its former range, Inhabits open forests and woodlands with a sparse grassy groundcover and fallen timber	Unlikely
Calyptorhynchus lathami (Glossy Black-Cockatoo)	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of She-oak occur; <i>Allocasuarina littoralis</i> (Black She-oak) and <i>A.</i> <i>torulosa</i> (Forest Oak) are important food sources	Possible
<i>Glossopsitta pusilla</i> (Little Lorikeet)	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland; Hunting can extend in to closed forest and more open areas; Roost in shaded portions of tree canopies; Nests in hollows of large, old trees	Possible
<i>Ninox strenua</i> (Powerful Owl)	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest; Roosts by day in dense vegetation; Nest in large tree hollows	Possible
<i>Tyto longimembris</i> (Eastern Grass Owl)	Found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains	Unlikely
Tyto novaehollandiae (Masked Owl)	Lives in dry eucalypt forests and woodlands from sea level to 1100 metres; A forest owl, but often hunts along the edges of forests, including roadsides; Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting	Possible

Anthochaera phrygia (Regent Honeyeater)	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak	Unlikely
Daphoenositta chrysoptera (Varied Sittella)	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and <i>Acacia</i> woodland	Possible
<i>Coracina lineata</i> (Barred Cuckoo-shrike)	Found in coastal eastern Australia from Cape York to the Manning River in NSW; Generally uncommon in their range and are rare in NSW; Rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses	Possible
	Mammalia	
Dasyurus maculatus (Spotted-tailed Quoll)	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest; Individual animals use hollow- bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites	Possible
Phascogale tapoatafa (Brush-tailed Phascogale)	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter; Also inhabit heath, swamps, rainforest and wet sclerophyll forest; Agile climber foraging preferentially in rough barked trees of 25 cm DBH or greater	Possible
Planigale maculata (Common Planigale)	inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water; A fierce carnivorous hunters and agile climbers, preying on insects and small vertebrate	Possible
Phascolarctos cinereus (Koala)	Inhabit eucalypt woodlands and forests; Feed on the foliage of more than 70 eucalypt species and 30 non- eucalypt species, but in any one area will select preferred browse species	Possible
<i>Petaurus australis</i> (Yellow-bellied Glider)	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils; Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein; Den, often in family groups, in hollows of large trees	Possible
<i>Petaurus norfolcensis</i> (Squirrel Glider)	Inhabits dry sclerophyll forest and woodland, generally absent from rainforest and closed forest; Recorded in a range of vegetation communities, including Blackbutt, Forest Red Gum and Red Bloodwood forests, Coastal Banksia heathland and Grey Gum/Spotted Gum/ Grey Ironbark dry hardwood forests of the Central NSW Coast	Possible
Pteropus poliocephalus (Grey-headed Flying-fox)	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops	Possible
<i>Saccolaimus flaviventris</i> (Yellow-bellied Sheathtail- bat)	Roosts singly or in groups of up to six, in tree hollows and buildings; Forages in most habitats across its very wide range, with and without trees	Possible

<i>Mormopterus norfolkensis</i> (Eastern Freetail-bat)	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range; Roost mainly in tree hollows but will also roost under bark or in man-made structures	Possible
Chalinolobus nigrogriseus (Hoary Wattled Bat)	Occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and Ironbark, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common	Possible
Falsistrellus tasmaniensis (Eastern False Pipistrelle)	Prefers moist habitats, with trees taller than 20 metres; Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings	Possible
<i>Kerivoula papuensis</i> (Golden-tipped Bat)	Found in rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, <i>Casuarina</i> -dominated riparian forest and coastal <i>Melaleuca</i> forests	Possible
Miniopterus australis (Little Bentwing-bat)	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub; Usually in well- timbered areas; Roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings	Possible
Miniopterus schreibersii (Eastern Bentwing-bat)	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures; Hunts in forested areas	Possible
<i>Myotis macropus</i> (Southern Myotis)	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, and stormwater channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface	Unlikely
<i>Scoteanax rueppellii</i> (Greater Broad-nosed Bat)	Commonly found in tall wet forest but utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest; Usually roosts in tree hollows but it has also been found in buildings	Possible
<i>Vespadelus troughtoni</i> (Eastern Cave Bat)	Very little is known about the biology of this uncommon species; Cave-roosting species that is usually found in dry open forest and woodland	Possible
<i>Pseudomys gracilicaudatus</i> (Eastern Chestnut Mouse)	Mostly found, in low numbers, in heathland (usually dense, wet heath and swamps); Optimal habitat appears to be regenerating heathland burnt from 18 months to four years previously	Unlikely

Table F.1: Threatened	I species listed	I under the TSC Act
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The list of threatened species returned in the EPBC Act Protected Matters Report where the species or the species habitat is known to occur within the area (10 km buffer around the subject site) is provided below in Table F.2. Note: excludes flora species, which have been considered separately under Section 5.2.3 of this report, aquatic avian species as well as all estuarine and marine species of fauna

Species	Habitat and Distribution	Potential Occurrence
	Amphibia	
<i>Mixophyes iterates</i> (Giant Barred Frog)	Found along freshwater streams with permanent or semi-permanent water, generally (but not always) at lower elevation; Moist riparian habitats such as rainforest or wet sclerophyll forest are favoured for the deep leaf litter that they provide for shelter and foraging, as well as open perching sites on the forest floor	Unlikely
<i>Litoria aurea</i> (Green & Golden Bell Frog)	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.)	Unlikely
	Aves	
Botaurus poiciloptilus (Australasian Bittern)	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha</i> spp.) and spikerushes (<i>Eleocharis</i> spp.)	Unlikely
Dasyornis brachypterus (Eastern Bristlebird)	Currently confined to three disjoint areas of south- eastern Australia including the NSW/Queensland border, the Illawarra and the NSW/Victorian border; Favours dense low vegetation	Unlikely
Anthochaera phrygia (Regent Honeyeater)	In NSW, the Regent Honeyeater has an area of occupancy of less than 200 km ² (NSW SC 2010) and is now largely absent from many areas where it was formerly recorded. This is most notably the Riverina and South-West Slopes, but also in many areas of the Central-West and North-West Slopes, and on the Central Coast around Sydney; Mostly occur in dry Box-Ironbark eucalypt woodland and dry sclerophyll forest associations in areas of low to moderate relief, wherein they prefer moister, more fertile sites available	Unlikely
Lathamus discolor (Swift Parrot)	Endemic to south-eastern Australia, breeds only in Tasmania and migrates to mainland Australia in autumn; Key habitats for the species on the coast and coastal plains of New South Wales include <i>Corymbia maculata</i> (Spotted Gum), <i>Eucalyptus robusta</i> (Swamp Mahogany), <i>Eucalyptus gummifera</i> (Red Bloodwood) and <i>Eucalyptus tereticornis</i> (Forest Red Gum) forests	Possible
Rostratula australis (Australian Painted Snipe)	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire	Unlikely

Mammalia			
Dasyurus maculatus (Spotted-tailed Quoll)	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest; Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites	Possible	
<i>Pseudomys novaehollandiae</i> (New Holland Mouse)	The species is now largely restricted to the coast of central and northern NSW; Deeper top soils and softer substrates being preferred for digging burrows; Inhabit open heathland, open woodland with a heathland understorey and vegetated sand dunes	Unlikely	
Phascolarctos cinereus (Koala)	Inhabit eucalypt woodlands and forests; Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species	Possible	
Pteropus poliocephalus (Grey-headed Flying-fox)	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops	Possible	
Chalinolobus dwyeri (Large-eared Pied Bat)	The species current distribution is poorly known; Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle- shaped mud nests of the Fairy Martin; Found in well-timbered areas containing gullies	Unlikely	

Table E.2: Threatened species returned in the Protected Matters Search Tool Report

F1.2 Threatened Species for Consideration

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 study area constitutes potential habitat for the following twenty-five (25) threatened species (Table F.3). Note: Threatened species of flora have also been considered separately under Section 5.4.

Family	Scientific Name	Common Name		
Aves				
Accipitridae	Lophoictinia isura	Square-tailed Kite		
Cacatuidae	Calyptorhynchus lathami	Glossy Black-Cockatoo		
Psittacidae	Glossopsitta pusilla	Little Lorikeet		
	Lathamus discolor	Swift Parrot		
Strigidae	Ninox strenua	Powerful Owl		
Tytonidae	Tyto novaehollandiae	Masked Owl		
	Tyto tenebricosa	Sooty Owl		
Neosittidae	Daphoenositta chrysoptera	Varied Sittella		
Campephagidae	Coracina lineata	Barred Cuckoo-shrike		
	Mammalia			
Dasyuridae	Dasyurus maculatus	Spotted-tailed Quoll		
	Phascogale tapoatafa	Brush-tailed Phascogale		
	Planigale maculata	Common Planigale		
Phascolarctidae	Phascolarctos cinereus	Koala		
Petauridae	Petaurus australis	Yellow-bellied Glider		
	Petauris norfolcensis	Squirrel Glider		
Pteropodidae	Pteropus polioephalus	Grey-headed Flying-fox		
Emballonuridae	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat		
Molossidae	Mormopterus norfolkensis	Eastern Freetail Bat		
Vespertilionidae	Chalinolobus nigrogriseus	Hoary Wattled Bat		
	Falsistrellus tasmaniensis	Eastern False Pipistrelle		
	Kerivoula papuensis	Golden-tipped Bat		
	Miniopterus australis	Little Bentwing-bat		
	Miniopterus schreibersii	Eastern Bentwing-bat		
	Scoteanax rueppellii	Greater Broad-nosed Bat		
	Vespadelus troughtoni	Eastern Cave Bat		

Table F.3: Subject species for Section 5A Assessment (see key below for listings)

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:

Aves

Square-tailed Kite (Lophoictinia isura)

The Square-tailed Kite is a medium sized long-winged raptor with a square tail and upturned wings when in flight. Adults have a white face with thick black streaks on the crown and finer streaks elsewhere. The saddle, rump and central upper tail-coverts are blackish with grey-brown barring. The underparts are predominately grey-brown with black tips on the grey tail and wings. There is an obscure bullseye on the wings and when sitting the legs are barely visible. The species is usually silent; however it may utter a hoarse or plaintiff yelp and a weak twitter near its nest.

The species is found in a variety of habitats including open forest, and shows a particular preference for timbered watercourses. The species is a specialist hunter of passerine birds, especially honeyeaters and appears to occupy large hunting ranges of more than 100 km². Nesting occurs between July and October, with birds constructing a large stick nest lined with eucalypt leaves generally located on a large horizontal branch of a eucalypt 12-26 metres above the ground.

The Square-tailed Kite is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated sixteen (16) records of the species within a 10 km x 10 km search area around the study area.

There is limited foraging habitat available to this species within the study area and it is unlikely 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.

Glossy Black-cockatoo (Calyptorhynchus lathami)

The Glossy Black-cockatoo is a dusky-brown to black cockatoo with a large bulbous bill and a broad red band through the tail. The red in the tail is barred black and edged with yellow. The female usually has irregular pale-yellow markings on the head and neck with yellow flecks on the underparts and underwing. The species is usually seen in pairs or small groups feeding favoured *Allocasuarina spp.* and *Casuarina spp.*

The species is uncommon although widespread throughout suitable forest and woodland habitats. As the Glossy Black-cockatoo feeds almost exclusively on the seeds of several species of *Casuarina* and *Allocasuarina* (particularly *A. littoralis, A. torulosa* and *C. verticillata*), the primary habitat requirements include a good supply of the fruit of these species together with large hollow-bearing eucalypts for nest sites.

The Glossy Black-cockatoo is listed as vulnerable in NSW under the *Threatened* Species Conservation Act 1995 and the South Australian sub-species is listed as endangered nationally under the *Environment Protection and Biodiversity*

Conservation Act 1999. The Atlas of NSW Wildlife database search indicated twentythree (23) records of the species within 10 km of the study area. The species was not recorded during the diurnal bird survey and other evidence such as feeding signs were not observed within the study area.

There is limited foraging habitat available to this species within the study area and it is unlikely 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.

Little Lorikeet (Glossopsitta pusilla)

The Little Lorikeet is a small bright green parrot, with a red face and black bill. It is a difficult bird to observe in its natural surrounding high in the canopy due to its small size and colour. The species usually keeps in small groups, often in company with other species of lorikeets. The species forages primarily in the canopy of eucalypt forest and woodland, feeding on nectar, pollen and occasionally native fruits such as Mistletoe. Riparian habitats are particularly favoured due to higher soil fertility and greater productivity. The Little Lorikeet roosts in treetops, which may be distant from feeding areas and nests in tree hollows in proximity of feeding areas if possible. Hollows in the branches and trunks of smooth-barked eucalypts are favoured nesting sites of the species.

The Little Lorikeet is distributed widely across eastern Australia from Cape York to South Australia. NSW provides a large portion of the species core habitat. Nomadic movements are common, influenced by season and food availability. The Little Lorikeet is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995*. The Atlas of NSW Wildlife database search indicated eight (8) record of the species within 10 km of the study area.

There is limited foraging habitat available to this species within the study area and it is unlikely 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.

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 no records of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the study area.

There is limited foraging habitat available to this species within the study area and it is unlikely 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.

Powerful Owl (Ninox strenua)

The Powerful Owl is a typical hawk-owl and the largest owl in Australasia. The sexes are similar with the male being larger. It has large orange-yellow eyes and no facial disc. Adults are 60-65 cm long and have a wingspan of up to 140 cm. The upper parts of the Powerful Owl are dark, greyish-brown barred with white and pale brown while the throat and underparts are cream or pale-buff barred with grey-brown chevron-shaped markings.

The species is a shy bird that lives in pairs and keeps to large permanent territories of 800-1000 ha. The habitat includes a range of vegetation types including woodland and open forest as well as tall open forest and rainforest. The main prey is medium-sized arboreal mammals such as the Greater Glider, Common Ringtail Possum and Sugar Glider. Birds roost by day in dense vegetation comprising various eucalypt species' as well as other species such as Turpentine (*Syncarpia glomulifera*), Black She-oak (*Allocasuarina littoralis*) and Blackwood (*Acacia melanoxylon*). Large tree hollows, at least half a metre deep in large eucalypts with a diameter at breast height (DBH) of 80-240 cm is required for nesting.

The Powerful Owl is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated five (5) records of the species within a $10 \text{ km} \times 10 \text{ km}$ search area around the study area.

There is limited foraging habitat and some potential roosting habitat and nesting sites available to this species within the study area. The site adjoins existing residential development and a busy road that has a significant volume of traffic and associated street lighting, which are likely to discourage the species from utilising the habitat. As the proposed development footprint within the road reserve is relatively small in scale and the site is generally compromised 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.

Masked Owl (Tyto novaehollandiae)

The Masked Owl is a medium-sized owl up to 40-50 cm long with dark eyes set in a prominent flat facial disc that is encircled by a dark border. There are several colour forms of the species with a wide variation in plumage. The upper parts are grey to dark brown with buff to rufous mottling and fine, pale spots. The wings and tail are prominently barred. The underparts are white to rufous-brown with variable dark spotting.

The species range extends across NSW from the coast to the western plains and inhabits dry sclerophyll forest and woodland. Although it is considered a forest owl, the species often hunts along the edges of forest, including roadsides, with the diet consisting of arboreal and terrestrial mammals, especially rats. Pairs occupy territories of 500-1000 hectares. The Masked Owl roosts in big hollows in trees, crevices in cliffs and sometimes caves, but rarely heavy foliage like the *Ninox* owls. Large tree hollows are required for nesting.

The Masked Owl is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated seven (7) records of the species within a 10 km x 10 km search area around the study area.

There is limited foraging habitat and some potential roosting habitat and nesting sites available to this species within the study area. The site adjoins existing residential development and a busy road that has a significant volume of traffic and associated street lighting, which are likely to discourage the species from utilising the habitat. As the proposed development footprint within the road reserve is relatively small in scale and the site is generally compromised 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.

Varied Sittella (Daphoenositta chrysoptera)

The Varied Sittella is a small songbird that grows to a length of 10-12 cm. It has a sharp, slightly upturned bill, short tail, barred under-tail, and yellow eyes and feet. In flight, the white rump and the pale orange wing bar are prominent. In NSW most individuals have a grey head and are streaked with dark brown, but in the extreme north-east they have a white head, and in the extreme south-west a black cap. The species is sedentary and inhabits most of mainland Australia except the treeless arid zone and open grasslands.

The Varied Sittella inhabits eucalypt forest and woodland, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. The species actively forages for food, typically climbing down the trunks of trees head first, and moving over branches in a characteristic zigzag fashion leaning over and peering to one side then the next. Food consists of arthropods taken from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches in the canopy. The species builds a cup shaped nest in an upright fork high in the living canopy. The species population in NSW is uncertain, but is believed to have undergone a moderate reduction over the past several years.

The Varied Sittella is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated seventeen (17) records of the species within a 10 km x 10 km search area around the study area.

There is limited foraging habitat and some potential nesting sites available to this species in the canopy of the study and it is unlikely 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.

Barred Cuckoo-shrike (Coracina lineata)

The Barred Cuckoo-shrike is a medium-sized bird to 25 cm inn length. It is dark grey above and under the chin, with a front barred with strong horizontal stripes of white and very dark grey. There is a darker stripe that runs from the base of the bill through the pale yellow eye. The species is distributed across coastal eastern Australia from Cape York to the Manning River in NSW. The Barred Cuckoo-shrike is generally uncommon in its range, and is rare in NSW. It is found in rainforest, eucalypt forest and woodland, clearings in secondary growth, swamp woodland and riparian corridors along watercourses. The species is usually seen in pairs or small flocks foraging among foliage of trees for insects and fruit.

The Barred Cuckoo-shrike is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated three (3) records of the species within a 10 km x 10 km search area around the study area.

There is limited foraging habitat and some potential nesting sites available to this species in the canopy of the study area. As the proposed development is relatively small in scale and contains only limited resources 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.* The Atlas of NSW Wildlife database search indicated seven (7) records of the species within a 10 km x 10 km search area around the study area.

Limited foraging habitat is available to this species within the study area. There is limited foraging habitat and some potential denning opportunities available to this species within the study area. The site adjoins existing residential development and a busy road that has a significant volume of traffic and associated street lighting, which are likely to discourage the species from utilising the habitat. As the proposed development footprint within the road reserve is relatively small in scale and the site is generally compromised 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.

Brush-tailed Phascogale (Phascogale tapoatafa)

The Brush-tailed Phascogale is an arboreal marsupial carnivore with a characteristic black, bushy tail. The species has a patchy distribution around the coast of Australia with the highest frequency occurring in forest on the Great Dividing Range in the north-east and south-east of the State.

The Brush-tailed Phascogale has a preference for dry sclerophyll open forest with sparse ground cover of herbs, grasses, shrubs or leaf litter and also rough-barked trees of 25cm DBH or greater. However, it is known to inhabit heath, swamps, rainforest and wet sclerophyll forest as well. The species uses tree hollows with entrances between 2.5 cm and 4 cm for nesting and shelter, and feed mostly on arthropods as well as other invertebrates and nectar. Females occupy exclusive territories of approximately 20-60 hectares and males have overlapping territories of up to 100 hectares.

The Brush-tailed Phascogale is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated two (2) records of the species within a 10 km x 10 km search area around the study area.

Limited foraging habitat is available to this species within the study area. There is limited foraging habitat and some potential denning opportunities available to this species within the study area. The site adjoins existing residential development and a busy road that has a significant volume of traffic and associated street lighting, which are likely to discourage the species from utilising the habitat. As the proposed development footprint within the road reserve is relatively small in scale and the site is generally compromised 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.

Common Planigale (Planigale maculata)

The Common Planigale is a small marsupial with a body length of 70-95 mm and a long tail more or less equal to the body length. The head is flattened but less so than in other species of Planigale. The species is uniform rufous-brown above, sometimes with small dull spots, rarely with bold white spots, and cinnamon wash to the flanks and lower face. The underparts are pale yellowish-grey, being most yellow on chin and throat.

The species occurs in a variety of habitats across its range, which includes the Kimberley of Western Australia, Arnhem Land in the Northern Territory and along the east coast from Cape York in the north to the Hunter River in NSW. On the east coast the species occurs in rainforest and sclerophyll forest. It is active at night and during the day shelters in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks. The species is a fierce carnivorous hunter and agile climber, preying on insects and small vertebrates, some nearly its own size. Breeding occurs from October to January. The female builds a nest lined with grass, eucalypt leaves or shredded bark.

The Common Planigale is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated three (3) records of the species within 10 km of the study area.

Limited foraging habitat is available to this species within the study area. There is limited foraging habitat and some potential denning opportunities available to this species within the study area. The site adjoins existing residential development and a busy road that has a significant volume of traffic and associated street lighting, which are likely to discourage the species from utilising the habitat. As the proposed development footprint within the road reserve is relatively small in scale and the site is generally compromised 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.

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 inhabitants 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.* The Atlas of NSW Wildlife database search indicated 981 records of the species within a 10 km x 10 km search area around the study area.

Two species listed on Schedule 2 of SEPP 44 including *Eucalyptus microcorys* (Tallowwood) and *Eucalyptus tereticornis* (Forest Red Gum) were recorded within the study area and within the adjacent habitat located within the road reserve. These species comprised more than 15 % of the total number of trees in the upper or lower strata of the tree component within the habitat, therefore the habitat satisfies the criteria for 'Potential Koala Habitat' for the purposes of SEPP 44.

Two relatively old Koala scats were observed at the base of a tree within the study area. The tree was identified as *Eucalyptus microcorys* (Tallowwood). There was also disturbance of bark on the trunks of several trees within the study area, which were consistent with the types of marks produced by the claws of Koalas when climbing trees. This was evident mostly on the trunks of some individuals of *Eucalyptus microcorys* (Tallowwood). Given the evidence recorded during the Koala survey there seems little doubt that the species utilises the habitat within the study area. The habitat within the study area and adjacent land within the road reserve comprises a relatively narrow strip of remnant vegetation that essentially runs through a developed residential and commercial landscape. There are food resources available to the Koala within the road reserve, however due to its narrow linear shape and position in the landscape these food resources are limited in any one part of the road reserve. Therefore, it is unlikely that a population of the Koala could rely on these food resources over a sustained period.

Aerial imagery indicates that the remnant vegetation within the John Oxley Drive road reserve forms part of an extensive vegetated corridor that provides connectivity between areas of Koala habitat to the north, east and south. This is likely to be important in providing a means by which Koalas are able to move between areas of otherwise disjunct habitat through the developed landscape. In this context the habitat within the study area is likely to be important to the species survival and likely constitutes part of a wider area of core Koala habitat.

The footprint of the upgrade work within the road reserve occupies approximately 2,500 m² of land in which all the vegetation will be removed. This represents a relatively small part of the remnant vegetation within the road reserve. In addition, it is unlikely that the functioning of the remnant vegetation within the road reserve as a wildlife corridor will be significantly affected by the proposed works. An off-site offset planting strategy is also proposed to mitigate removal of Koala food trees and a Koala Plan of Management is also proposed that will incorporate suitable fencing to reduce the risk of vehicle strike on Koalas in the vicinity of the development site. 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.

Yellow-bellied Glider (Petaurus australis)

The Yellow-bellied Glider is a large, active, sociable and vocal glider. Adults weigh 450 - 700 grams and have a head and body length of about 30 cm with a large bushy tail that is about 45 cm long. The species has grey to brown fur above with a cream to yellow belly, which is paler in young animals. The dark stripe down the back is characteristic of the group. It has a large gliding membrane that extends from the wrist to the ankle. It has a loud, distinctive call, beginning with a high-pitched shriek and subsiding into a throaty rattle.

The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. The species occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane

forests in the south. The Yellow-bellied Glider feeds primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. It extracts sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. The species lives in small family groups of 2-6 individuals and are nocturnal and usually den in family groups, in hollows of large living trees. The species is very mobile and occupy large exclusive home ranges of 20 - 85 hectares to encompass dispersed and seasonally variable food resources.

The Yellow-bellied Glider is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated that fife (15) records of the species within a 10 km x 10 km search area around the study area including some in the immediate vicinity of the site.

Limited foraging habitat is available to this species within the study area. There is limited foraging habitat and some potential denning opportunities available to this species within the study area. The site adjoins existing residential development and a busy road that has a significant volume of traffic and associated street lighting, which are likely to discourage the species from utilising the habitat. As the proposed development footprint within the road reserve is relatively small in scale and the site is generally compromised 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.

Squirrel Glider (Petaurus norfolcensis)

The Squirrel Glider is widely, though sparsely, distributed in eastern Australia from northern Queensland to western Victoria. West of the Great Dividing Range, the Squirrel Glider inhabits mature or old growth Box, Box-Ironbark and River Red Gum forest, while in coastal areas the species inhabits Blackbutt-Bloodwood forest with heath understorey, with a preference for mixed species stands having a shrub or Acacia mid-storey. Squirrel gliders live in family groups of a single male, one or more adult females and their offspring. The diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein. Abundant tree hollows are required for refuge and nest sites. Evidence of gliders utilising the site for foraging purposes was not observed during the site survey.

The Squirrel Glider is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated twenty-one (21) records of the species within a 10 km x 10 km search area around the study area.

There is limited foraging habitat and potential roosting habitat available to this species within the study area. The site adjoins existing residential development and a busy road that has a significant volume of traffic and associated street lighting, which are likely to discourage the species from utilising the habitat. Thirteen (13) hollow-bearing trees are likely to be removed from within the study area to facilitate the necessary upgrading of the John Oxley Drive road reserve. The footprint of the proposed works

within the road reserve is relatively small (approximately 2,500 m²) and an offsite nest box strategy is proposed to mitigate the removal of the hollow-bearing trees. 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.

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 50 km 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*. The Atlas of NSW Wildlife database search indicated seventy-seven (77) records of the species within a 10 km x 10 km search area around the study area.

This species could potentially use the habitat within the study area for foraging when the remnant trees in the canopy are flowering. Grey-headed Flying-foxes congregate in large numbers at roosting sites (camps) that may be found in rainforest patches, Melaleuca stands, mangroves, riparian woodland or modified vegetation in urban areas. However, there were no signs of a camp within the site. As the proposed development is relatively small in scale and the site contains limited resources 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.

Yellow-bellied Sheathtail-bat (Saccolaimus flaviventris)

The Yellow-bellied Sheathtail-bat is a very distinctive, large insectivorous Bat that reaches 87 mm in length. It has long, narrow wings, a glossy jet-black back, and a white to yellow belly extending to the shoulders and just behind the ear. Characteristically, it has a flattened head and a sharply-pointed muzzle. The tail is covered with an extremely elastic sheath that allows variation in the tail-membrane area. Males have a prominent throat pouch, while females have a patch of bare skin in the same place.

The species is widely distributed across northern and eastern Australia. In the most southerly part of its range most of Victoria, south-western NSW and South Australia) it is a rare visitor in late summer and autumn. It roosts singly or in groups up to six, in tree hollows and buildings. In treeless areas the species is known to utilise mammal burrows. The species forages in most habitats for insects flying high and fast over the forest canopy.

The Yellow-bellied Sheathtail-bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* There was one record of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the study area.

This species utilises a wide range of habitats for foraging and roosts. There is limited foraging habitat and potential roosting habitat available to this species within the study area. Thirteen (13) hollow-bearing trees are likely to be removed from within the study area to facilitate the necessary upgrading of the John Oxley Drive road reserve. The footprint of the proposed works within the road reserve is relatively small (approximately 2,500 m²) and an offsite nest box strategy is proposed to mitigate the removal of the hollow-bearing trees. 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.

Eastern Freetail-bat (Mormopterus norfolkensis)

The Eastern Freetail-bat is uniformly rich brown in colour, has a body length of 50-55 mm, a tail length of 35-45 mm and weighs 7-10 grams. The species habitat is poorly known but is believed to occur in a variety of habitats including wet sclerophyll forest, dry sclerophyll forest and woodland east of the Great Dividing Range. The species is believed to be solitary, feeding mostly on insects and roosting mainly in tree hollows.

The Eastern Freetail-bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated four (4) records of the species within a 10 km x 10 km search area around the study area. This species was also recorded (without confidence) during the ultrasonic echolocation detection survey.

There is limited foraging habitat and potential roosting habitat available to this species within the study area. Thirteen (13) hollow-bearing trees are likely to be removed from within the study area to facilitate the necessary upgrading of the John Oxley Drive road reserve. The footprint of the proposed works within the road reserve is relatively small (approximately 2,500 m²) and an offsite nest box strategy is proposed to mitigate the removal of the hollow-bearing trees. 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.

Hoary Wattled Bat (Chalinolobus nigrogriseus)

The Hoary Wattled Bat is a small Bat with dark grey to black fur on the back and greyish brown on the belly with a frosting of white tips to the hairs giving a hoary appearance. The lobe at the corner of the mouth is poorly developed and the secondary lobe is reduce to ta thin ribbon of skin along the lower lip. The species inhabits forests, favouring those dominated by Spotted Gum, boxes and Ironbark, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common. The Hoary Wattled Bat roosts in tree hollows and occasionally is found in rock crevices, and will occupy urban areas with suitable habitat.

The Hoary Wattled Bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated four (4) records of the species within a 10 km x 10 km search area around the study area.

There is limited foraging habitat and potential roosting habitat available to this species within the study area. Thirteen (13) hollow-bearing trees are likely to be removed from within the study area to facilitate the necessary upgrading of the John Oxley Drive road reserve. The footprint of the proposed works within the road reserve is relatively small (approximately 2,500 m²) and an offsite nest box strategy is proposed to mitigate the removal of the hollow-bearing trees. 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.

Eastern False Pipistrelle (Falsistrellus tasmaniensis)

The Eastern False Pipistrelle is a relatively large and robust insectivorous bat. The fur of the upper parts is uniformly reddish brown and the fur of the underparts is paler. The face forward of and including the ears is naked and pale brown, while the skin of the flight membranes, lips, forearms and feet is blackish. The ears are long, narrow with rounded tips and there is a distinct notch on the upper rear margin.

The species occurs in tall forest on the southeast coast and ranges from southern Queensland to Victoria and Tasmania. It prefers moist habitats, with trees taller than 20 m and generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. The species hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. It hibernates in winter.

The Eastern False Pipistrelle is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* There was one record of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the study area. This species was also recorded (without confidence) during the ultrasonic echolocation detection survey.

There is limited foraging habitat and potential roosting habitat available to this species within the study area. Thirteen (13) hollow-bearing trees are likely to be removed from within the study area to facilitate the necessary upgrading of the John Oxley Drive road reserve. The footprint of the proposed works within the road reserve is relatively small (approximately 2,500 m²) and an offsite nest box strategy is proposed to mitigate the removal of the hollow-bearing trees. 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.

Golden-tipped Bat (Kerivoula papuensis)

The Golden-tipped Bat has dark brown, curly fur with bright golden tips that extends along the wings, legs and tail. It has a short, pointed, over-hanging muzzle and pointy, funnel-shaped ears. Adults weigh about 6 grams and have a wingspan of about 25 cm.

The Golden-tipped Bat is distributed along the east coast of Australia in scattered locations from Cape York Peninsula in Queensland to south of Eden in southern NSW

and also occurs in New Guinea. The species is found in rainforest and adjacent wet and dry sclerophyll forest up to 1000 metres. It is also recorded in tall open forest, *Casuarina*-dominated riparian forest and coastal *Melaleuca* forests. It roosts mainly in abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests, as well as in tree hollows, dense foliage and epiphytes; located in rainforest gullies on small first- and second-order streams. The species will fly up to two kilometres from roosts to forage in rainforest and sclerophyll forest on mid and upper-slopes, where it feeds on small web-building spiders.

The Golden-tipped Bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated one (1) record of the species within 10 km of the study area.

There is limited foraging habitat and potential roosting habitat available to this species within the study area. Thirteen (13) hollow-bearing trees are likely to be removed from within the study area to facilitate the necessary upgrading of the John Oxley Drive road reserve. The footprint of the proposed works within the road reserve is relatively small (approximately 2,500 m²) and an offsite nest box strategy is proposed to mitigate the removal of the hollow-bearing trees. 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.

Little Bentwing-bat (Minopterus Australia)

The Little Bentwing-bat occurs along the east coast of Australia from north-eastern Queensland to the central coast of New South Wales. The species mainly forages for insects between the canopy and understorey of well-timbered habitats including wet and dry sclerophyll forest, woodland, rainforest and coastal swamp forest. The Little Bentwing-bat is regarded as a cave-obligate species that roosts by day in caves, tunnels and mine shafts. Maternity colonies are formed during summer in roost sites with high humidity, which are often shared with the Eastern Bentwing-bat.

The Little Bentwing-bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated twenty-eight (28) records of the species within a 10 km x 10 km search area around the study area. This species was also recorded (with confidence) during the ultrasonic echolocation detection survey.

This species forages across a wide range of habitats but requires caves, tunnels and mine shafts for roosting. As these types of habitat features are not present within the study area it is unlikely that the species could utilise the habitat for roosting or shelter. There is limited suitable foraging habitat within the study area. The proposed development is relatively small in scale and the majority of the habitat within the road reserve will remain unchanged from its present state. 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.

Eastern Bentwing-bat (Minopterus schreibersii)

The Eastern Bentwing-bat occurs in eastern Australia from north Queensland to southeastern South Australia. In New South Wales, the species is found along the coast and western slopes including high elevations of the Great Dividing Range. The Eastern Bentwing-bat forages for insects mainly above the tree canopy in a range of timbered habitats including rainforest, coastal swamp forest, heathland, woodland and sclerophyll forest. The species is regarded as a cave-obligate, roosting in caves, tunnels, mine shafts and closed stormwater drains.

The Eastern Bentwing-bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated twelve (12) records of the species within a 10 km x 10 km search area around the study area.

This species forages across a wide range of habitats but requires caves, tunnels and mine shafts for roosting. As these types of habitat features are not present within the study area it is unlikely that the species could utilise the habitat for roosting or shelter. There is limited suitable foraging habitat within the study area. The proposed development is relatively small in scale and the majority of the habitat within the road reserve will remain unchanged from its present state. 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.

Greater Broad-nosed Bat (Scoteanax rueppellii)

The Greater Broad-nosed Bat is a large robust bat with a broad head and short, squarish muzzle. The ears are widely spaced, short and have a rounded apex with a concave rear edge immediately below the apex. The upper parts vary from mid-brown to dark cinnamon-brown and the underparts are tawny-olive in colour.

The species occurs in a range of habitats including cleared grazing land, heathland, coastal swamp forest, woodland, rainforest as well as wet sclerophyll forest and dry sclerophyll forest. The species usually roosts in tree hollows and forages after sunset, flying slowly along watercourses at an altitude of 3 metres to 6 metres.

The Greater Broad-nosed Bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated that nine (9) records of the species within a 10 km x 10 km search area around the study area. This species was also recorded (without confidence) during the ultrasonic echolocation detection survey.

There is limited foraging habitat and potential roosting habitat available to this species within the study area. Thirteen (13) hollow-bearing trees are likely to be removed from within the study area to facilitate the necessary upgrading of the John Oxley Drive road reserve. The footprint of the proposed works within the road reserve is relatively small (approximately 2,500 m²) and an offsite nest box strategy is proposed to mitigate the removal of the hollow-bearing trees. 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.
Eastern Cave Bat (Vespadelus troughtoni)

This species remains one of the least known members of its genus in eastern Australia. It is a cave-dweller, known to occur in drier forest and tropical woodland from the coast and Dividing Range to the semi-arid zone. It has been found roosting in small groups in sandstone overhangs, mine shafts and occasionally in buildings.

The Eastern Cave Bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995.* The Atlas of NSW Wildlife database search indicated four (4) record of the species within a 10 km x 10 km search area around the study area. This species was also recorded (without confidence) during the ultrasonic echolocation detection survey.

This species forages across a wide range of habitats but requires caves, tunnels and mine shafts for roosting. As these types of habitat features are not present within the study area it is unlikely that the species could utilise the habitat for roosting or shelter. There is limited suitable foraging habitat within the study area. The proposed development is relatively small in scale and the majority of the habitat within the road reserve will remain unchanged from its present state. 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.

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.

Two species listed on Schedule 2 of SEPP 44 including *Eucalyptus microcorys* (Tallowwood) and *Eucalyptus tereticornis* (Forest Red Gum) were recorded within the study area and within the adjacent habitat located within the road reserve. These species comprised more than 15 % of the total number of trees in the upper or lower strata of the tree component within the habitat, therefore the habitat satisfies the criteria for 'Potential Koala Habitat' for the purposes of SEPP 44.

Two relatively old Koala scats were observed at the base of a tree within the study area. The tree was identified as *Eucalyptus microcorys* (Tallowwood). There was also disturbance of bark on the trunks of several trees within the study area, which were consistent with the types of marks produced by the claws of Koalas when climbing trees. This was evident mostly on the trunks of some individuals of *Eucalyptus microcorys* (Tallowwood). Given the evidence recorded during the Koala survey there seems little doubt that the species utilises the habitat within the study area. The habitat within the study area and adjacent land within the road reserve comprises a relatively

narrow strip of remnant vegetation that essentially runs through a developed residential and commercial landscape. There are food resources available to the Koala within the road reserve, however due to its narrow linear shape and position in the landscape these food resources are limited in any one part of the road reserve. Therefore, it is unlikely that a population of the Koala could rely on these food resources over a sustained period.

Aerial imagery indicates that the remnant vegetation within the John Oxley Drive road reserve forms part of an extensive vegetated corridor that provides connectivity between areas of Koala habitat to the north, east and south. This is likely to be important in providing a means by which Koalas are able to move between areas of otherwise disjunct habitat through the developed landscape. In this context the habitat within the study area is likely to be important to the species survival and likely constitutes part of a wider area of core Koala habitat.

The footprint of the upgrade work within the road reserve occupies approximately 2,500 m² of land in which all the vegetation will be removed. This represents a relatively small part of the remnant vegetation within the road reserve. In addition, it is unlikely that the functioning of the remnant vegetation within the road reserve as a wildlife corridor will be significantly affected by the proposed works. An off-site offset planting strategy is also proposed to mitigate removal of Koala food trees and a Koala Plan of Management is also proposed that will incorporate suitable fencing to reduce the risk of vehicle strike on Koalas in the vicinity of the development site. Given the small scale of the development and the mitigation measures proposed, 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.

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;

No endangered ecological community was recorded within the study area (proposed development 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 study area (proposed development 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 footprint of the upgrade work within the road reserve occupies approximately $2,500 \text{ m}^2$ of land in which all the vegetation will be removed and 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;

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 study area to be removed, modified, fragmented or isolated constitutes a relatively small area of remnant vegetation containing a disturbed habitat and is located within road reserve in which remnant native vegetation will remain. Therefore, the habitat within the study area 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):

The Koala habitat assessment tool score of 9 indicates that the habitat within the study area may contain habitat critical to the species survival for the purposes of the EPBC. Based on the assessment under Figure 2 of the Guidelines, as the amount of proposed clearing is less than 2 hectares referral to the Minister for adversely affecting habitat critical to the survival of the Koala is not recommended.

The footprint of the upgrade work within the road reserve occupies approximately 2,500 m² of land in which all the vegetation will be removed. This represents a relatively small part of the remnant vegetation within the road reserve. In addition, it is unlikely that the functioning of the remnant vegetation within the road reserve as a wildlife corridor will be significantly affected by the proposed works. An off-site offset planting strategy is also proposed to mitigate removal of Koala food trees and a Koala Plan of Management is also proposed that will incorporate suitable fencing to reduce the risk of vehicle strike on Koalas in the vicinity of the development site. Therefore, it is considered unlikely that the action proposed will 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 a recovery plan in place for the Koala and the large forest Owls (collectively). As the proposed development site constitutes a relatively small area, contains a

disturbed habitat and is located within an existing developed area it is considered that the action proposed is consistent with the objectives or actions of the aforementioned recovery plans.

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 the proposed development are:

Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners (Manorina melanocephala):

In NSW the Noisy Miner is found throughout the coastal plains, foothills, ranges and tablelands (up to 1200 metres), as well as on the inland slopes and plains of the semiarid zone, favouring open, lightly timbered areas and habitat edges and so has benefitted from the large-scale vegetation changes that accompanied the European settlement of Australia. This includes clearing of forest and woodland, fragmentation of forest and woodland and reduction of understory vegetation by livestock grazing, invasion of exotic grasses, altered fire regimes and parkland clearing.

The removal of vegetation within the study area has the potential to create conditions that suite the Noisy Miner. However, it is noted that such conditions already exist in association with the current residential and commercial use of the adjacent land and that the species is already established in the area. Therefore, this KTP is already in play.

Anthropogenic Climate Change:

The use of machinery and power tools during any future earthworks or mining 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.

Clearing of native vegetation

Clearing refers to the destruction of a sufficient proportion of one or more strata within native vegetation. There are numerous impacts as a result of clearing native vegetation, including:

- Destruction of habitat causing a loss of biological diversity, and may result in total extinction of species or loss of local genotypes;
- Fragmentation of populations resulting in limited gene flow between small isolated populations, reduced potential to adapt to environmental change and loss or severe modification of the interactions between species;
- Riparian zone degradation, such as bank erosion leading to sedimentation that affects aquatic communities;
- Disturbed habitat which may permit the establishment and spread of exotic species which may displace native species; and

• Loss of leaf litter, removing habitat for a wide variety of vertebrates and invertebrates.

Given the small footprint of the proposed works within the road reserve, its position in the landscape and extent of disturbance that currently exists within the site and also on the adjacent developed land it is unlikely that the proposed works will contribute significantly to this KTP.

Invasion, establishment and spread of Lantana (Lantana camara):

Lantana has significant adverse effects on biodiversity. It typically forms dense thickets, suppressing native vegetation and seedlings through shading, nutrient competition, smothering and allelopathy (chemically suppresses the germination and/or growth of other plant species). Lantana readily invades disturbed sites and communities, including edges and canopy breaks in dense forest communities. In open forests and woodlands Lantana often becomes a dominant understorey species. In warmer, moister areas Lantana often becomes dominant in regenerating pastures. In NSW Lantana has been identified as a threat to numerous threatened species of flora, at least two threatened species of fauna and several endangered ecological communities. Lantana was recorded within the study area. Lantana is already established within the study area where it is a dominant species of the understorey. The proposed action will result in the removal of Lantana from the site.

Herbivory and environmental degradation caused by feral deer

All species of Deer have patchy distributions in forest and woodland in eastern New South Wales, with two species (Red and Fallow Deer) extending west of the Great Dividing Range. Feral deer are known to occur in many conservation reserves, across the State. Grazing and trampling by Deer can alter the composition and structure of a number of Endangered Ecological Communities and can alter the composition and structure of the habitats of threatened fauna. Evidence of feral Deer was recorded within the study area during the current study, however the proposed action will result in the habitat within the study area being removed.

Predation by the European Red Fox (Vulpes vulpes)

Since its introduction into Australia in the 1870s, the Red Fox has contributed to severe declines and extinctions of a suite of native fauna, particularly among medium-sized (450-5000 gram) ground-dwelling and semi-arboreal mammals, ground-nesting birds and freshwater turtles. Recent experimental studies have shown that predation by foxes continues to threaten remnant populations of many of these species. Two Fox dens that appear to be in use as well at least two others that appear to be abandoned were recorded within the study area during the scats and signs survey. The proposed action will remove the habitat within the study site rendering it unavailable to the Fox in future.



Addendum II to Ecological Assessment Report EA-2015-2807

Proposed Masters Retail Development (18 John Oxley Drive Port Macquarie) Road Reserve Biodiversity Survey

Prepared for: CVC Mezzanine Finance Pty Ltd

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Title	Addendum II to Ecological Assessment Report
Project	Proposed Masters Retail Development
Property	Lot 12 & 13 DP 1088869 18 John Oxley Drive Port Macquarie
Client	CVC Mezzanine Finance Pty Ltd
Report No.	EA-2015-2807 Addendum II
Draft/Final	Final – 22 September 2015

The preparation of this addendum to the ecological 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.

All information contained within this addendum are prepared for the exclusive use of the client and with respect to the land described herein and are not to be used for any other purpose or by any other person or entity. No reliance should be placed on the information contained in this report for any purposes other than those stated herein.

Prepared By:	Steve Britt BSc. (Botany) Grad. Dip. Design for Bushfire Prone Areas Master of Wildlife Mgt. (Habitat)
Signed:	K
Date:	22 September 2015

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1. Glossary of Terms and Acronyms

AABR: Australian Association of Bush Regenerators

Abundance: Means a quantification of the population of the species or community

Affected species: Means subject species likely to be affected by the proposal

AHD: Australian height datum

APZ: Asset protection zone (for bushfire protection purposes)

Assessment guidelines: Means assessment guidelines issued and in force under Section 94A of the *Threatened Species Conservation Act 1995* or, subject to Section 5C of the *Fisheries Management Act 1994*

CAVS: Census of Australian Vertebrates

Conservation status: Is regarded as the degree of representation of a species or community in formal conservation reserves

Critical habitat: The area declared to be critical habitat under Part 3 of the *Threatened Species Conservation Act 1995*

DCP: Area 13 Thrumster Development Control Plan 2013

DECC: Department of Environment, Conservation and Climate Change

Development: The erection of a building on that land, the carrying out of work in, on, over or under that land, the use of that land or of a building or work on that land, and the subdivision of that land

Endangered ecological community: An ecological community specified in Part 1 of Schedule 1 of the *Threatened Species Conservation Act 1995*

Endangered population: A population specified under Part 1 of Schedule 1 of the *Threatened Species Conservation Act 1995*

Endangered species: a species listed under Schedule 1 of the *Threatened Species Conservation Act 1995*

EP&A Act: Environmental Planning and Assessment Act, 1979

EPBC Act: Environment Protection and Biodiversity Conservation Act 1999

Field survey: Means on the ground flora and fauna assessment

Habitat: An area or areas occupied, or periodically or occasionally occupied by a species, population or ecological community and includes any abiotic component

HBT: Hollow-bearing tree

Key Threatening Process: Is a threatening process listed under the *Threatened Species Conservation Act* 1995

KFT: Koala food tree

KPoM: Area 13 UIA Koala Plan of Management

LEP: Port Macquarie-Hastings Local Environmental Plan 2011

Locality: the area within a 5 km radius of the study area

NPW Act: National Parks and Wildlife Act 1974

OEH: NSW Office of Environment and Heritage

PBP: Planning for Bushfire Protection 2006

PCT: NSW Plant Community Type classification

PMST: Protected matters search tool

Recovery and threat abatement plan: A plan to promote the recovery of threatened species, population or an ecological community with the aim of returning the species, population, or ecological community to a position of viability in nature

ROTAP: Rare or threatened Australian plant

SAT Survey: The Spot Assessment Technique: determining the importance of habitat utilisation by Koalas (*Phascolarctos cinereus*), Phillips and Callaghan 1995

SEPP: State Environmental and Planning Policy

Subject Site: The identified land (Lot(s) and DP(s)

Study area: The geographic extent of the ecological assessment (may be the subject site or a portion of it)

Threatened species: A species specified in Part 1 or 4 of Schedule 1 or in Schedule 2 of the *Threatened Species Conservation Act 1995*

Threatening process: Means a threatening process that threatens, or could potentially threaten, the survival or evolutionary development of a species, population or ecological community

TSC Act: Threatened Species Conservation Act 1995

VIS: NSW Vegetation Information System (classification database)

VMP: Vegetation Management Plan

Vulnerable species: A species listed under Schedule 2 of the *Threatened Species Conservation Act 1995* or when a fish, listed under the *Fisheries Management Act 1994*.

2. Introduction

2.1 Addendum Context

This document is an addendum to the ecological assessment report (reference number EA-2015-2807) prepared by FloraFauna Consulting and dated 31 August 2015 in relation to the upgrading of the John Oxley Drive road reserve associated with a proposed bulky goods retail development, including a Masters Home Improvement Centre on land identified as Lots 12 and 13 DP 1088869, 18 John Oxley Drive Port Macquarie. It should be noted that changes will not be made to the original report and that this addendum forms part of the documentation of the ongoing Development Application.

This document supersedes the following sections of the original ecological assessment report:

- Section 5.3.3: Hollow-bearing trees,
- Appendix C Flora Species List; and
- Appendix D: Hollow-bearing tree assessment forms.

This document also supersedes the previous addendum to the ecological assessment report (dated 10 September 2015):

Note: The flora species list (of the original ecological assessment report) has also been updated and is appended to this document as Appendix A.

2.2 Background

The original ecological assessment was undertaken prior to the study area within the road reserve having been surveyed and pegged out to clearly define its boundaries. In response, FloraFauna Consulting initially adopted a cautious approach to ensure the study area was fully assessed by incorporating a generous area of land into the study that included land located outside of the defined study area. The study area was subsequently pegged out by King and Campbell and a follow-up survey of the hollow-bearing trees (HBTs) and Koala food trees (KFTs) was conducted, which was confined to the land located within the defined study area.

Following the survey of hollow-bearing trees and Koala food trees within the defined study area (proposed construction site) advice was received from the Port Macquarie-Hastings Council ecologist that any hollow-bearing trees and Koala food trees located on the adjacent land within the road reserve close enough to be impacted by the proposed earthworks would also need to be considered. The survey was subsequently expanded to incorporate all hollow-bearing trees and Koala food trees located such that the proposed earthworks associated with upgrading of John Oxley Drive would encroach within the Tree Protection Zone (TPZ) as defined by *Australian Standard AS* 4970-2009 Protection of trees on development sites (AS 4790-2009).

3. Methodology

3.1 Hollow-bearing Trees

The site was reinvestigated and all hollow-bearing trees within the study area as well as those where the proposed upgrading works was deemed likely to encroach into the TPZ were located. The Port Macquarie-Hastings hollow-bearing tree assessment previously undertaken was verified and the trees were tagged for future identification.

3.2 Koala Food Trees

A comprehensive Koala Plan of Management does not apply to the study area and adjacent land. Therefore, as a precautionary approach all Koala food trees species greater than 150 mm DBH within the study area as well as those where the proposed upgrading works was deemed likely to encroach into the TPZ were located and tagged for future Identification. The tree diameter of 150 mm was adopted as this is consistent with the provisions of the Area 13 Koala Plan of Management (KPoM) that applies to lands in the nearby Thrumster locality. It is noted that the Area 13 KPoM permits the removal of Koala food trees for essential infrastructure (i.e. arterial roads) and that a compensation rate of 4:1 is applicable.

3.3 Tree Protection Zone

Australian Standard 4790-2009 specifies the 'Tree Protection Zone' (TPZ) as the principal means of protecting trees on development sites, which is described as a combination of the root area and crown area requiring protection. Those trees where the development footprint encroached within the TPZ are considered to be impacted such that their retention is considered unviable in the long term. The TPZ was determined according to the methodology of AS 4790-2009 where the radius of the TPZ is calculated for each tree by multiplying its diameter at breast height (DBH) by twelve; i.e. TPZ = DBH x 12, where the DBH is the trunk diameter measured at 1.4 metres above the ground.

Note: The definition of DBH for the purposes of AS 4790-2009 varies slightly from the one provided in the Glossary.

4. Results

There were twenty (20) trees surveyed including fifteen within the defined study area and five (5) trees on the adjacent land within the road reserve. The details of the surveyed trees are provided in Table 4.1.

Waypoint	Tag No.	Species	DBH (cm)	Height (m)	Notes
		Trees within the de	fined study a	irea	
1	901	Eucalyptus microcorys	17	10	KFT
2	902	Eucalyptus microcorys	82	30	HBT
3	903	Eucalyptus microcorys	15	8	KFT
4	904	Eucalyptus microcorys	119	30	HBT and KFT
5	905	Eucalyptus microcorys	89	20	KFT
6	906	Eucalyptus pilularis	117	30	HBT
7	907	Eucalyptus pilularis	60	15	НВТ
8	908	Eucalyptus microcorys	84	30	HBT and KFT
9	909	Eucalyptus tereticornis	40	12	KFT
10	910	Eucalyptus tereticornis	26	12	KFT
11	911	Eucalyptus tereticornis	79	15	KFT
12	912	Eucalyptus microcorys	69	15	KFT
13	913	Eucalyptus tereticornis	95	20	KFT
14	914	Eucalyptus resinifera	56	15	HBT
15	915	Eucalyptus pilularis	111	30	НВТ
Trees on adjacent land with compromised TPZ					
16	916	Eucalyptus pilularis	82	25	НВТ
17	917	Eucalyptus tereticornis	58	25	KFT
18	918	Eucalyptus pilularis	117	30	HBT
19	919	Eucalyptus microcorys	93	30	HBT and KFT
20	920	Eucalyptus pilularis	84	25	НВТ

Table 4.1: Surveyed trees

The hollow-bearing tree assessment form for each of the hollow-bearing trees listed in Table 4.1 are appended to this document as Appendix B. The locations of the surveyed trees listed in Table 4.1 are indicated in Figure 4.1.

The TPZ of five (5) trees identified as either a hollow-bearing tree or Koala food tree were found to be compromised by their proximity to the proposed upgrade work site within the John Oxley Drive road reserve. The details of these trees are provided in Table 4.2.

Waypoint	Tag No.	Species	DBH (cm)	TPZ (m)	Setback (m)
16	916	Eucalyptus pilularis	82	9.84	9
17	917	Eucalyptus tereticornis	58	6.96	4
18	918	Eucalyptus pilularis	117	14.04	10
19	919	Eucalyptus microcorys	93	11.16	7
20	920	Eucalyptus pilularis	84	10.08	2

 Table 4.2: Surveyed (adjacent) trees with a compromised TPZ



Figure 3.1: Locations of the surveyed trees

5. Conclusion

This document is an addendum to the ecological assessment report; reference number EA-20153-2807 prepared by FloraFauna Consulting and dated 31 August 2015 in relation to the upgrading of the John Oxley Drive road reserve associated with a proposed bulky goods retail development, including a Masters Home Improvement Centre on land identified as Lots 12 and 13 DP 1088869, 18 John Oxley Drive Port Macquarie. This addendum was prepared to provide data regarding hollow-bearing trees and Koala food trees located within the defined study area (proposed Work site for upgrading of the John Oxley Drive road reserve adjacent to the proposed Masters site) as well as those hollow-bearing trees and Koala food trees located on adjacent land within the road reserve where the proposed upgrading works was deemed likely to encroach into the TPZ (as defined in AS 4790-2009). It should be noted that changes will not be made to the original report, however this document supersedes Section 5.3.3, Appendix C and Appendix D of the original ecological report and the previous addendum to the ecological report dated 10 September 2015.

This survey has confirmed that it will be necessary to remove a total of twenty (20) trees identified as either being hollow-bearing trees or Koala food trees in association with the external road works for the subject Development Application. Eleven (11) of these trees are hollow-bearing trees of which three (3) are Koala food trees. The remaining nine (9) trees surveyed were identified as Koala food trees (without visible hollows). In relation to the hollow-bearing trees, the tree removal strategy and the compensatory nest box strategy as detailed in Section 7 of the original ecological report remains applicable. It is noted that just two species, the Rainbow Lorikeet and Galah were observed utilising tree hollows during the habitat assessment, fauna survey and tree survey. In relation to the twelve (12) Koala food trees to be removed, the compensation rate (Trust Fund) should be based on forty-eight (48) trees as prescribed by the Area 13 KPoM.

AS 4790-2009 makes provision for variations to the TPZ, thereby making it possible to encroach into or make variations to the standard TPZ. Minor encroachment is less than 10% of the area of the TPZ and is deemed to be outside the structural root zone (SRZ). In these instances a detailed root investigation is usually not required. However, the encroachment should be compensated for elsewhere and contiguous with the TPZ. Only tree number 16 (Tag no. 916) is likely to constitute a minor encroachment of the TPZ, however this would need to be verified by stadia survey. Any encroachment above 10% or that is inside the SRZ is considered to be a major variation under the Standard and requires a report from an Arborist that demonstrates that the tree would be remain viable. It is unlikely that any of the trees detailed in Table 4.2 could remain viable given their assessed TPZ and setback from the construction site edge.

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7. Appendix A: Flora Species List

Family	Species	Common Name
Adiantaceae	Adiantum hispidulum	Rough Maidenhair
Apiaceae	Centella asiatica	Indian Pennywort
Apocynaceae	Araujia sericifera*	Moth Vine*
	Gomphocarpus physocarpus*	Narrow-leaved Cotton Bush*
	Marsdenia rostrata	Milk Vine
	Parsonsia straminea	Common Silkpod
Araceae	Gymnostachys anceps	Settler's Twine
Araliaceae	Polyscias sambucifolia	Elderberry Panax
	Schefflera actinophylla*	Umbrella Tree*
Arecaceae	Syagrus romanzoffiana*	Cocos Palm*
Asparagaceae	Asparagus aethiopicus*	Asparagus Fern*
	Asparagus plumosus*	Climbing Asparagus Fern*
Asteliaceae	Cordyline stricta	Narrow-leaved Palm Lily
Asteraceae	Ageratina adenophora*	Crofton Weed*
	Ageratum houstonianum*	Blue Billygoat Weed*
	Bidens pilosa*	Cobbler's Pegs*
	Chrysanthemoides monilifera subsp. rotundata*	Bitou Bush*
	Cirsium vulgare*	Spear Thistle*
	Eclipta prostrata	
	Osteospermum fruticosum*	Shrubby Daisy-bush*
	Senecio madagascariensis*	Fireweed*
	Sonchus oleraceus*	Common Sowthistle*
	Taraxacum officinale*	Dandelion*
	Vernonia cinerea var. cinerea	
Athyriaceae	Deparia petersensii subsp. congrua	Japanese Lady Fern
Bignoniaceae	Jacaranda mimosifolia*	Jacaranda*
	Pandorea pandorana subsp. pandorana	Wonga Wonga Vine
Casuarinaceae	Allocasuarina torulosa	Forest Oak
	Casuarina glauca	Swamp Oak
Commelinaceae	Commelina cyanea	Native Wandering Jew
Convolvulaceae	Ipomoea cairica*	Coastal Morning Glory*
Cupressaceae	Callitris macleayana	Stringybark Pine
Cyperaceae	Carex appressa	Tall Sedge
	Cyperus eragrostis*	Umbrella Sedge*
	Eleocharis equisetina	
	Gahnia clarkei	Tall Saw-sedge
	Lepidosperma laterale	Variable Sword-sedge
Dennstaedtiaceae	Pteridium esculentum	Bracken
Dicksoniaceae	Calochlaena dubia	Rainbow Fern
Dilleniaceae	Hibbertia aspera	
	Hibbertia scandens	Climbing Guinea Flower
Ericaceae	Leucopogon juniperinus	Prickly Beard-heath
Escalloniaceae	Anopterus macleayanus	Macleay Laurel

Fabaceae	Senna pendula yar. alabrata*	Easter Cassia*
(Caesalpinioideae)		
Fabaceae	Glycine clandestina	Twining Glycine
(Faboideae)	Glycine microphylla	Small-leaf Glycine
	Platylobium formosum	Handsome Flat Pea
	Hardenbergia violacea	False Sarsaparilla
	Indigofera australis	Australian Indigo
	Jacksonia scoparia	Dogwood
	Kennedia rubicunda	Dusky Coral Pea
	Tephrosia grandiflora*	
Fabaceae	Acacia floribunda	White Sally
(Mimosoideae)	Acacia implexa	Hickory Wattle
	Acacia irrorata	Green Wattle
	Acacia longissima	Long-leaf Wattle
	Acacia maidenii	Maiden's Wattle
Iridaceae	Moraea sp.*	Moraea*
Juncaceae	Juncus continuus	
Lauraceae	Cassytha pubescens	Devil's Twine
	Cinnamomum camphora*	Camphor Laurel*
Lobeliaceae	Pratia purpurascens	Whiteroot
Lomandraceae	Lomandra longifolia	Spiny-headed Mat-rush
	Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush
Luzuriagaceae	Eustrephus latifolius	Wombat Berry
_	Geitonoplesium cymosum	Scrambling Lily
Malaceae	Pyracantha crenulata*	Nepal Firethorn*
Meliaceae	Dysoxylum fraserianum	Rosewood
	Melia azedarach	White Cedar
	Synoum glandulosum subsp. glandulosum	Scentless Rosewood
Myrsinaceae	Ardisia crenata*	Coralberry*
Myrtaceae	Callistemon salignus	Willow Bottlebrush
	Corymbia intermedia	Pink Bloodwood
	Eucalyptus microcorys	Tallowwood
	Eucalyptus pilularis	Blackbutt
	Eucalyptus propinqua	Small-fruited Grey Gum
	Eucalyptus resinifera	Red Mahogany
	Eucalyptus siderophloia	Grey Ironbark
	Eucalyptus tereticornis	Forest Red Gum
	Melaleuca linariifolia	Flax-leaved Paperbark
	Melaleuca quinquenervia	Broad-leaved Paperbark
	Tristaniopsis laurina	Water Gum
Ochnaceae	Ochna serrulata*	Mickey Mouse Plant*
Orchidaceae	Cryptostylis subulata	Large Tongue Orchid
Oxalidaceae	Oxalis corniculata*	Creeping Oxalis*
Passifloraceae	Passiflora edulis*	Common Passionfruit*
	Passiflora subpeltata*	White Passionflower*
Phormiaceae	Dianella caerulea	Blue Flax Lily
Phyllanthaceae	Breynia oblongifolia	Coffee Bush
	Glochidion ferdinandi	Cheese Tree

Pittosporaceae	Billardiera scandens	Hairy Apple Berry
	Pittosporum revolutum	Rough Pittosporum
	Pittosporum undulatum	Sweet Pittosporum
Poaceae	Andropogon virginicus*	Whisky Grass*
	Capillipedium spicigerum	Scented-top Grass
	Chloris gayana*	Rhodes Grass*
	Cynodon dactylon	Common Couch
	Digitaria parviflora	Small-flowered Finger Grass
	Entolasia marginata	Bordered Panic
	Entolasia stricta	Wiry Panic
	Imperata cylindrica	Blady Grass
	Oplismenus aemulus	Basket Grass
	Ottochloa gracillima	Slender Shade Grass
	Paspalum dilatatum*	Paspalum*
	Paspalum mandiocanum*	Broadleaf Paspalum*
	Paspalum urvillei*	Vasey Grass*
	Pennisetum clandestinum*	Kikuyu Grass*
	Setaria sphacelata*	South African Pigeon Grass*
	Sporobolus africanus*	Parramatta Grass*
Plantaginaceae	Plantago lanceolata*	Lamb's Tongues*
Polygonaceae	Muehlenbeckia gracillima	Slender Lignum
	Persicaria decipiens	Slender Knotweed
Proteaceae	Banksia integrifolia subsp. integrifolia	Coastal Banksia
	Grevillea robusta	Silky Oak
	Hakea salicifolia subsp. salicifolia	
	Lomatia silaifolia	Crinkle Bush
	Persoonia levis	Broad-leaved Geebung
Rhamnaceae	Alphitonia excelsa	Red Ash
Rosaceae	Rubus fruticosus sp. agg.*	Blackberry complex*
	Rubus moluccanus var. trilobus	Molucca Bramble
	Cupaniopsis anacardioides	
Sapindaceae	Dodonaea triquetra	Large-leaf Hop-bush
	Jagera pseudorhus var. pseudorhus	Foambark Tree
Smilacaceae	Smilax australis	Lawyer Vine
Solanaceae	Solanum densevestitum	
	Solanum mauritianum*	Wild Tobacco Bush*
Strelitziaceae	Strelitzia Nicolai*	Giant Strelitzia*
Thymelaeaceae	Pimelea linifolia subsp. linifolia	Slender Rice Flower
	Wikstroemia indica	Bootlace Bush
Ulmaceae	Trema tomentosa var. aspera	Native Peach
Verbenaceae	Lantana camara*	Lantana*
	Verbena bonariensis*	Purpletop*
Violaceae	Viola hederaceae	Ivy-leaved Violet
Vitaceae	Cissus antarctica	Water Vine
Zingiberaceae	Alpinia caerulea	Native Ginger

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

* Indicates an introduced species

8. Appendix B: HBT Assessment Forms

Port Macquarie – Hastings Council
Hollow-bearing tree assessment
LGA/Project: John Oxley, Drive (road ceserve - Masters)
Date20.9.2015 Easting: (52.8.74979 Northing: -31:4.53.99(Datum: GDA
Tree species (if known): Eucalyptus microcorys Alive Dead Score
Height (m): DBH (cm): .1.19 DBH Score
Number of visible hollows:
Hollow Size (variable: 1 or more):
In situ < 30m > 30m Score Image: State of the state
Longevity:
TOTAL SCORE: 17
Evidence of existing use
Recommendation(s):
Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis
PORT MACQUAR

Port Macquarie – Hastings Council
Hollow-bearing tree assessment
LGA/Project: John Oxley Drive (read reserve - Masters).
Date29:29.5 Easting:/52.874998 Northing:-3(:454:67. Datum: GDA
Tag No. 904
Height (m): <u>30</u> DBH (cm): <u>90</u>
> 5 2 - 4 0 - 1 Score V 3
Hollow Size (variable: 1 or more):
In situ< 30m> 30mScoreImage: State of the state
Longevity:
TOTAL SCORE: 18
Evidence of existing use
Recommendation(s):
Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis
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Port Macquarie – Hastings Council
Hollow-bearing tree assessment
LGA/Project: John Oxley Drive (road reserve-Masters)
Date20:9:20:5 Easting:152:874887 Northing:-31:4543 Datum: GDA.
Tree species (if known): Eucalyptus pulularis. Alive Dead Score
Height (m): <u>30</u> DBH (cm): <u>117</u> DBH <u>Score</u> <u>3</u>
Number of visible hollows:
Hollow Size (variable: 1 or more):
In situ< 30m> 30mScoreV3
Longevity:
TOTAL SCORE: 18
Evidence of existing use
Recommendation(s):
Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis
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Port Macquarie – Hastings Council
Hollow-bearing tree assessment
LGA/Project: John Oxley Drive (road reserve - Masters)
Date 29.9.28:5 Easting: 152.874868 Northing: -31.454426 Datum: GDA
Tree species (if known): Excal yptus pilularis Alive Dead Score
DBH (cm): DBH (cm): DBH Score 1.5 1.5
>5 2-4 0-1 Score V / -5
Hollow Size (variable: 1 or more):
In situ< 30m> 30mScore✓✓3
Longevity:
TOTAL SCORE: 11.5
Evidence of existing use
Recommendation(s):
Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis
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Port Macqu	arie – Hastings Council
Hollow-be	earing tree assessment
LGA/Project: Jehn Oxley Dr.	ive (road reserve - Masters)
Date29:2:20:5 Easting:152-874	1834 Northing: -31:4594.29. Datum: GDA
Tree species (if known): Eucaly	Alive Dead Score
Tag No. 908	
Height (m): <u>30</u> DB	BH (cm): . <u>8.4</u> DBH Score <u>3</u>
Number of visible hollows:	> 5 2 - 4 0 - 1 Score
Hollow Size (variable: 1 or more): >100mm >50mm <50mm Score
Habitat Proximity:	In situ < 30m > 30m Score
Longevity:	High Medium Low Score
TOTAL SCORE: 14.5	
Evidence of existing use	
Recommendation(s):	
Explanatory Notes: Hollow-bearing trees (HBTs) are an is significant factor affecting biodiversity more quantitative and ecologically m otherwise currently applied. As advoc	important element in the Australian landscape and a values. This assessment sheet is intended to provide a teaningful approach to the ranking of HBTs than is ated by Gibbons & Lindenmayer (2002), the emphasis
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Port Macqu	arie – Hastings Council
Hollow-b	earing tree assessment
LGA/Project: John Oxley	Drive (road reserve - Masters)
Date20.7.2015 Easting: 152.8	74.527 Northing:-31.455313. Datum: GDA
Tree species (if known): Eucal Tag No: 914	yptus resinctera Alive Dead Score
Height (m): <i>I.ร.</i> D	DBH (cm):
Number of visible hollows:	> 5 2 - 4 0 - 1 Score
Hollow Size (variable: 1 or more	a): >100mm >50mm <50mm Score
Habitat Proximity:	In situ < 30m > 30m Score
Longevity:	High Medium Low Score
TOTAL SCORE: 10	
Evidence of existing use	6110w - termitarium
Recommendation(s):	
Explanatory Notes: Hollow-bearing trees (HBTs) are an significant factor affecting biodiversity more quantitative and ecologically r otherwise currently applied. As advoc	important element in the Australian landscape and values. This assessment sheet is intended to provide meaningful approach to the ranking of HBTs than i cated by Gibbons & Lindenmayer (2002), the emphasi
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Port Macquarie – Hastings Council
Hollow-bearing tree assessment
LGA/Project: John Oxley Drive (road reserve - Masters)
Date 29.9.2015 Easting: 1.52.8.79.527 Northing: -31:4553.85. Datum: G.S.A
Tree species (if known): Eucalyptus pilularis. Alive Dead Score Tag No. 915
Height (m): <u>30</u> DBH (cm): <u>///</u> <u>Score</u> <u>3</u>
> 5 2 - 4 0 - 1 Score V 3
Hollow Size (variable: 1 or more):
In situ< 30m
Longevity:
TOTAL SCORE: 18
Evidence of existing use
Recommendation(s):
Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis
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Port Macquarie – Hastings Council
Hollow-bearing tree assessment
LGA/Project: John Oxley Drive (road reverve - Masters)
Date 29:1:29:5 Easting: 152.8.74639 Northing: -31:45547 Datum: GDA
Tree species (if known): Escal yetus Pilularis Alive Dead Score
DBH DBH (cm): DBH Score 3
>5 2 - 4 0 - 1 Score V 1 - 5
Hollow Size (variable: 1 or more): >100mm >50mm <50mm Score 3
Habitat Proximity:In situ< 30m> 30mScoreV3
Longevity:
TOTAL SCORE: 15
Evidence of existing use
Recommendation(s):
Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis

Port Macquarie – Hastings Council	
Hollow-bearing tree assessment	
LGA/Project: John Oxley Drive (road reserve - Masters)	
Date29:929/5 Easting:152:8748/7 Northing:-31:454321. Datum: GDA	
Tree species (if known): Euselyptus pilularis Alive Dead Score	
Height (m): <u>30</u> DBH (cm): <u>117</u> DBH <u>Score</u>	
> 5 2 - 4 0 - 1 Score V 3	
Hollow Size (variable: 1 or more):	
In situ < 30m > 30m Score Image: State of the state	
Longevity: High Medium Low Score	
TOTAL SCORE: 18	
Evidence of existing use	
Recommendation(s):	
Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis	

Port Macquarie – Hastings Council
Hollow-bearing tree assessment
LGA/Project: John Oxley Drive (road reserve - Masters)
Date29:92995 Easting: 152:8.74.8.7 Northing: -31:454.321. Datum: GDA
Tree species (if known): Eusalyptus pilularis Alive Dead Score Tag No. 918
Height (m): <u>39</u> DBH (cm): <u>117</u>
Number of visible hollows:
Hollow Size (variable: 1 or more):
Habitat Proximity:
Longevity:
TOTAL SCORE: 18
Evidence of existing use
Recommendation(s):
Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis
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Port Macquarie – Hastings Council
Hollow-bearing tree assessment
LGA/Project: John Oxley Drive (read reverve - Masters)
Date29:9:29:5 Easting:152:874938 Northing:-31:95445€. Datum:G≬A
Tree species (if known): Eusalyptus Microconys Alive Dead Score
Height (m): 3.9 DBH (cm): DBH Score
>5 2 - 4 0 -1 Score V / -5
Hollow Size (variable: 1 or more):
Habitat Proximity: In situ < 30m > 30m Score
Longevity:
TOTAL SCORE: 14-5
Evidence of existing use
Recommendation(s):
Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis
PORT MACQUARIE HASTINGS

Port Macquarie – Hastings Council
Hollow-bearing tree assessment
LGA/Project: John Oxley, Drive (road reserve - Masters)
Date 20: 9/20/6 Easting: 152-875 Northing: -31:453911, Datum: GDA
Tree species (if known): Eucalyptus. pilulacis Alive Dead Score
Height (m): .3.0 DBH (cm): 2.2 DBH <u>Score</u> 3
> 5 2 - 4 0 - 1 Score V V O
Hollow Size (variable: 1 or more):
Habitat Proximity:
Longevity:
TOTAL SCORE: 13
Recommendation(s):
Explanatory Notes: Hollow-bearing trees (HBTs) are an important element in the Australian landscape and a significant factor affecting biodiversity values. This assessment sheet is intended to provide a more quantitative and ecologically meaningful approach to the ranking of HBTs than is otherwise currently applied. As advocated by Gibbons & Lindenmayer (2002), the emphasis
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APPENDIX KPOM_B – Flora and Fauna Assessment, Peter Parker Environmental Consultants

Peter Parker

Environmental Consultants Pty Ltd 250 Broken Head Road, Broken Head, NSW 2481

2 0266 853 148



MASTERS CONCEPT AND BULKY GOODS RETAIL DEVELOPMENT

LOTS 12 AND 13 DP 1088869, 18 JOHN OXLEY DRIVE PORT MACQUARIE

FLORA AND FAUNA ASSESSMENT

PREPARED FOR CVC MEZZANINE FINANCE PTY LTD C/- KING & CAMPBELL PTY LTD, PORT MACQUARIE

25 May 2015

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SUMMARY

- This flora and fauna assessment report has been prepared for CVC Mezzanine Finance Pty Ltd with respect to a bulky goods retail proposal at John Oxley Drive, Port Macquarie.
- A flora and fauna assessment was undertaken by Peter Parker
 Environmental Consultants Pty Ltd in May 2015.
- This assessment identified that the site had little conservation significance, being an abandoned caravan park. However, several large tallowwood and a number of koala food trees were recorded, two of which contained hollows.

- A discussion of threatened species known from the vicinity of the site is included in this report.
- This assessment concluded that the proposed development is unlikely to have a significant effect on threatened species or endangered ecological communities.


Fig. 1: Proposed development superimposed over aerial photo

Peter Parker; Consultancy Report ...

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1.0 INTRODUCTION

This flora and fauna assessment report has been prepared for CVC Mezzanine Finance Pty Ltd with respect to the development of a Masters Home Improvement store and bulky goods retail development and the subdivision of the existing two lots at Lots 12 and 13 DP 1088869, 18 John Oxley Drive, Port Macquarie.

The site is known as Lots 12 and 13 DP 1088869 and has a total site area of area of 4.83 ha, including;

- Lot 12 comprising of 4.574 ha; and
- Lot 13 comprising of 2,561 m².

The proposed development includes the subdivision of the site to create two lots, incorporating easements for access and services. These include:

- Lot A with a site area of approximately 3.254 ha; and
- Lot B with a site area of approximately 1.575 ha.

The development of Lot A includes:

- A Masters Home Improvement store, with a total gross floor area of approximately 13,552m²;
- Main car park for 260 vehicles;
- Overflow car park for 109 vehicles;
- North car park for 26 vehicles; and
- Associated loading facilities.

The development of Lot B includes:

- A bulky goods retail premises with a total floor area of 6,920m²;
- Main car park for 156 vehicles; and
- Associated loading facilities.

Vehicular access from John Oxley Drive, including:

- A primary vehicular access point for entry and exit to each lot; and
- A secondary vehicular access point for entry only into only the proposed north car park and loading facilities for proposed Lot A.

Landscaping works, including:

- A minimum 3 m wide landscape buffer to John Oxley Drive;
- A 3-6 m wide landscape buffer to the adjacent Sienna Grange; and
- Acoustic screening and fencing to the adjacent Sienna Grange development to the west.

A flora and fauna assessment was undertaken by Peter Parker Environmental Consultants Pty Ltd on 11-12 May 2015. The proposed development will be located in the vacated Port Gateway Residential Park. The site has been extensively cleared and modified (Fig. 1).



Fig. 2: Koala food trees

Peter Parker; Consultancy Report ... - 7 -

2.0 FIELD SURVEYS

2.1 Flora

Flora and fauna surveys were undertaken at the site on 11-12 May 2015.

The flora survey included the compilation of a floristic list by walking in meandering transects over the site, the identification of trees and plotting trees using a global positioning system ("GPS") (Figs. 2 and 3).

2.2 Fauna

A habitat evaluation for fauna was undertaken simultaneously with the flora survey. Threatened flora and fauna entered in the Office of Environment and Heritage ("OEH") wildlife atlas within a 1 km diameter of the site (the study area) are mapped in Fig. 3.

Two Anabat bat detecting devices were set up overnight on 11 May in proximity to several large trees (Fig. 5). These were collected on 12 May and calls were downloaded onto a digital flash card and later identified by this consultant.

Threatened fauna records sourced from the OEH Wildlife Atlas are listed in Fig. 3 and addressed in section 4 of this report.



Fig. 3: Threatened fauna (Source: OEH Wildlife Atlas)

Peter Parker; Consultancy Report ... - 9 -

3.0 RESULTS

3.1 Vegetation communities

The proposal is to be located on the vacated Port Gateway Residential Park. The Residential Park has been gravelled, landscaped, drained and invaded by exotic and noxious weeds since its closure. The site supports native and exotic grasses as well as scattered native and exotic trees, some of which are of considerable size and maturity.

3.1.1 Tall sparse woodland

Three tallowwoods, *Eucalyptus microrys*, were recorded along the frontage of the site with John Oxley Drive (Plate 6). Nine swamp mahogany, *Eucalyptus robusta*, and two forest redgum, *Eucalyptus tereticornis*, were scattered throughout the site (Fig. 2).

The other woody vegetation comprises of introduced native and exotic trees, most of which would have been planted for landscaping purposes (Fig. 4, Appendix 1).

Four large aspen, *Populus tremula*, have been planted in a row in the northern part of the site. These trees have attained a height of approximately 20 m.

3.1.2 Landscaped areas and grassland

Understorey vegetation was comprised predominantly of exotic species, including introduced grasses, shrubs and ground covers (Appendix 1).

Swampy areas to the west of the site were dominated by swamp rice grass, *Leersia hexandra*, (Plate 4) and dryer areas by the exotic Parramatta grass, *Sporobolus indicus* var. *capensis* (Fig. 4).



Fig. 4: Native and exotic trees and palms

Peter Parker; Consultancy Report ... - 11 -



Plate 1: The site of the proposal



Plate 2: Typical exotic weed infestation



Plate 3: Grassland in the west with grey kangaroo



Plate 4: Drainage through the site



Plate 5: Hollow-bearing forest redgum with galah



Plate 6: Large tallowwood fronting John Oxley Drive

3.1.3 Plants or vegetation communities of conservation significance and hollow-bearing trees

The site is dominated by exotic species of little conservation significance and does not support threatened plants or endangered ecological communities.

Two hollow-bearing trees were recorded. These are a tallowwood and a forest redgum (Fig. 5). These trees were assessed in accordance with Council's hollow-bearing tree protocol and scored 10.5 and 11 respectively.

Two additional large tallowwood to that containing hollows were recorded along the site's frontage with John Oxley Drive. These three tallowwood were the most significant trees recorded due to their size, condition and maturity.

3.2 Fauna

3.2.1 Reptiles and frogs

A number of lizards, skinks and small reptiles are expected to occur at the site. These include the bearded dragon, *Pogona barbata*, the eastern water dragon, *Physignathus lesueurii*, and eastern grass skink, *Lampropholis delicata*.

Two common frog species were recorded in a drain running through the site. These were the striped marsh frog, *Limnodynastes peronii*, and the common froglet, *Crinia signifera*.

A number of other frog species are likely to occur at the site based on the presence of suitable breeding sites (Appendix 2: Fauna).

3.2.2 Birds

The noisy miner, *Manorina melanocephala*, the laughing kookaburra, *Dacelo novaeguineae*, the welcome swallow, *Hirundo neoxena*, the grey butcherbird, *Hirundo neoxena*, the Australian magpie, *Gymnorhina tibicen*, the torresian crow, *Corvus orru*, the masked lapwing, *Vanellus miles*, and the Australian magpie lark, *Grallina cyanoleuca*, were recorded. These are all common ubiquitous species.

The rainbow lorikeet, *Trichoglossus haematodus,* and the scalybreasted lorikeet, *Trichoglossus chlorolepiotus*, are opportunistic blossom feeders which foraged throughout the site. The tawny frogmouth, *Podargus strigoides*, was observed on 11 May by spotlight.

The little egret, *Ardea garzetta*, was observed foraging near a drain running through the site on 12 May 2015.

4.2.3 Mammals

The eastern grey kangaroo, *Macropus giganteus*, was particularly common with large groups (n> 20) observed in the western part of the site (Plate 3). The koala, *Phascolarctos cinereus*, was not recorded and there was no evidence of koala scats under tallowwood, swamp mahogany or forest redgum.

The Anabat survey detected two bat species. These were the eastern forest bat, *Vespadelus pumilus*, and the little bent-wing bat, *Miniopterus australis*.



Fig. 5: Hollow-bearing trees and Anabat location

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The OEH Wildlife Atlas provided records of the following threatened species within the study area (Fig. 3):

- The koala;
- The eastern freetail bat, *Mormopterus norfolkensis*;
- The hoary wattled bat, *Chalinolobus nigrogriseus*;
- The grey-headed flying-fox, *Pteropus poliocephalus*; and
- The squirrel glider, Petaurus breviceps\norfolcensis

These species, together with the little bent-wing bat, are addressed in section 4 (below).

4.0 STATUTORY CONSIDERATIONS

4.1 *Environmental Planning and Assessment Act*, 1979

The *Threatened Species Conservation Act 1995* ("TSC Act") commenced on 1 January 1996. This Act, *inter alia*, amended s4, s110, s111 and s112 of the *Environmental Planning and Assessment Act*, 1979 ("EPA Act") with regard to the protection of plants and animals.

For the purposes of the EPA Act and, in particular, in the administration of sections 78A, 79B, 79C, 111 and 112, the following must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

• any assessment guidelines¹; and

¹ For the purpose of this assessment the guidelines referred to are: *Threatened species assessment guidelines, the assessment of significance.* Publ. DECC 2007

• each of the factors listed under sections 5A a-g of the EPA Act as detailed below.

S.5A (a)

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

The following factors have been considered in assessing the likelihood of whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction by this proposal:

- the proposal's likely impact upon the key habitat components essential to the species' lifecycle; and
- the size of the local population in comparison with that which is proposed to be removed/modified.

A local population is that population referred to in the *guidelines*. This report has used database records for a 1 km diameter circle around the site (Fig. 3).

Flora

No threatened plant species were recorded at the site. Thus, the proposal would not *have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*

Fauna either recorded at the site or those species which have essential habitat components at the site

A number of threatened species are known to occur in the study area (Fig. 3). These species are addressed in the following s.5A assessment.

<u>Mammals</u>

<u>Koala</u>

Koalas spend the majority of their time resting in the forks of trees and are generally most active in the first few hours following sunset (Mitchell 1990). Throughout NSW, koalas have been observed feeding on the leaves of approximately 70 species of eucalypt and 30 non-eucalypt species (Phillips 1990). However, in any one area, koalas will feed almost exclusively on a small number of preferred species.

The koala is not territorial and the home ranges of individuals extensively overlap. Individuals tend to use the same set of trees, but generally not at the same time. Home ranges are variable depending on the location, with those in poorer habitats being larger than those in high quality habitats. On average, males usually have larger home ranges than do females. Koalas spend a lot of time alone, devoting little time to social interactions. They do not tend to move much, under most conditions changing trees only a few times a day. There is little evidence of longer movements by individuals, though dispersing individuals, mostly young males, may occasionally cover distances of several kilometres over land with little vegetation.

There are wildlife database records of the koala from the vicinity of the site and suitable koala food trees occur at the site. However, The Oxley Highway and John Oxley Drive are substantial movement barriers and the site is fenced with 2 m construction grade fences. It is unlikely that the koala could gain access to the site.

Little bent-wing bat

The little bent-wing bat is characterised by an exceptionally long terminal segment of the third finger. This placental flying mammal is greyish black to fawn-brown above and paler below.

This species utilises caves, old mines and a variety of structures such as buildings and stormwater drains as diurnal roosts. It occurs in diverse types of forests, ranging from rainforest to warm temperate wet and dry sclerophyll forests. It forages on small insects below the tree canopy and relies on a limited number of caves for maternity and hibernation roosts (Dwyer 1983b). With the onset of spring, adult females move from widely scattered roosts to specific nursery caves. These sites are often shared with the common bent-wing bat. The little bent-wing bat relies on large numbers of common bent-wing bats to raise cave temperatures to that necessary to raise young (Dwyer 1983b; Baudinette *et al.* 1994).

This species was recorded flying over the site on 11 May 2015. However, it is unlikely that the proposal will impact on this species as its foraging habitat at the site is relatively small in area and no breeding sites of significance were recorded.

The eastern freetail-bat

The eastern freetail-bat has dark brown to reddish brown fur on the back and is slightly paler below. Like other freetail-bats it has a long (3 - 4 cm) bare tail protruding from the tail membrane. Freetailbats are also known as mastiff-bats, having hairless faces with wrinkled lips and triangular ears and weigh up to 10 grams. This species roost mainly in tree hollows but will also roost under bark or in man-made structures. It occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range

http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile. aspx?id=10544. The proposal is unlikely to significantly affect this species as roosting habitat at the site is marginal in both extent and suitability.

The hoary wattled bat

The hoary wattled bat is a small sooty-coloured bat with light silvery-white tipped hairs of variable length. There is a small lobe of skin, or wattle, between the ears and mouth. This bat is typically observed flying about at dusk, leaving its roost site before other bat species have emerged.

In NSW it occurs in dry open eucalypt forests, favouring forests dominated by spotted gum, boxes and ironbarks, and heathy coastal forests where red bloodwood and scribbly gum are common. Because it flies fast below the canopy level, forests with naturally sparse understorey layers may provide the best habitat http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.a spx?id=10158. The proposal is unlikely to significantly affect this species as roosting habitat at the site is marginal in both extent and suitability.

The squirrel glider

The squirrel glider favours wet and dry sclerophyll forests and woodlands. It relies on tree hollows for shelter and prefers dry sclerophyll forest and woodland with mixed aged stands of several eucalypt species. The diet of the squirrel glider is broadly similar to that of the sugar glider. However, it consumes more invertebrates and less plant saps and gums. Dietary analysis of all Australian gliders and arboreal marsupials established that most species were specialist granivores (seed eaters). Predictably, fruit consumption is also an unrepresented dietary item in gliders as fleshy fruit are rare in eucalypt forests and woodlands. The squirrel glider is known to eat young birds and eggs although meat eating is uncommon (Gibbons and Lindenmayer 2002).

The squirrel glider is broadly distributed, extending along the drier western slopes of the Great Divide from Central Victoria, through NSW to northern Queensland. It extends from the coast to west of the Great Divide from the Queensland to the Victorian borders.

This species was not recorded during spotlighting on 11 May 2012, although suitable habitat trees were noted. The proposal is unlikely to significantly affect the squirrel glider as suitable habitat at the site is restricted to one tree (a tallowwood) and this is remote from habitat on the eastern side of John Oxley Drive.

Grey-headed flying-fox

The grey-headed flying-fox occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths, swamps, urban gardens and cultivated fruit crops (Eby, 1995).

Grey-headed flying-foxes forage on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia* (Eby, 2000), and fruits of rainforest trees and vines. This species is an important pollinator and seed-disperser of native trees. The availability of native fruits, nectar and pollen varies over time and throughout the range of the species. Grey-headed flying foxes accommodate this by migrating in response to food availability, sometimes travelling hundreds of kilometres. In addition, during periods when native food is limited, they disperse from colonial roosts, often foraging in cultivated gardens and fruit crops.

it is unlikely that the proposal will impact on this species as food resources at the site are minimal and significant areas of suitable foraging habitat are located in the nearby areas.

S5A (a) conclusion

The proposal is unlikely to "*have an adverse effect on the life cycle* of the species such that a viable local population of the species is likely to be placed at risk of extinction" as no threatened species habitat will be significantly modified or removed.

S.5A (b)

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

No endangered populations, listed under Part 2 of Schedule 1 of the TSC Act, occur within the vicinity of the subdivision site. Thus, the action proposed will not cause *a viable local population of the species to be placed at risk of extinction*.

S.5A (c)

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

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

No Critically Endangered Ecological Communities ("EECs") occur at the site.

Accordingly, the action proposed will not 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 nor will the proposed action substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

S.5A (d)

- *d) in relation to the habitat of a threatened species, population or ecological community:*
 - (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and
 - (ii) whether an area of habitat is likely to become
 fragmented or isolated from other areas of habitat as
 a result of the proposed action, and
 - (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 proposal will not result in the removal or modification of threatened species habitat or any EEC. In addition, it will not result in habitat fragmentation. Thus, the proposal will have no impact on the long-term survival of the species, population or ecological community in the locality.

S.5A (e)

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

The site does not contain any area which has been identified and declared as critical habitat under Part 3 of the TSC Act. Therefore, critical habitat will not be affected.

S.5A (f)

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

A number of recovery plans or threat abatement plans apply to some extent. These include recovery plans for the grey-headed flying-fox, and the koala and threat abatement plans for the European red fox. The proposed development is not contrary to the objects of recovery planning to any significant extent as habitat removal is limited to isolated trees.

S.5A (g)

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 Threatening processes gazetted under the TSC Act include the following:

- Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners, *Manorina melanocephala;*
- Alteration of habitat following subsidence due to longwall mining;
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands (as described in the final determination of the Scientific Committee to list the threatening process);
- Anthropogenic climate change;
- Bushrock removal;
- Clearing of native vegetation. Clearing is defined as the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long-term modification, of the structure, composition and ecological function of a stand or stands;
- Competition and grazing by the feral European Rabbit, Oryctolagus cuniculus;
- Competition and habitat degradation by feral goats, *Capra* hircus;
- Competition from feral honey bees, *Apis mellifera*;
- Death or injury to marine species following capture in shark control programs on ocean beaches;
- Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments;
- Forest eucalypt dieback associated with over-abundant psyllids and bell miners;
- Herbivory and environmental degradation caused by feral deer;

- High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition. High frequency fire is defined as two or more successive fires close enough together in time to interfere with or limit the ability of plants or animals to recruit new individuals into a population, or for plants to build up a seed-bank of sufficient size to maintain the population through the next fire;
- Importation of red imported fire ants, *Solenopsis invicta*;
- Infection by Psittacine Circoviral (beak and feather) disease affecting endangered psittacine species and populations;
- Infection of frogs by amphibian chytrid causing the disease, chytridiomycosis;
- Infection of native plants by the fungus, *Phytophthora cinnamomi*;
- Introduction and establishment of exotic rust fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae
- Introduction of the large earth bumblebee, *Bombus terrestris*;
- Invasion and establishment of exotic vines and scramblers;
- Loss or degradation (or both) of sites used for hill-topping by butterflies. Hill-topping in butterflies is a complex behaviour that often facilitates mating between sexes. Many butterfly species appear to congregate on hill-tops or ridges that are usually higher than the surrounding landscape. These sites may range in area from a few square metres to several hectares;
- Invasion and establishment of scotch broom, *Cytisus scoparius*;
- Invasion and establishment of the cane toad, *Bufo marinus;*
- Invasion, establishment and spread of Lantana;

- Invasion of native plant communities by African olive, *Olea europaea* L. subsp. *cuspidate*;
- Invasion of native plant communities by bitou bush, *Chrysanthemoides monilifera*. The ability of bitou bush to become the overwhelming dominant in invaded ecological communities threatens all plant communities within its distribution;
- Invasion of native plant communities by exotic perennial grasses;
- Invasion of the yellow crazy ant, *Anoplolepis gracilipes* into NSW
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants;
- Loss of hollow-bearing trees;
- Predation by the mosquito fish, Gambusia holbrooki;
- Predation by the European red fox, *Vulpes vulpes*;
- Predation by the feral cat, Felix cattus. Predation by the feral cat has been implicated in the extinction and decline of many species of birds on islands around Australia and in the early extinction of up to seven species of small mammals on the Australian mainland;
- Predation by the ship rat, *Rattus rattus*, on Lord Howe Island; and
- Removal of dead wood and dead trees.

None of these threatening processes are likely to significantly increase as a result of this proposal.

The development of the site will require some tree removal. However, such removal is not within the meaning of: "*clearing of native vegetation"*. The extent of tree removal is minimal and will not destroy a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long-term modification, of the structure, composition and ecological function of a stand or stands.

Two hollow-bearing trees were recorded. Their removal, if ultimately required will be compensated by the provision of nest boxes in accordance with Council's requirements. In the context of an increase in threatening processes, their removal is of minor significance.

4.2 Koala habitat and State Environmental Planning Policy No. 44

State Environmental Planning Policy No. 44 - Koala Habitat Protection ("SEPP 44") commenced on 13 February 1995 with the aim 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;

- (a) "by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat;
- *(b)* by encouraging the identification of areas of core koala habitat; and
- (c) by encouraging the inclusion of areas of core koala habitat in environment protection zones."

4.2.1 Definitions in SEPP 44

Various definitions are provided in SEPP 44. These are as follows:

"Core koala habitat" means an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population;

"Potential koala habitat" means areas of native vegetation where the trees of the types listed in Schedule 2 of the Policy constitute at least 15% of the total number of trees in the upper or lower strata of the tree component;

"Land to which the Policy applies" SEPP 44 applies to land for which a development application has been lodged for each local government area listed in Schedule 1 of the Policy. It does not apply to land dedicated or reserved under the *National Parks and Wildlife Act 1974* or to land dedicated under the *Forestry Act 1916* as a State forest or flora reserve.

SEPP 44 applies to land that:

- Has an area of more than 1 ha; or
- Has, together with any adjoining land in the same ownership, an area of more than 1 ha;
- Whether or not the development application applies to the whole, or only part, of the land.

4.2.2 Circular B35

Circular B35 dated 22 March 1995 assists in the interpretation of SEPP 44. The guidelines contained within Circular B35 must be considered by Council when determining a development application (S.2.0, P. 7).

Clause 5.1 of circular B35 provides clarification with respect to the application of SEPP 44 The clause includes the following:

"It is the intention of the policy that investigations for potential and core koala habitats be limited to those areas in which it is proposed to disturb habitat"

4.2.3 SEPP 44 assessment

The subject land is greater than 1 ha, thus SEPP 44 applies to the land. For potential koala habitat to occur, koala food trees listed under Schedule 2 of the Policy need to comprise 15% or more of the total number of native trees in the upper or lower strata of the tree component.

Analysis of aerial photography suggests that koala food trees are likely to occupy 15% or more of the tree canopy. Thus, potential koala habitat occurs at the site in accordance with SEPP 44. However, there was no evidence of koala presence (e.g., scats or scratches) under or on tallowwood, swamp mahogany or forest redgum, all of which are koala food trees listed under SEPP 44. Thus, a koala plan of management pursuant to SEPP 44 is not required.

5.0 REFERENCES

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Appendix 1: Vegetation

Scientific name

* introduced or naturalised

ANGIOSPERMS (Flowering plants) Monocotyledons ARECACEAE

Archontophoenix alexandrae *Chrysalidocarpus lutescens *Syagrus romanzoffianum

POACEAE

Cynodon dactylon *Eragrostis curvula (complex) Imperata cylindrica var. major Leersia hexandra *Paspalum distichum *Paspalum notatum *Paspalum urvillei *Setaria sphacelata *Sporobolus indicus var. capensis *Stenotaphrum secundatum

APIACEAE **Hydrocotyle bonariensis*

ASCLEPIADACEAE *Gomphocarpus fruiticocus

- ASTERACEAE
- *Ageratum houstonianum *Biddens pilosa *Cirsium vulgare *Conyza albida * Hypochoeris radicata *Senecio lautus *Tagetes minuta *Xanthium occidentale

BIGNONIACEAE *Jacaranda mimosifolia

CAESALPINIACEAE *Senna pendula var. glabrata

CASUARINACEAE Casuarina glauca

CONVOLVULACEAE * Ipomea cairica

FABACEAE Subfamily CAESALPINIOIDEAE *Bauhinia sp. Subfamily FABOIDEAE *Croatalaria incarna subp. purpurascens *Erythrina indica

LAURACEAE

Common name

alexandra palm golden cane palm queen or cocos palm

couch love-grass blady grass swamp rice grass water couch Bahia grass varsey grass canary seed grass Parramatta grass buffalo grass

hydrocotyle

narrow-leaf cotton-bush

blue billygoat weed cobbler's pegs spear thistle tall fleabane flatweed fireweed stinking roger noogoora burr

jacaranda

winter senna

swamp she-oak

coast morning glory

orchid tree

woolly rattlepod coral tree

Scientific name

* introduced or naturalised *Cinnamomum camphora

MALVACEAE *Sida rhombifolia

MUSACEAE *Strelitzia nicolai

MYRTACEAE Callistemon sp. Eucalyptus spp. Eucalyptus microcorys Eucalyptus robusta Eucalyptus tereticornis Leptospermum liversidgei Melaleuca linariifolia

PROTEACEAE Grevillia robusta

ROSACEAE *Rubus fruticosus

SALICACEAE *Populus nigra *Populus tremula

VERBENACEAE * Lantana camara *Verbena bonariensis *Verbena littoralis

Common name

camphor laurel

Paddy's lucerne

east-west palm

bottlebrush a peppiment tallowwood swamp mahogany forest red gum lemon-scented tea tree snow in summer

silky oak

blackberry

Lombardy poplar aspen

lantana purpletop common verbena

Appendix 2: Fauna

Scientific name	Common name	Recorded	Expected
* : introduced species; # threatened sp	ecies		
MAMMALS			
CANIDAE	4		
Canis familaris*	dog		x
vuipes vuipes*	IOX		X
LEPORIDAE	brown baro	×	
Anyctolagus cuniculus*	rabbit	^	×
Oryctolagus cumculus			~
Macronus giganteus	eastern grev kangaroo	x	
Macropus giganteus	custern grey kangaloo	~	
MOLOSSIDAE			
Molossidal Mormonterus porfolkensis#	eastern free-tail bat		×
Mormonterus cn. 1			×
Austronomus australis	white-striped free-tail bat		×
Austronomus austrans	white striped nee tail bat		~
MUDIDAE			
MURIDAE Mus musculus*	house mouse		v
Mus musculus ·	nouse mouse		X
PERAMELIDAE	nouthour busine bandiopat		
Isoodon macrourus	northern brown bandicool		X
Tricnosurus Vulpecula	common brushtali possum		x
PTEROPODIDAE			
Pteropus poliocephalus #	grey-headed flying-fox		x
VESPERTILIONIDAE			
Chalinolobus gouldii	Gould's wattled bat		х
Miniopterus australis #	little bent-wing bat	X	
vespadelus pumilus	eastern forest bat	x	
PTPPC			
BIRDS	white threated compose		
Gerygone olivacea	white-throated gerygone		x
Milvus sphenurus	whistling kite		x
ALCEDINIDAE			
Dacelo novaeguineae	laugning kookaburra	x	
ANATIDAE			
Anas superciliosa	расітіс біаск диск		x
ARDEIDAE	1994 L		
Ardea garzetta	little egret	х	
CAMPEPHAGIDAE			
Coracina novaehollindiae	DIACK-faced cuckoo-shrike	х	
CHARADRIIDAE			
Vanellus miles	masked lapwing	х	
COLUMBIDAE			
Streptopelia chinensis*	spotted turtle-dove		х
CORVIDAE			

Scientific name	Common name	Recorded	Expected		
* : introduced species; # threatened species					
Corvus orru	torresian crow	x			
CRACTICIDAE Cracticus nigrogularis Cracticus torquatus Gymnorhina tibicen Strepera graculina	pied butcherbird grey butcherbird Australian magpie pied currawong		x x x x		
CUCULIDAE Cacomantis flabelliformis	fan-tailed cuckoo		x		
GRALLINIDAE Grallina cyanoleuca	Australian magpie-lark		x		
Hirundo neoxena	welcome swallow		x		
MELIPHAGIDAE Manorina melanocephala Meliphaga lewinii Myzomela sanguinolenta Philemon citreogularis Philemon corniculatus	noisy miner Lewin's honeyeater scarlet honeyeater little friarbird noisy friarbird	x x x	x x		
MEROPIDAE Merops ornatus	rainbow bee-eater		x		
ORIOLIDAE Oriolus sagittatus Sphecotheres viridis	olive-backed oriole figbird		x x		
PACHYCEPHALIDAE Colluricincla harmonica Rhipidura leucophrys	grey shrike-thrush willie-wagtail		x x		
PLATALEIDAE Threskiornis spinicollis	straw-necked ibis		x		
PODARGIDAE Podargus strigoides	tawny frogmouth	x			
PSITTACIDAE Cacatua galerita Cacatua roseicapilla Platycercus eximius Trichoglossus chlorolepiotus Trichoglossus haematodus	sulphur-crested cockatoo galah eastern rosella scaly-breasted lorikeet rainbow lorikeet	x x x	x x		
REPTILES AGAMIDAE Physignathus lesueurii Pogona barbata	eastern water dragon bearded dragon		x x		
BOIDAE Morelia spilota	carpet python		x		
COLUBRIDAE Dendrelaphis punctulata	green tree snake		x		
ELAPIDAE Demansia psammophis	yellow-faced whip snake		x		

Common name	Recorded	Expected
ecies		
eastern grass skink	x	
green tree frog		x
rocket frog		х
common eastern froglet striped marsh frog	x x	
	Common name ecies eastern grass skink green tree frog rocket frog common eastern froglet striped marsh frog	Common name Recorded ecies


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LEAD TO REJECTION R.T.A. FILE : 11/196.1332	DIAGRAM NOT TO SCALE		D.P.811017 97° 86.41 97° 86.41 00.98^{-75} 100.98^{-75} 14.57 R.0.9 R	217.14 07. 1. 00. 9°0.102.55 1.005 36'	(SEE SHEET 3)		2.762 hg 14 2.762 hg 150 150 150 10 10 10 10 10 10 10 10 10 10 10 10 10	$\frac{146.63}{100} = \frac{100.98}{100.98} = 100.9$	$\begin{bmatrix} 1 \\ 1 \\ 2 \\ 3 \\ 1 \\ 2 \\ 1 \\ 2 \\ 1 \\ 2 \\ 1 \\ 2 \\ 1 \\ 2 \\ 1 \\ 2 \\ 1 \\ 2 \\ 1 \\ 2 \\ 2$	QT 00 0. P.8/10/7) CD. P. M.G.I. P. FD. 230.95	1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5. 6. 6. 6. 6. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7	514.3				
R.T.A. PLAN: 0011 196 SS 0353	SEE SIGNATURES FORM MANAGER, PROPERTY SERVICES NORTHERN CLIENT SERVICES ROADS AND TRAFFIC AUTHORITY, NSW	APPROVED:	LOT 7, D.P.8II0I7 AND LOTS IF TO I8 INCLUSIVE ARE REQUIRED FOR CONTROLLED ACCESS ROAD UNDER SECTION 49 OF THE ROADS ACT, 1993. ACCESS WILL BE RESTRICTED ACROSS THE BOUNDARIES MARKED A-B-C-D, E-F-G-H-J, K-L & M-N.	PANEL FOR USE ONLY for statements of intention to dedicate public roads or to create public reserves, drainage reserves, easements restrictions on the use of land or positive covenants.	Plans used in preparation of survey / compilation D.P.s 858086, 877628, 882820, 792325 852214, 1049609, 262236, 1069890, 740429, 640759, 244850, 811017, 812130, 102553, 772163 & 269597 RTA F.BK. 0011 196 FP 1000	(specify the land actually surveyed or specify any land shown in the plan that is not the subject of the survey Signature : SEE SIGNATURES FORM Surveyor registered under the Surveying Act 2002 Datum Line : "X" - "Y" Type : Urban	GREIG SUTHERLAND or ROADS & TRAFFIC AUTHORITY, N.S.W. a surveyor registered under the Surveying Act 2002, certify that the survey represented in this plan is accurate has been made in accordance with the Surveying Regulation 2001 and was completed on : 19-8-2005 The survey relates to LOTS 12 TO 18 INCL AND CONNECTIONS	This is sheet 1 of my plan in 3 sheets. (Delete if inapplicable). Surveying Regulation 2001	county: MACQUARIE	Locality: PORT MACQUARIE Parish: MACQUARIE	L.G.A.: HASTINGS	Lengths are in metres. Reduction Ratio I:2000	PLAN OF LAND TO BE ACQUIRED FOR THE PURPOSES OF THE ROADS ACT, 1993.	Ref.Map: PARISH#, Y8215-6# DP244850#, DP772163, DP792325 Last Plan: DP740429, DP1069890	Purpose: ROADS ACT 1993	Title System: TORRENS	Registered: 1-11-2005

DP1088869



WARNING : CREASING OR FOLDING WILL



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For use where space is insufficient in any panel on Plan Form 2	L.G.A.: HASTINGS Locality: PORT MACQUARIE Parish: MACQUARIE County: MACQUARIE	This is sheet of the plan of sheets covered by Subdivision Certificate No.: of Authorized Person/General Manager/Accredited Certifier. Delete whichever is inapplicable	This is sheet 3 of my plan in 3 sheets dated 19-8-2005 SEE SIGNATURES FORM Signature : Dated Surveyor registered under Surveying Act, 2002.	DP1088869 Registered: 1-11-2005	e-plan

Req:R806024 /Doc:DP 1088869 P /Rev:02-Nov-2005 /Sts:SC.OK /Prt:21-Nov-201 Ref:Kingp&sCampb#slqPfyoftd /Src:P

CERTIFICATES, SIGNA	TURES AND SEALS Sheet 1 of 1 sheet(s)	
PLAN OF LAND TO BE ACQUIRED FOR THE PURPOSES OF THE ROADS ACT, 1993.	DP1088869	
	* Registered: 1-11-2005	
Surveying Regulation 2001 I, GREIG SUTHERLAND of ROADS AND TRAFFIC AUTHORITY, N.S.W. a surveyor registered under the Surveying Act 2002, certify that the survey represented in this plan is accurate, has been made in accordance with the Surveying Regulation 2001 and was completed on: 19/8/2005 The survey relates to LOTS 12 TO 18 INCLUSIVE AND CONNECTIONS (specify the land actually surveyed or specify any land shown in the plan that is not the subject of the survey) Signature Dated: 13/9/05 Surveyor registered under the Surveying Act 2002 Datum Line: "X" – "Y". Type: Urban	SIGNATURES, SEALS and STATEMENTS of intention to dedicate public roads or to create public reserves and drainage reserves. EXECUTED FOR THE ROADS AND TRAFFIC AUTHORITY, NSW BY ITS DELEGATE MARTIN HOWARD PURSUANT TO DELEGATION BOOK 4394 No. 422. MANAGER, PROPERTY SERVICES NORTHERN CLIENT SERVICES	
(Authorised Officer) that all necessary approvals in regard to the allocation of the land shown hereon have been given Signature:	THIS PLAN IS EXEMPT FROM SUBDIVISION CERTIFICATION PURSUANT TO A DECISION BETWEEN DUAP, RTA & LPI NSW – SEE 1997 M6 (Item 2), LAND IN THIS PLAN COMPRISES ONLY ROAD OR ROAD AND RESIDUE. 3/9/0 AUTHORISED OFFICER ROADS AND TRAFFIC AUTHORITY, NSW	
Accreditation no:	MANAGER, PROPERTY SERVICES NORTHERN CLIENT SERVICES ROADS AND TRAFFIC AUTHORITY, NSW Use PLAN FORM 6A for additional certificates, signatures and seals	

SURVEYOR'S REFERENCE: 24103 CHECKLIST

R.T.A. PLAN: 0011 196 SS 0353

APPENDIX KPOM_D – PMHC Draft Concept Plan for Duplication of John Oxley Drive Corridor







🎆 Environment & Heritage | NS... 🗙 🏾 🎆 Office of Environment & Herit... 💥 + ▼ C 8 - Google w.au/mapviewerapp/index.html U 🛜 Map Legend 🔹 👔 Identify Print 💽 Overview Map (1) 📰 😢 Lincoln Gardens Retirement Village os cinereus Nation Court Locistey Prace The Retreat Village MA 00: :00 AM Newport Village Cartha . Port Macquarie Base Hospital P Wing his Road 0 4 Port Galeway Residential Park Highlields Circuit (\mathbf{X}) Record: 2 Dataset Name: OEH Default Sightings User Key: SJJSI0131902 Species Code: 1162 Scientific Name: Phascolarctos cinereus Kuar Place Common Name: Koala First Date: 27/09/2008 12:00:00 AM Last Date: 27/09/2008 12:00:00 AM Observation Type: Observed ▲ Latitude: -31.454674721 Longitude: 152.873697689 OXLEY HIGHWAY Zone: 58 v rebird Piace Easting: 488000 Northing: 6520000 Accuracy: 100 Bills Palade

APPENDIX KPOM_F – PMHC Offsite Land location and Offset Planting guide



PMVC 34 Scribbly Gum Dune Heathy Woodland

Formation: Dry Sclerophyll Forests	COMMUNITY PHOTO
Sub-formation: Shrubby	
Class: Coastal Dune Dry Sclerophyll	
EEC analog: na	
No. field sites: 10	
Total area: 140.37ha	
Floristic type: Eucalyptus racemosa	
Structure: Eucalyptus racemosa- Banksia aemula- Caustis recurvata	

WHERE DOES IT GROW?

<u>Landscape position</u>: This community occurs on sub-coastal flats on the coastal plain. <u>Landform</u>: <u>Soils/origin</u>: Sand <u>Sits between or within</u>: PMVC 31,

HOW DOES IT LOOK?

Typical structure and variations: A mid-high to tall woodland to open forest dominated by Scribbly Gum *Eucalytus racemosa* with other Eucalypt species present but less common including Tallwood *Eucalyptus microcorys*, Red Bloodwood *Corymbia gummifera*, Blackbutt *Eucalyptus pilularis*, Needlebark *Eucalyptus planchoniana*, Swamp Mahogany *Eucalyptus robusta* and Broad-leaved Paperbark *Melaleuca quinquenervia* over a tall shrubland dominated by Wallum Banksia *Banksia aemula* and Tantoon *Leptospermun polygalifolium* over a mid-high to tall sedgeland dominated by Curly Sedge *Caustis recurvata*, Bracken Fern *Pteridium esculentum* and Xanthorrhoea *X. fulva*.

WHAT USUALLY GROWS THERE?

Tallest stratum: A mid-high to tall woodland to open forest dominated by Scribbly Gum *Eucalyptus racemosa*. Other species include Tallwood *Eucalyptus microcorys*, Coastal Banksia *Banksia integrifolia*, Old man Banksia *Banksia serrata*, Red Bloodwood *Corymbia gummifera*, Blackbutt *Eucalyptus pilularis*, Needlebark *Eucalyptus planchoniana*, Swamp Mahogany *Eucalyptus robusta* and Broad-leaved Paperbark *Melaleuca quinquenervia*

Mid stratum: A tall shrubland dominated by Wallum Banksia Banksia aemula and Leptospermum polygalifolium. Other species include Sydney Golden Wattle Acacia longifolia, Heath-leaved Banksia Banksia ericifolia, Coffee Bush Breynia oblongifolia, Blueberry Ash Eleocarpus reticulatus, Olive Tea-tree Leptospermum liversidgei, Smooth Geebung Persoonia levis, Satinwood Nematolepis squamea,

Lowest stratum:. A mid-high to tall sedgeland dominated by Curly Sedge *Caustis recurvata* growing in association with Sporadanthus interruptus, Tall Saw-sedge *Gahnia clarkeii*, Spiny-headed Mat Rush *Lomandra longifolia*, Bracken Fern *Pteridium esculentum and Xanthorrhoea X. fulva*. Small shrubs include Prickly Moses *Acacia browneii*, Bauera *B. capitata, Pale Pink Boronia B. floribunda*, Showy Boronia *B. ledifolia*, Boronia *B. pinnata*, *Dillwynia floribunda*, Wallum Heath *Epacris pulchella*, Broad-leaf Wedge Pea *Gompholobium latifolium*, Rice Flower *Pimelea linifolia*, Wedding Bush *Ricinocarpus pinifolius*, Graminoids (grass and grass like plants) include Blue Flax Lily *Dianella caerulea*, Blady Grass *Imperata cylindrica*,Weeping Grass *Microleana stipodes*, Patersonia *P.sp., Forbs and perennial geophytes (bulbs and orchids) include Pomax P. umbellata*, Rush Lily *Sowerbaea juncea*, Woolly Xanthosia *Xanthosia pillosa*, Baumea juncea, Caustis blakei, Leptocarpus tenax and Monotoca scoparia. Vines,climbers and scramblers include Common Apple Berry *Billardiera scandens*, Cassytha C. glabella, Climbing Guinea Flower *Hibbertia scandens*, Dusky Coral Pea *Kennedia rubicunda*, Common Silkpod *Parsonsia straminea*, Native Sarsaparilla *Smilax gleiphylla* Ferns include Blechnum nudum

Look up broom like plant with green translucent berries

ARE YOU SURE?

Ecological Community confirmation (using plant species):

This Ecological Community differs from PMVC 31 by having the following species:

This Ecological Community differs from PMVC 40 by having the following species: Prickly Moses Acacia browneii, Wallum Banksia Banksia aemula, Heath-leaved Banksia ericifolia, Bauera B.capitata, Pale Pink Boronia B. floribunda, Dillwynia D. floribunda, Needlebark Eucalyptus planchoniana, Swamp Mahogany Eucalyptus robusta, Broad-leaf Wedge Pea Gompholobium latifolium, Olive Tea-tree Leptospermum liversidgei, Broad-leaved Paperbark Melaleuca quinqunervia, Monotoca scoparia, Satinwood Nematolepis squamea, Wedding Bush Ricinocarpus pinifolius ,Rush Lily Sowerbaea juncea, Woolly Xanthosia Xanthosia pillosa,

WHERE CAN I SEE IT?

- Localities to view typical examples
- Opposite Ocean Drive pump station, North Haven

WHY IS IT IMPORTANT?

Koala habitat category: Other

PMVC 63B Broad-leaved Paperbark -Swamp Mahogany Swamp Forest on Alluvium

Formation: Forested Wetland	COMMUNITY PHOTO
Sub-formation:	
Class: Coastal Swamp Forests	
EEC analog : Swamp Sclerophyll Forests on coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	
No. field sites:	
Total area: ha	
Floristic type: Melaleuca quinquinervia	
Structure: Melaleuca quinquinervia- Eucalyptus robusta- Gahnia clarkeii .	

WHERE DOES IT GROW?

<u>Landscape position</u>: low lying, lower slope <u>Landform</u>: <u>Soils/origin</u>: alluvium <u>Sits between or within</u>:

HOW DOES IT LOOK?

Typical structure and variations: A very tall open forest dominated by *Melaleuca quinquenervia and Eucalyptus robusta*. Other melaleucas and Willow Bottlebrush are present in the canopy as well as Cabbage Tree Palms. The ground is dominated by *Gahnia clarkeii* in wetter situations and *Lomandra longifolia* in drier situations. The absence of fire will encourage rainforest species to establish and other history of the site eg. grazing, clearing or flooding will influence the vegetations structure and composition.

WHAT USUALLY GROWS THERE?

Tallest stratum: A very tall open forest dominated by Broad-leaved *Melaleuca quinquenervia* and Swamp Mahogany *Eucalyptus robusta*. Prickly-leaved Paperbark *Melaleuca styphellioides*, Willow Bottlebrush *Callistemon salignus* and Cabbage Tree Palm *Livistona australis* are also present.

Mid stratum: This layer is generally sparse and in the absence of fire more typical rainforest species are present such as Lily Pily Acmena smithii, Creek Sandpaper Fig Ficus coronata and Cheese Tree Glochidion ferdinandi.

Lowest stratum: This layer is generally dominated by Tall Saw Sedge Gahnia clarkeii .Other species include the gramminoids (grass and grass-like plants) Cunjevoi Alocasia brisbanensis ,Narrow-leaved Palm Lily *Cordyline stricta*, Spiny-headed Mat Rush *Lomandra longifolia and* Basket Grass *Oplismenus aemulus* .Forbs and perennial geophytes (bulbs and orchids) include Spotted Knotweed *Persicaria strigosa* Vines, climbers and scramblers include Sweet Moorinda *Moorinda jasminoides and* Snake Vine *Stephania japonica*. *Ferns include Rough Tree Fern Cyathea australis, Harsh Ground Fern Hypolepis muelleri and Bracken Fern Pteridium esculentum*.

ARE YOU SURE?

Ecological Community confirmation (using plant species): Melaleuca quinquenervia, Eucalyptus robusta, Gahnia clarkeii and Livistona australis

This Ecological Community differs from PMVC 61B Broad-leaved Paperbark Swamp Woodland/Forest on Alluviums (nearest relative PMVC 62B Broad-leaved Paperbark-Swamp Mahogany Swamp Forest on Alluvium) by having the following species:

Tallest stratum; Swamp Mahogany *Eucalyptus robusta,* Prickly-leaved Paperbark *Melaleuca styphellioides* Lowest stratum; Vines, climbers and scramblers include Sweet Moorinda *Moorinda jasminoides* and ferns Harsh Ground Fern *Hypolepis muelleri*

This Ecological Community differs from PMVC 62B Broad-leaved Paperbark-Swamp Mahogany Swamp Forest on Alluvium (nearest relative PMVC 61B Broad-leaved Paperbark Swamp Woodland/Forest on Alluvium) by having the following species:

Tallest Stratum: Cabbage Tree Palm Livistona australis

Mid Stratum: Lily Pily Acmena smithii, Creek Sandpaper Fig Ficus coronata,

Lowest Stratum: Gramminoids (grass and grass-like plants) include Cunjevoi Alocasia brisbanensis, Narrowleaved Palm Lily Cordyline Stricta, Basket Grass Oplismenus aemulus. Forbs and perennial geophytes (bulbs and orchids): Spotted Knotweed Persicaria strigosa Vines, climbers and scramblers include Sweet Moorinda Moorinda jasminoides, Snake Vine Stephania japonica Ferns include Rough Tree Fern Cyathea australis and Harsh Ground Fern Hypolepis muelleri.

This Ecological Community differs from PMVC 64B Broad-leaved Paperbark- Forest Red Gum Swamp Forest on Alluvium (nearest relative PMVC 62B Broad-leaved Paperbark-Swamp Mahogany Swamp Forest on Alluvium) by having the following species:

Mid Stratum: Creek Sandpaper Fig Ficus coronata

Lowest Stratum: Forbs and perennial geophytes (bulbs and orchids) : Cunjevoi Alocasia brisbanensis, Spotted Knotweed Persicaria strigosa

This Ecological Community differs from PMVC 70 Swamp Oak Coastal Floodplain Wetland Forest (nearest relative PMVC 71 Swamp Oak-Mixed Eucalypt Coastal Floodplain Wetland Forest Complex) by having the following species;

Tallest Stratum; Cabbage Tree Palm Livistona australis

Mid Stratum; Creek Sandpaper Fig Ficus coronata

Lowest Stratum: Gramminoids (grass and grass-like plants) include Narrow-leaved Palm Lily *Cordyline stricta*, Basket Grass *Oplismenus aemulus* Vines, climbers and scramblers include Sweet Moorinda *Moorinda jasminoides* Ferns include Rough Tree Fern *Cyathea australis* and Bracken Fern *Pteridium esculentum*

Lowest Stratum; Narrow-leaved Palm Lily *Cordyline stricta*, Basket Grass *Oplismenus aemulus* Vines, climbers and scramblers include Sweet Moorinda *Moorinda jasminoides*. Ferns include Rough Tree Fern *Cyathea australis* and Bracken Fern *Pteridium esculentum*.

This Ecological Community differs from PMVC 71 Swamp Oak- Mixed Eucalypt Coastal Floodplain Wetland Forest Complex (nearest relative PMVC 70 Swamp Oak Coastal Floodplain Wetland Forest) by having the following species;

Tallest Stratum; Cabbage Tree Palm Livistona australis

Mid Stratum: Lily Pily Acmena smithii, Creek Sandpaper Fig Ficus coronata

Lowest Stratum: Gramminoids (grass and grass-like plants) include Cunjevoi Alocasia brisbanensis, Spinyheaded Mat-Rush Lomandra longifolia Forbs and perennial geophytes (bulbs and orchids) include Spotted Knotweed Persicaria strigosa, Vines, climbers and scramblers include Sweet Moorinda M. jasminoides and Snake Vine Stephania japonica Ferns include Rough Tree Fern Cyathea australis, Harsh Ground Fern Hypolepis muelleri and Bracken Fern Pteridium esculentum

WHERE CAN I SEE IT?

Localities to view typical examples

• Waniora, off Koala Street Port Macquarie

WHY IS IT IMPORTANT?

Koala habitat category: Other