Appendix I

Flora and fauna assessment

Settlement City Shopping Centre – Port Macquarie
Environmental Assessment proposed Stage 1

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Mandis Roberts

FLORA AND FAUNA ASSESSMENT

Expansion and partial redevelopment of Settlement City Shopping Centre

PREPARED FOR	**Manidis Roberts Pty Ltd**
PROJECT NO	**0140-0003**
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Contents

Abbreviations

ABBREVIATION	DESCRIPTION
CAMBA	China-Australia Migratory Bird Agreement
DECC	Department of Environment and Climate Change
DG	Director General
DGR's	Director General Requirements
DoP	Department of Planning
DPI	Department of Primary Industries (including NSW Fisheries)
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
FM Act	*Fisheries Management Act 1995*
JAMBA	Japan-Australia Migratory Bird Agreement
SEPP	State Environmental Planning Policy
TSC Act	*Threatened Species Conservation Act 1995*

Executive Summary

This report provides a flora and fauna assessment for the proposed expansion and partial redevelopment of Settlement City, located 1.3km to the north of the Port Macquarie central business area. The subject site is the existing Settlement City shopping centre and car parks, excluding the Panthers Club. The study area was expanded to include both the subject site, Panthers Club and directly adjoining lands around these built structures, though within the confines of Bay Street and Park Street to the south and east, respectively, and the edge of the canals to the north and west. The objectives of this study were to:

1. Provide an introduction and background to the proposed redevelopment works and study area characteristics (**Section 1.3**).
2. Provide a summary of the legislative requirements associated with the proposed redevelopment (**Section 2**).
3. Undertake data audits to gather existing information on the ecological condition, value and conservation significance of the study area (**Section 4** and **Appendix A**).
4. Conduct field investigations in line with legislative requirements (**Section 3**) to validate existing information, including aquatic and terrestrial habitat assessments and vegetation community validation (**Section 4**).
5. Document and map potential occurrences of aquatic and terrestrial ecological values, including species and Endangered Ecological Communities (EEC) listed under *Threatened Species Conservation Act 1995* (TSC Act) and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) (**Section 5**).
6. Assess the impacts of the proposed development on listed species and communities identified in accordance with:
    i. Part 3A of the EP&A Act including the *Draft Guidelines for Threatened Species Assessment* (DPI&DECC 2005)
    ii. EPBC Act significance assessment guidelines;
    iii. Threatened Species Conservation Act 1995;
    iv. Fisheries Management Act 1995; and
    v. Relevant ecological provisions in environmental planning instruments (SEPPs, REPs, LEPs) (See **Section 6**).

Results

The results of the investigations determined that the study area comprises predominantly built environment (ie the existing Settlment City, Panthers and associated car parks).

Some planted vegetation on the western edge of the study area and scattered plantings within car parking areas and landscaped garden beds offer some value for terrestrial fauna, including the koala (Vulnerable under TSC Act) and grey-headed flying-fox (Vulnerable under TSC Act and EPBC Act)

The western and northern edge of the study area was considered to offer corridor value for terrestrial fauna, in particular koala.

Aquatic ecosystems were observed on the outer edge of and directly adjacent to the north and western boundaries of the study area. This included scattered and depauperate areas of saltmarsh species and grey mangrove.

Some portions of the study area contained primary browse species for koala (ie the western edge and northwest corner) and were considered as Core Koala Habitat under SEPP44 Koala Habitat Protection.

The terrestrial and aquatic ecological constraints based on federal and state legislative considerations were mapped (see **Section 5**).

Impact Assessment

Ecological principals to guided development were established and included:

- Focus the proposed expansion and partial redevelopment within areas of Low Constraint,
- Offset any losses of native vegetation proposed to be removed in areas of Moderate Constraint by compensatory plantings, and
- Avoid development and establish any compensatory plantings within High Constraint areas.

The resulting project design proposed for the expansion and partial redevelopment of Settlement City was found to be in line with the development principals derived from the ecological constraints mapping. The proposal is within the confines of the existing Settlement City Shopping Centre footprint and in areas of Low to Moderate ecological constraint.

Mitigation Measures

Several mitigation and ameliorative measures have been recommended to be incorporated into the Statement of Commitments (refer to **Section 7**), to further reduce and prevent secondary development impacts. These include:

- Conserve and enhance the existing wildlife corridor values and/or connective importance of vegetation along the western and northern edges of the site by avoiding High Constraint areas and undertaking strategic compensatory plantings implemented via a Landscape Management Plan.

- Incorporation of Water Sensitive Urban Design principles, through a Stormwater, Erosion And Sedimentation Management Plan including, where possible, a strategy for managing stormwater run-off, detention and reuse of water. This may include measures such as: temporary bunding should be installed to redirect runoff away from waterfront zones, erosion and sediment control fences, hay bail drainage obstructions, long term sediment detention basins. All measures are to be in place and maintained before and during construction and operation.

- A Construction Environmental Management Plan and Stormwater, and the Erosion And Sedimentation Management Plan is to consider and manage impacts on existing, though scattered and depauperate extent of saltmarsh species (*Sarcocornia quinqueflora, Sueda australis, Sporobolus virginicus* and *Juncus krausii*) colonising the western and northern shorelines, adjacent to the study area.

- Trees proposed to be removed within area of Moderate Constraint are to be replaced by compensatory plantings (ie as landscape trees) of the same species at a ratio of 2:1. Plantings are to be strategically positioned along the northern boundary of the study area or other similar suitable location as directed by the Landscape Management Plan.
- Traffic calming devices such as koala signage, speed limit signs and speed bumps should be considered to reduce traffic collision threats for koala.
- All construction fencing is to be positioned outside of high constraint areas and are to have sufficient gap (ie 20cm) along the base of the fence to allow koala passage.

Conclusions

Provided mitigation measures are incorporated, the proposed expansion and partial redevelopment of Settlement City is considered to meet an "improve or maintain outcome" in accordance with Part 3A of the EP&A Act and will not have a significant impact on protected matters listed under the EPBC Act. The proposal is also considered to be consistent with SEPP44 Koala Habitat Protection, as the majority of Core Koala Habitat will be retained on site, compensatory plantings will offset the loss of primary browse species proposed to be removed, traffic calming devices should reduce current threats and an improved koala corridor is likely to result. Similarly, the proposal will mitigate potential secondary aquatic impacts (SEPP 62 Sustainable Aquaculture and saltmarsh and seagrass) through incorporation of the principals of Water Sensitive Urban Design principles implemented through a Stormwater, Erosion And Sedimentation Management Plan.

1 Introduction

Manidis Roberts Pty Ltd engaged Ecological Australia Pty Ltd (ELA) to prepare a Flora and Fauna Assessment report for the proposed expansion and partial redevelopment of Settlement City Shopping Centre, located 1.3 km to the north of Port Macquarie central business area, hereafter referred to as the study area (Figure 1). This report represents the findings of the ecological investigations and impact assessment that has been undertaken.

To support project application for the proposal, a flora and fauna assessment is required to gain Department of Planning Approval under Part 3A and address the Director Generals Requirements (DGR's) for the expansion and partial redevelopment of the shopping centre.

1.1 OBJECTIVES

Objectives of this ecological assessment are to:

1. Provide an introduction and background to the proposed development works and study area characteristics (**Section 1.3**).
2. Provide a summary of the legislative requirements associated with the proposed redevelopment (**Section 2**).
3. Undertake data audits to gather existing information on the ecological condition, value and conservation significance of the study area (**Section 4** and **Appendix A**).
4. Conduct field investigations in line with legislative requirements (**Section 3**) to validate esisting information, including aquatic and terrestrial habitat assessments and vegetation community validation (**Section 4**).
5. Document and map potential occurrences of aquatic and terrestrial ecological values, including species and Endangered Ecological Communities (EEC) listed under *Threatened Species Conservation Act 1995* (TSC Act) and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) (**Section 5**).
6. Assess the impacts of the proposed development on listed species and communities identified in accordance with:
    i. Part 3A of the EP&A Act including the *Draft Guidelines for Threatened Species Assessment* (DPI&DECC 2005)
    ii. EPBC Act significance assessment guidelines;
    iii. Threatened Species Conservation Act 1995;
    iv. Fisheries Management Act 1995; and
    v. Relevant ecological provisions in environmental planning instruments (SEEPs, REPs, LEPs) (See **Section 6**).

1.2 DESCRIPTION OF PROJECT

The proposed expansion and partial redevelopment will extend the gross floor area by approximately 9,000m² and provide additional car parking spaces. The redevelopment will realign the existing mall, waterfront foodcourt, increase the quantity of retail space, and add a restaurant precinct, cinemas, gym commercial suites and multideck carpark.

1.3 STUDY AREA

The proposed development site is located on the outskirts of the Port Macquarie CBD, within the Hastings Local Government Area (Figure 1). The subject site is the actual area that is proposed to be redeveloped, and is confined to the existing Settlement City shopping centre and carpark. The study area has been expanded to considered impacts on directly adjoining lands and constitutes the Settlement City Shopping Centre, Panthers Club, car parks and directly adjacent lands. The study area is bounded by Park Street to the east and Bay Street to the south. Water frontage is to the north and west of the site. The extent of the study area is approximately 6.4 hectares.

Prior to the construction of the shopping centre and recreation club in 1985, the land was used for agricultural grazing. No original soils or remnant native vegetation are present on the site. Street plantings of native and introduced species are also present within the shopping centre precinct.

The shorelines surrounding the site have limited rock protection. Saltmarsh, seagrasses and mangrove species are present along the western shoreline of the site. Plantings found along the western and northern shoreline slopes consists of mainly native species that naturally occur on sandy soils

Figure 1: Proposed Settlement City Expansion and Partial Redevelopment

2 Legislative Requirements

The following section provides a brief summary of the legislative requirements in relation to ecological issues on site.

2.1 COMMONWEALTH PLANNING INSTRUMENTS

2.1.1 Environmental Protection and Biodiversity Conservation Act 1999

Approval from the Commonwealth Environment Minister is required under the EPBC Act if the action (can include a project, development, undertaking or activity) will, or is likely to, have a significant impact on matters considered to be of national environmental significance (NES matters). The EPBC Act does not define significant impact but identifies matters that are necessary to take into consideration.

In this study area threatened species, ecological communities and migratory species (JAMBA/CAMBA) that are listed under the Act may be relevant.

2.2 STATE GOVERNMENT PLANNING INSTRUMENTS

2.2.1 Environmental Planning and Assessment Act 1979

The proposal is to be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Under Part 3A, the proponent and consent authority must consider all aspects of the environment, including biological, physical, social and economic factors and the principles of ecologically sustainable development, when assessing the impacts of the project. Assessment under Part 3A of the EP&A Act includes consideration of threatened species, endangered populations and communities listed under the TSC Act, Matters of National Environmental Significance listed under the EPBC Act and requires a "maintain or improve" outcome with respect to biodiversity values.

Part 3A of the EP&A Act removes the requirement to assess the significance of impacts on threatened species, populations and ecological communities or their habitat pursuant to Section 5A of the EP&A Act (the 7-part test). However, an assessment of the magnitude and extent of impacts and the significance of the impacts as related to the conservation importance of the habitat, individuals and populations likely to be affected is required (DECC & DPI, 2005).

The Department of Environment and Climate Change (DECC) and the Department of Primary Industries (DPI) have prepared Draft Guidelines for the assessment of impacts on threatened species, populations or ecological communities or their habitats arising from development applications assessed under Part 3A of the EPA Act (DECC DPI, 2005).

The Assessment Guidelines outline guiding principles for the provision of information to "enable decision makers to ensure that developments deliver the following environmental outcomes:

1. "Maintain or improve" biodiversity values (i.e. there is no net impact on threatened species or native vegetation);
2. Conserve biological diversity and promote ESD;
3. Protect areas of high conservation value (including areas of Critical habitat);

4. Prevent the extinction of threatened species;
5. Protect the long-term viability of local populations of a species, population or ecological community; and
6. Protect aspects of the environment that are matters of National Environmental Significance" (pursuant to the EPBC Act).

In order to assess the magnitude of the proposed development and determine whether the above outcomes are achievable, Appendix 3 of the Assessment Guidelines provides guiding assessment questions to identify potential effects of the proposal on threatened species, population or ecological communities or their habitats.

These questions have been addressed in Appendix B of this document for each threatened species, population or ecological community that are known or likely occurrences within the study area. Where a proposal can not avoid or mitigate impacts on threatened species, populations and ecological communities, according to key thresholds, other measures, including undertaking a suitable and approved offset action, may need to be taken.

Director General Requirements have been issued in relation to the proposed redevelopment. Within these requirements the project plan must consider the following:

- Consideration of the consistence of the project with the EP&A Act
- Consideration of any matters of National Environmental Significance under the EPBC Act.
- Address the potential impacts of the project on any aquatic and terrestrial threatened species, populations or ecological communities listed under the TSC Act, *Fisheries Management Act*.
- Outline measures for the conservation of existing wildlife corridor values or connective importance of any vegetation within the site.
- Address measures to protect and manage any riparian corridors or adjacent aquatic habitats.

2.2.2 Threatened Species Act 1995

The TSC Act aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The Act is integrated with the NSW EP&A Act and requires consideration of whether a development or an activity will affect threatened species, populations and ecological communities or their habitat.

2.2.3 Fisheries Management Act 1994

The Fisheries Management Act 1994 (FM Act) aims to conserve, develop and share the fishery resources of NSW for the benefit of present and future generations. The FM Act protects both marine vegetation and threatened species, including species found in inland rivers.

A Part 7 permit is required for:

- activities involving dredging and reclamation work;
- activities temporarily or permanently obstructing fish passage; and
- harming marine vegetation.

As such, a Part 7 permit is required for any activity involving dredging and reclamation work (s.200), harming marine vegetation (i.e. removal of seagrass and mangrove) and for activities temporarily or permanently obstructing fish passage (s219). However, as there is no marine vegetation within the proposed re-development site, the requirement for a permit to harm marine vegetation is not necessary.

Additionally the FM Act, through the *Fish Habitat Protection Plan No.1,* requires public authorities, including local government and state authorities to notify the Minister of any proposal to remove or relocate woody debris. As no such removal will occur, the redevelopment is not subject to the requirements of this plan.

2.2.4 Water Management Act 2000

The *Water Management Act 2000* (WM Act) and *Water Act 1912* (Water Act) control the extraction of water, the use of water, the construction of works such as dams and weirs and the carrying out of activities in or near water sources in NSW. 'Water sources' are defined very broadly and include any river, lake, estuary, place where water occurs naturally on or below the surface of the ground and NSW coastal waters.

If a 'controlled activity' is proposed on 'waterfront land', an approval is required under the WM Act (s91).

'Controlled activities' include:

- the construction of buildings or carrying out of works;
- the removal of material or vegetation from land by excavation or any other means;
- the deposition of material on land by landfill or otherwise; or
- any activity that affects the quantity or flow of water in a water source.

'Waterfront land' is defined as the bed of any river or lake, and any land lying between the river or lake and a line drawn parallel to and 40 metres inland from either the highest bank or shore (in relation to non-tidal waters) or the mean high water mark (in relation to tidal waters). The distance of 40 metres can be reduced by the Water Management (General) Regulation 2004 (the Regulation) Depending upon the regulation, land adjoining coastal waters may also be waterfront land.

Approvals for controlled activities are administered by the NSW Department of Water and Energy (DWE). DWE have developed a set of guidelines to assist applicants who are considering carrying out a controlled activity on waterfront land.

2.2.5 SEPP 14- Coastal Wetlands

State Environmental Planning Policy 14 - Coastal Wetlands (SEPP 14) was introduced to protect coastal wetlands in New South Wales (outside of the Sydney Metropolitan area). Any activity involving filling, draining, levee bank construction or clearing in a gazetted SEPP 14 wetland is designated development under the EP&A Act. An EIS is required to be prepared for all designated development.

No SEPP 14 wetlands occur within the study area and the proposed sand extraction is unlikely to result in secondary impacts on SEPP 14 wetland.

2.2.6 SEPP 44 – Koala Habitat Protection

State Environmental Planning Policy 44 – Koala Habitat Protection (SEPP 44) was introduced to protect potential and core koala habitat in NSW. Under SEPP 44, developers of land with koala habitat (as defined in the SEPP) have to consider the impact of their proposals on koalas, and in certain circumstances, prepare individual koala plans of management for their land.

Councils are encouraged to prepare shire wide koala plans of management and, once agreed to by the NSW Department of Infrastructure, Planning and Natural Resources (DIPNR), they could be used by developers to address koala issues – individual plans would no longer be required.

Port Macquarie Hastings Council has prepared a Draft Koala Plan of Management (KPOM). As this KPOM is still in draft form, the KPOM has been used to inform the SEPP44 assessment process but has not been used in place of the provisions of the SEPP44 policy

2.2.7 SEPP 62- Sustainable Aquaculture

State Environment Planning Policy 62 – Sustainable Aquaculture (SEPP 62) was introduced to protect the commercial cultivation of oysters from declining water quality as a result of development activities and human use. Consent authorities are required to consider whether, because of its nature and location, a development may have an adverse effect on oyster aquaculture or Priorty Oyster Aquaculture Area (POAA). There are oyster leases currently operating within the Hasting River. Advice from DPI is that this SEPP would apply to the development, however broader land use planning issues are not further investigated as part of this report.

2.2.8 SEPP 71- Coastal Protection

State Environmental Planning Policy 71 - Coastal Protection (SEPP 71) was introduced to protect coastal environment in New South Wales. Any activity involved in the proposed redevelopment need to consider SEPP 71 at a planning level, and as such have not been considered within this flora and fauna assessment.

2.3 REGIONAL STRATEGIES AND LOCAL GOVERNMENT PLANNING INSTRUMENTS

2.3.1 Draft Mid North Coast Regional Strategy

The Draft Mid North Coast Regional Strategy applies to the eight local government areas of Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Port Macquarie–Hastings, Greater Taree and Great Lakes. The primary purpose of the Regional Strategy is to ensure that adequate land is available and appropriately located to accommodate the projected housing and employment needs of the Region's population over the next 25 years. The draft strategy places limits on growth in some areas where the value of environmental/cultural assets and natural resources is high. It will apply until 2031 and will be reviewed every 5 years.

The Port Macquarie- Hastings local government area has been identified as a major regional centre that will experience significant population growth pressure along the mid north coast. The centre currently has several regional functions including tertiary education, health care and resort tourism. The Strategy identified two new urban release areas that are proposed to be developed: Thrumster and Bonny Hills. Ongoing development of taller buildings will continue around the Port Macquarie CBD.

Areas of high environmental significance and growth areas are yet to be agreed. The final strategy will incorporate the agreed mapped areas to clearly identify where growth will occur and the places where unplanned growth will be excluded.

The current draft maps provide an indication of the extent and location of growth areas, sites with significant issues, and potential areas of high level constraints. The draft growth area map for Port Macquarie- Hastings indicates that the study area is located within the proposed growth area of the region and is an existing urban area.

2.3.2 Hastings Council Local Environmental Plan

The *Hastings Local Environmental Plan 2001* (LEP) was published in the NSW Government Gazette on 8 June 2001, and applies to the balance of the Port Macquarie-Hastings Council area. The LEP applies development controls to the Council area based on land use zones.

Land use zoning of the Settlement City Shopping Centre site is defined in Zoning Map – Sheet 06/23. The map indicates that the area is zoned as 3(t) Tourist Business. The area to the east of Park Street is zoned as 6(a) open space.

The LES states that the objectives of the Tourist Business zone are to;

- Permit development appropriate to the status and function of the particular business centre
- Permit a range of tourist developments which take advantage of the tourism potential of the centre
- Enable appropriate development where allowed with consent

3 Methods

3.1 INFORMATION GATHERING AND REVIEW

3.1.1 Data Audit

A search of the online EPBC Protected Matters Search Tool and Atlas of NSW Wildlife was performed on 13th January 2009. The search of the EPBC Protected Matters Search Tool and the Atlas of NSW Wildlife covered an area of 10 km radius centered within the study area. Species from both searches were combined to produce a list of threatened species that occur within a 10 km radius.

Appendix A identifies the threatened species returned by the database search together with an assessment of the likelihood of occurrence for each species. Each species' likely occurrence was determined by reviewing records in the area, habitat availability and knowledge of the species' ecology. Five terms for the likelihood of occurrence of species are used in this report, as defined below:

- "yes" = the species was or has been observed on the site.
- "likely" = a medium to high probability that a species uses the site.
- "potential" = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely, or unlikely to occur.
- "unlikely" = a very low to low probability that a species uses the site.
- "no" = habitat on site and in the vicinity is unsuitable for the species.

3.1.2 Literature Review

A literature review of the previous studies undertaken on or near the Settlement City Shopping Centre study area was undertaken to gain further knowledge of the potential flora and fauna species that may occur within the study area.

- Of particular relevance is the *Flora and Fauna Assessment* by Anne Clements and Associates in September 2005 which was summarised in the 2006 Concept Plan for the site.

3.2 DEPARTMENTAL CONSULTATION

The DGR's state that consultation must be undertaken with the following agencies during the preparation of the environmental assessment:

- NSW Roads and Traffic Authority
- Department of Natural Resources
- Department of Primary Industries (Port Stephens Fisheries Centre); and
- Hastings Council

ELA was required by the client to consult with NSW DPI only. As such, ELA wrote to Mr Patrick Dwyer of the Aquatic Ecosystems branch advising him that he would be consulted in mid February. Antony von Chrismar of ELA discussed the proposed redevelopment with Mr Dwyer on 18 February 2009 and correspondence was recorded via email.

3.3 FIELD INVESTIGATION

A one day site assessment of the study area was undertaken by Antony von Chrismar of Eco Logical Australia on the 23rd of January 2009. The survey involved an investigation of the extent of the existing Settlement City development and a traverse of the study area on foot to identify ecological constraints (*ie.* evidence of the presence of or suitable habitat for threatened fauna, threatened flora and endangered ecological communities). Weather conditions during field surveys are outlined in Table 2.

Table 2: Weather conditions during field surveys

Date	Min Temp (°C)	Max Temp (°C)	Rainfall (mm)
23rd January 2009	21	31	0

Weather observations were taken from Port Macquarie Airport (www.bom.gov.au)

3.3.1 Habitat Assessment

A habitat assessment (pro-forma based) was undertaken at suitable locations within the study area (See **Figure 2**) that entailed identifying habitat characteristics, both terrestrial and aquatic, including floristic composition and structure, forage resources, log and hollow resources, disturbance history and habitat interconnectivity.

3.3.2 Vegetation Validation

Five vegetation survey transects were undertaken at suitable locations where vegetation existed within the study area (See **Figure 2**).. All plant species were identified using current nomenclature provided on PlantNet (2009) and according to Harden (1991). Species occurrence was recorded according to vegetation strata. The results were used to verify the findings of previous studies (ie Clements 2005).

3.3.3 Opportunistic Observations

All opportunistic sightings and observations of secondary evidence (eg signs of fauna habitation) were recorded in the field. This included evidence of fauna tracks and scats.

3.3.4 SEPP44 Koala Habitat Assessment

In order to fullfill the requirements of SEPP44 Koala Habitat Protection, an evaluation of the proportion of Primary Browse Trees, listed under Schedule 2 of SEPP44, in the upper and lower canopy component across the study area was undertaken. Primary Browse Trees were also specifically targeted for signs of koala occupation. In addition, areas to the east and north east of the study area were investigated for signs of koala to inform an evaluation of habitat use and potential koala corridor values.

Figure 2: Field Methods

4 Results

4.1 INFORMATION GATHERING AND REVIEW

4.1.1 Data Audit

The likelihood of occurrence table in Appendix A contains an assessment of whether habitat on site is suitable for those threatened species and ecological communities and migratory species that have been recorded within 10km of the site. The threatened species, populations and EEC's considered likely to occur listed are the koala (listed as vulnerable under the TSC Act) and grey-headed flying fox (listed as vulnerable under the TSC Act and EPBC Acts)

The koala is known to have previously occurred on site and is associated with both wet and dry Eucalypt forest and woodland that contains a canopy cover of approximately 10 to 70% (Reed et al. 1990), with acceptable Eucalypt food trees. Some preferred eucalyptus species are: *Eucalyptus tereticornis, E. punctata*, *E. cypellocarpa*, *E. Viminalis*.

The grey-headed flying fox potentially utilises habitat features on site. Generally it inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas (Churchill 1998, Eby 1998). Camps are often located in gullies, typically close to water, in vegetation with a dense canopy (Churchill 1998).

It is noted that data extracted from the Atlas of NSW Wildlife and DEW Protected Matters Report are only indicative and cannot be considered a comprehensive inventory. It is further noted that the EPBC Protected Matters search identified a number of marine species (turtles, cetaceans, sharks, migratory marine species) as potentially occurring within a 10 kilometre radius of the site. Given the terrestrial nature of the proposed redevelopment, these species have been excluded from the list as they are unlikely to be in indirectly or directly impacted by the action.

4.1.2 Literature Review

An assessment of the flora and fauna on and adjoining the Settement City Shopping Centre and the Panthers Club in Port Macquarie was undertaken in early September 2005 by Clements (2005). Sampling of the presence of vegetation at the site was carried out at 22 spot locations along the edges the study area. No methods were indicated in the report of the methods used for fauna observations.

The 2005 assessment determined that no original soils or remnant vegetation occurred at the site due to existing land construction. Along the canal to the west of the site, well established beds of the seagrass/Eelgrass *(Zostera capricorni*) were recorded. Mangroves occurred in small numbers with only one mature plant, grey mangrove (*Avicennia marina*), observed. Some colonisation of saltmarsh associate species: *Juncus kraussii*, *Sporobolus virginicus*, *Sarcocornia quinqueflora* and *Suaeda australis*, was found on the western shoreline slopes.

Planting of mostly native species was observed in 2005 on the western and northwest slopes between a 1m high Bessar block wall and the shoreline. Of the 30 species recorded, *Casuarina glauca* was the most abundant species in these areas. The noxious weed, Bitou Bush (*Chrysanthemoides monilifera subsp. rotundata*) was the most commonly recorded exotic species at these sites.

Street planting along Bay Street, Park Street, surrounding the shopping centre and the club in 2005 were mainly comprised of nursery stock species, including native and exotic trees and shrubs.

There is minimal information in the 2005 assessment report of the fauna present at the site. Only one observation is noted within the report of oysters that were observed to be spawning in the adjoining waters of the canal to the west of the site.

In addition to a description of the flora within the site, the 2005 assessment report made four key recommendations including;

- Treatment of storm run-off from the shopping centre and car park should be upgraded if any future development occurs on the site
- Exotic species should be removed and replaced with local native species
- A planting scheme should be developed and implemented to replace the ageing landscape incorporating existing successful species on the site such as tuckeroo (*Cupaniopsis anacardioides*)
- The built base of the revetment wall in the western area of the site should be investigated by an engineer

4.2 DEPARTMENTAL CONSULTATION

The following key issues were raised by the DPI to be addressed in the environmental assessment included;

- Advised that the client would need to take into consideration the requirements of SEPP 62 – Sustainable Aquaculture. With particular regard to potential impacts on the local oyster fishery.
- Given that the project is essentially redevelopment within existing infill development, emphasis was not placed on achieving prescriptive buffers, such as those administered under the *Water Management Act* for example, a policy that is dealt with by DWE, but rather to focus on improving the current state of stormwater management to prevent potential contaminants from entering the local fishery consistent with achieving SEPP 62 requirements.
- Potential impacts on local sea grass beds were also raised, not only from runoff, but also impacts from a shading due to construction activities.

4.3 FIELD INVESTIGATION

4.3.1 Habitat Assessment

The study area encompasses an essentially artificial and modified area associated with the reclaimed lands of the local canal development. As such, the habitat available on site comprises landscape plantings (both native endemic, non-endemic) and, where allowed, the regeneration of any introduced seed to the study area (both native and exotic).

Terrestrial Habitat

A narrow strip along the northwest corner, western edge, the southwest edge of the study area contains predominantly native endemic landscape plantings, with some locally non-endemic native species and

ornamental species, such as cadadgi (*Corymbia torelliana*), cocos palm (*Syagrus romanzoffiana*). Other isolated plantings also occur within the existing car park in the southeast portion of the study area.

In terms of structural habitat values (ie the presence of leaf litter, debris, logs and hollows), the study area is extremely simplified, due to the young age of landscape plantings and grounds maintenance. The strip along the western edge of the study area presents some minor exception to this, whereby litter and debris has accumulated to some degree along the ground. No hollow bearing trees occur within the study area.

Landscape plantings within the study area are likely to provide forage resources, including seasonal inflorence and foliavore browse trees, such as the important winter flowering eucalypts forest red gum (*Eucalyptus teretecornis*) and tallowwood (*E. microcorys*).

The strip of vegetation along the western edge of the study area provides some potential corridor function for more mobile fauna groups, cabable of traversing some areas of open ground within the urban matrix.

Aquatic and Esturatine Habitat

Although beyond the extent of the subject site, estuarine aquatic habitat extended along the lower edge of the rock embankment adjacent to the northern and western boundary of the study area, interfacing with the artificial canals of the local canal development. Sydney rock oysters (*Saccostrea glomerata*) were observed along the rock embankment, below which deposited sand occurred. This area was also found to have supported colonisation of some esturine flora and fauna, such as a small clump of grey mangrove (*Avicenia marina*) and fiddler crabs (*Uca perplexa*). Deposited sand below the high water mark of the embankment to the west of the site supported colonies of seagrass (*Zostera capricorni*).

Small numbers of colonising saltmarsh species (*Sarcocornia quinqueflora, Sueda australis, Sporobolus virginicus* and *Juncus krausii*) were also found along the intertidal zone. As stated in Clements (2005) the presence of such species indicates that these areas are regularly inundated. Due to their occurrence outside of the study area and subject site, poor condition, low density and colonisation of an artificial environment, these saltmarsh species have not been assessed as 'Coastal Saltmarsh' ECC under the TSC Act. Potential impacts on the aquatic and estuarine environment have none the less been considered and addressed in mitigation measures.

4.3.2 Vegetation Validation

Vegetation within the study area generally concurs with the findings of Clements (2005). Recorded flora species according to transects surveyed are provided in **Appendix C**, with transect locations provided in Figure 2. Formal vegetation types and communities were not observed or mapped within the study area, as most of the vegetation was landscape plantings with some natural colonisation of locally endemic species and weed species. Instead, broad vegetation zones have been mapped to provide an indication of the distribution of vegetation across the study area (refer to **Figure 3**).

No threatened flora species or endangered ecological communities were recorded or are considered likely to occur within the study area, as all vegetation is considered planted.

Zone 1 –Locally endemic native plantings with minimal maintenance

This zone occurred as a strip along the western edge of the study area. Emergent and canopy species included forest red gum (*Eucalyptus teretecornis*), tallowwood (*E. microcorys*), swamp oak (*Casuarina glauna*), broad-leaved paperbark (*Melaleuca quinquenervia*), bleeding heart (*Omalanthus populifolius*). Some occurrence of non-endemic cadaghi was also present in this zone. The shrub layer included coastal wattle (*Acacia longifolia*), swamp wattle (*Acacia elongata*), Callistemon sp. Ground layer species included spiney headed mat-rush (*Lomandra longifolia*), blue flax lilly (*Dianella caerulea*). A small patch of grey mangrove occurred on the western interface of the study area, as referred to in Clements (2005). Bitou bush (*Chrysanthemoides monilifera*), ochna (*Ochna serrulata*) and common olive (*Olea europaea*) were also found.

Zone 2 – Non-endemic exotic plantings and lawns within garden maintenance

This zone occurred along the northern edge of the study area and is subject to ongoing grounds maintenance, such as lawn mowing and pruning. Most of the plantings in this zone are not locally endemic or native. Species include emergent cocas palms, hedges and lawns of common couch (*Cynodon dactylon*).

Zone 3 – Scattered endemic or non-locally endemic native plantings with maintenance

This zone encompassed areas where plantings occurred within or adjacent to existing car parks and built structures subject to ongoing grounds maintenance. Many of the plantings were native species, including tallowwood, forest red gum, spotted gum (*Corymbia maculata*), flooded gum (*Eucalyptus grandis*). The ground layer lacked structure, though with some ornamental and native plantings, such as spiney headed mat-rush.

4.3.3 Opportunistic Observations

All opportunistic sightings or observations of species presence were recorded and are provided in the species list in **Appendix C**.

One threatened species, the koala, was recorded within the study area, though outside of the subject site, based on the presence of identified koala scats and scratches (refer to Figure 3 for scat tree locations).

4.3.4 SEPP 44 Koala Habitat Assessment

Potential Koala Habitat Assessment

Potential Koala Habitat is defined as areas where the tree species listed under Schedule 2 (Table 3) constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. An area of land to which the policy applies must be at least one hectare in area (and may include adjoining land in the same ownership).

The study area contains greater than 15% primary browse trees in the upper and mid canopy component, with concentrations of browse trees, such as forest red gum and tallowwood along the western boundary of the study area. As such a Core Koala Habitat assessment is required, as provided below.

Table 1: SEPP 44 Schedule 2 Primary Browse Trees

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

Core Koala Habitat Assessment

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.

Trees present witin the study area were visually searched for koalas, the trunks were inspected for scratches and the ground searched for faecal pellets. Koala scats and scratches were observed at two locations in the northwest corner of the study area, as well as other locations outside of the study area to the east and north east (refer **to Figure 3**).

The Atlas for Wildlife database was searched for records of koala sightings within the study area and locality. The closest record of koala is approximately 700m to the south within a narrow corridor remnant indirectly linked to the study area, followed by a record 940m south in the same corridor and adjacent to the Oxley Highway. Although the study area and locality is fragmented by the Port Macquarie urban matrix, koala movement through this matrix is widely recorded and it is considered likely that the local koala population is utilising the site in the context of the tenuous north to south corridor link, albiet with associated threats (ie traffic and dogs). Given these signs of koala presence and nearby local records, it is considered that portions of the site (ie where primary browse trees occur along the western edge of the study area) met the definition of Core Koala Habitat under SEPP44.

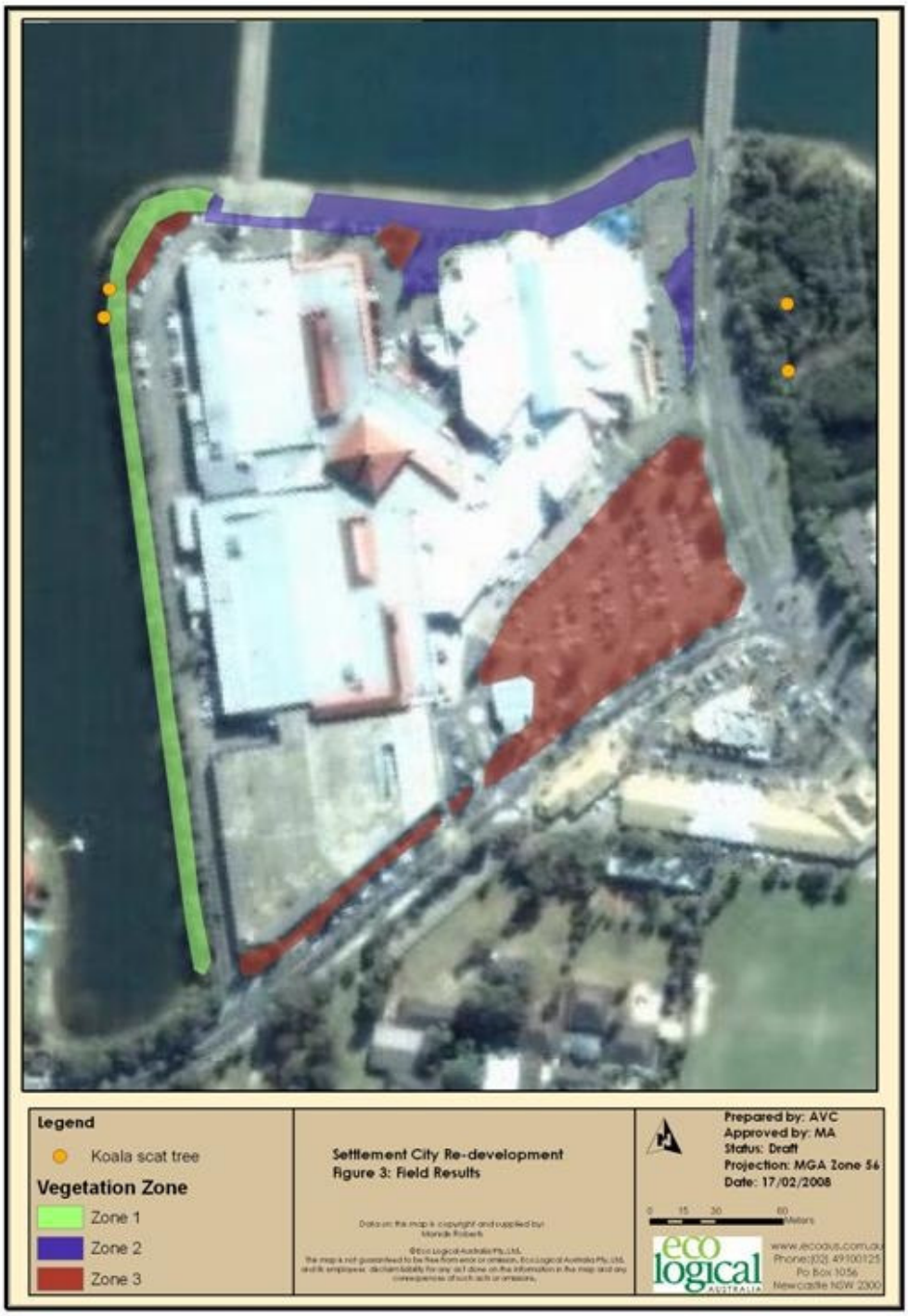

Figure 3: Vegetation zones and field results

5 Ecological Constraints

This section identifies high, moderate and low environmental constraints based on the relevant legislation and regulation requirements and existing habitat values within the study area. The following sections outlines the ecological constraints of the study area and provides a map illustrating the extent of the levels of constraint (refer to **Figure 4**).

5.1 HIGH CONSTRAINT

High constraint areas were identified as occurring along the western and northern edge of the study area and should be avoided in any proposed development. Specifically, the following factors provide a justification of why High Constraint areas have been mapped in these areas.

- The western and northern edge of the site represents a corridor of Core Koala Habitat. While the context of the habitat is poor due to fragmentation and associated threats of the surrounding urban infrastruture, the existing corridor can be maintained and recommended mitigation measures will improve habitat value and connectivity in the medium to long term.

- The *Water Management Act 2000* requires that a Core Riparian Zone of between 20 and 40 metres is considered for waterfront developments. Given the proposal is infill development and following DPI advice, a High Constraint area is identified as the extent of non-developed land adjacent to the foreshore. This areas serves as a buffer between the proposed redevelopment and the water front.

- Aquatic and estuarine habitats, including scattered and depauperate salt tolerant species, mangroves and sea grasses, are recolonising aquatic areas directly adjacent to the north and west of the study area. While the condition of these communities is poor and fragmented, it is important to manage development impacts in order to maintain the current ecological function of these aquatic communities. The estuarine areas are unable to be mapped due to the scale of the site in comparison to their relative distrubtion and abundance.

5.2 MODERATE CONSTRAINT

Areas within the study area that contain moderate ecological constraints include;

- Native and introduced tree species, including primary koala browse trees, planted throughout the existing car park area and along adjacent streets in low densities. Trees in the Moderate Constraint area provide some potential ecological value as forage (ie primary browse trees). It is recommended that trees in this area be retained where possible within the site. Where tree removal is unavoidable, compensatory plantings can be positioned within High Constraint areas, for example in the lawn area along the northern edge of the study area.

5.3 LOW CONSTRAINT

Low constraint areas within the study area comprise the built environment of the existing Settlement City development and should be the focus of any proposed redevelopment

Figure 4: Ecological Constraints.

6 Impact Assessment

6.1 POTENTIAL ECOLOGICAL IMPACTS OF THE PROPOSED DEVELOPMENT

6.1.1 General Impacts

The proposed expansion and partial redevelopment (refer to Figure 1) will increase the capacity and update facilities of the shopping centre. As such, the proposal has the potential to cause impacts to the ecology of the site and its surrounds. General impacts that may result from the proposal include:

- Increase in the use of the site by the community leading to increased anthropogenic impacts. While this use is expected to remain within the footprint of the development, there is potential for increased littering and disturbance to occur in the surrounding environment. This may cause a decrease in the health and condition of the surrounding vegetation and adjacent shoreline environment along the northern and western slopes of the site.

- Increase in stormwater runoff from the shopping centre and carpark may potentially impact the water quality of the adjacent watercourse. A larger area of non porous surfaces on the site may result in greater volumes of runoff from the site containing pollutants. Runoff entering the adjacent waterway has the potential to decrease water quality and impact on estuarine species and communities.

6.1.2 Impacts on Terrestrial Habitat

Impacts on terrestrial habitat may occur within the footprint of the redevelopment or in areas adjacent to the redevelopment footprint.

- Removal of terrestrial habitat - Terrestrial habitat within the footprint is limited. A number of native and introduced tree plantings located in existing car parks will be removed as a result of the redevelopment. Introduced trees are not of high ecological significance, and their removal is unlikely to cause a significant impact on the ecology of the site and its surrounds. However, the removal of primary browse species for koala (discussed in 4.3.4) is likely to result in a decrease in foraging material for the species.

- Disturbance of habitat from construction operations - Direct impacts on adjacent areas of terrestrial habitat may result from construction operations. The installation of construction fences within Zone 1 and 3 of the site may disturb the movement of koala's through this habitat. The fences may also cause additional disturbance to habitat and impact on the condition of the vegetation corridor.

6.1.3 Impacts on Aquatic Habitat

Aquatic habitat that is located adjacent to the western and northern boundaries of the study area has the potential to be either directly or indirectly impacted by the development:

- Disturbance of estuarine aquatic habitat – The footprint of the redevelopment does not encroach on existing shoreline habitat, but there is potential for construction operations to impact on these areas.

- Increased runoff and sedimentation – Short term increases in sediments from construction runoff has the potential to impact on adjacent seagrass communities. Reduced light attenuation of waters along the western area of the site may potentially lead to loss of seagrass communities.

- Impacts on water quality also has the potential adversely impact on the health of commercial produced oysters within 10 km of the site (as per SEPP 62).

6.2 EP&A ACT- PART 3 GUIDELINES ASSESSMENT

The Part 3A assessment of impacts on threatened species and ecological communities according to DECC and DPI guidleines (DECC DPI 2005) is provided in **Appendix B**. Two species, the koala and the grey-headed flying-fox were either recorded or considered likely to occur within the study area and have been assessed against the questions provided in DECC and DPI (2005). It is considered that provided the mitigation and ameliorative measures provided in Section 7.1 are adopted as part of the proposal and incorporated into the statement of commitments, then the proposal will fullfill an "improve or maintain outcome" under these guidlines.

6.3 THE EPBC ACT ASSESSMENT OF IMPACTS ON THREATENED AND MIGRATORY SPECIES

Under the Act any action which "has, will have, or is likely to have a significant impact on a matter of national environmental significance" is defined as a "controlled action", requires approval from the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) which is responsible for administering the *EPBC Act*.

The grey-headed flying-fox was considered likely to occur within the study area and has been assessed against the EPBC guidelines for assessment of impacts on threatened and migratory species, provided in Appendix B. It is considered that provided the mitigation and ameliorative measures provided in Section 7.1 are adopted as part of the proposal and incorporated into the statement of commitments then impacts on protected matters listed under the EPBC Act will be avoided.

7 Draft Statement of Commitments – Flora and Fauna

7.1 MITIGATION AND AMELIORATION

The following measures provide for the conservation of aquatic and terrestrial flora and fauna and their habitats as they occur on and adjacent to the subject redevelopment site. It is recommended that these measures are incorporated in to the statement of commitments for the project.

- Conserve and enhance the existing wildlife corridor values and/or connective importance of vegetation along the western and northern edges of the study area by avoiding High Constraint areas and undertaking strategic compensatory plantings implemented via a Landscape Management Plan.
- Incorporation of Water Sensitive Urban Design principles, through a Stormwater, Erosion And Sedimentation Management Plan including, where possible, a strastegy for managing stormwater runoff, detention an reuse of water. This may include measures such as: temporary bunding should be installed to redirect runoff away from waterfront zones, erosion and sediment control fences, hay bail drainage obstructions, long term sediment detention basins. All measures are to be in place and maintained before and during construction and operation.
- A Construction Environmental Management Plan and Stormwater, and the Erosion And Sedimentation Management Plan is to consider and manage impacts on existing, though scattered and depauperate extent of saltmarsh species (*Sarcocornia quinqueflora, Sueda australis, Sporobolus virginicus* and *Juncus krausii*) colonising the western and northern shorelines.
- Trees proposed to be removed within areas of Moderate Constraint are to be replaced by compensatory plantings (ie as landscape trees) of the same species at a ratio of 2:1. Plantings are to be strategically positioned along the northern boundary of the study area or other similar suitable location as directed by the Landscape Management Plan.
- Traffic calming devices such as koala signage, speed limit signs and speed bumps should be considered to reduce traffic collision threats for koala.
- All construction fencing is to be positioned outside of High Constraint areas and is to have sufficient gap (ie 20cm) along the base of the fence to allow koala passage.

8 Conclusion

This report provides a flora and fauna assessment for the proposed expansion and partial redevelopment of Settlement City, located 1.3km to the north of the Port Macquarie central business area.

The results of the investigations determined that the study area comprises predominantly built environment (ie the existing Settlment City, Panthers and associated car parks). Some planted vegetation on the western edge of the study area and scattered plantings within car parking areas and landscaped garden beds offer some value for terrestrial fauna, including the koala (Vulnerable under TSC Act) and grey-headed flying-fox (Vulnerable under TSC Act and EPBC Act) The western and northern edge of the study area was considered to offer corridor value for terrestrial fauna, in particular koala. Aquatic ecosystems were observed on the outer edge of and directly adjacent to the north and western boundaries of the study area. This included scattered and depauperate areas of saltmarsh species and grey mangrove.

Some portions of the study area contained primary browse species for koala (ie the western edge and northwest corner) and were considered as Core Koala Habitat under SEPP44 Koala Habitat Protection. The terrestrial and aquatic ecological constraints including federal and state legislative requirements were mapped (see Section 5).

Ecological principals to guide development were established and included:

- Focus the proposed expansion and partial redevelopment to within areas of Low Constraint,
- Offset any losses of native vegetation proposed to be removed in areas of Moderate Constraint by compensatory plantings, and
- Avoid development and establish any compensatory plantings within High Constraint areas.

The resulting concept design proposed for the expansion and partial redevelopment of Settlement City was found to be in line with the development principals derived from the ecological constraints mapping. The proposal is within the confines of the existing Settlement City Shopping Centre footprint and in areas of Low to Moderate ecological constraint.

Several mitigation and ameliorative measures have been recommended to be incorporated into the Statement of Commitments (refer to Section 7), to further reduce and prevent secondary development impacts.

Provided mitigation measures are incorporated, the proposed expansion and partial redevelopment of Settlement City is considered to meet a “improve or maintain” outcome in accordance with Part 3A of the EP&A Act and will not have a significant impact on protected matters listed under the EPBC Act. The proposal is also considered to be consistent with SEPP44 Koala Habitat Protection, as the majority of Core Koala Habitat will be retained on site, compensatory plantings will offset the loss of primary browse species proposed to be removed, traffic calming devices should reduce current threats and an improved koala corridor is likely to result. Similarly, the proposal will mitigation potential secondary aquatic impacts (SEPP 62 Sustainable Aquaculture and saltmarsh and seagrass)through incorporation of the principals of Water Sensitive Urban Design principles implemented through a Stormwater, Erosion And Sedimentation Management Plan.

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Appendix A: Likelihood of Occurrence Tables

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the database search. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the field survey and professional judgement. The terms for likelihood of occurrence are defined below:

- "yes" = the species was or has been observed on the site
- "likely" = a medium to high probability that a species uses the site
- "potential" = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- "unlikely" = a very low to low probability that a species uses the site
- "no" = habitat on site and in the vicinity is unsuitable for the species.

FAUNA

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
FROGS					
Crinia tinnula	Wallum Froglet	V	—	Wallum swamps and associated low land meandering watercourses on coastal plains (Ehmann 1997). Occurs in elevations up to around 50m and is closely related to freshwater habitats in the coastal zone (DECC 2007). Found most commonly in wallum wetlands characterised by low nutrients, highly acidic, tanin-stained waters that	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
				are typically dominated by paperbarks and tea-trees. Also found in sedgeland and wet heathland (DECC 2007)	
Litoria aurea	Green and Golden Bell Frog	E	V	This species has been observed utilising a variety of natural and man-made waterbodies (Pyke & White 1996) such as coastal swamps, marshes, dune swales, lagoons, lakes, other estuary wetlands, riverine floodplain wetlands and billabongs, stormwater detention basins, farm dams, bunded areas, drains, ditches and any other structure capable of storing water (DECC 2007). Fast flowing streams are not utilised for breeding purposes by this species (Mahony 1999). Preferable habitat for this species includes attributes such as shallow, still or slow flowing, permanent and/or widely fluctuating water bodies that are unpolluted and without heavy shading (DECC 2007). Large permanent swamps and ponds exhibiting well-established fringing vegetation (especially bulrushes–Typha sp. and spikerushes–Eleocharis sp.) adjacent to open grassland areas for foraging are preferable (Ehmann 1997; Robinson 1993). Ponds that are typically inhabited tend to be free from predatory fish such as Mosquito Fish (Gambusia holbrooki) (DECC 2007).	No
Litoria brevipalmata	Green Thighed Frog	V	—	Wet sclerophyll forest along the northern coast of NSW to Ourimbah (Anstis 2002). Also in a variety of habitats including dry to wet sclerophyll forest, rainforests and shrubland with a healthy understorey (DECC 2007). Breeding aggregations occur in still water habitats such as grassy temporary to semi-permanent ponds and flooded	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
				ditches in late spring and summer (Cogger 2000; Anstis 2002; DECC 2007).	
DIURNAL BIRDS					
Lathamus discolour	Swift Parrot	E1	E	Breeds in Tasmania between September and January. Migrates to mainland in autumn, where it forages on profuse flowering Eucalypts (Blakers et al. 1984; Schodde and Tidemann 1986; Forshaw and Cooper 1981). Hence, in this region, autumn and winter flowering eucalypts are important for this species. Favoured feed trees include winter flowering species such as Swamp Mahogany (Eucalyptus robusta), Spotted Gum (Corymbia maculata), Red Bloodwood (C. gummifera), Mugga Ironbark (E. sideroxylon), and White Box (E. albens) (DECC 2007).	No
Thalassarche cauta	Shy Albatross	V	V, M	This pelagic or ocean-going species inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea, although occasionally it occurs in continental shelf waters, in bays and harbours. Although uncommon north of Sydney, the species is commonly recorded off southeast NSW, particularly between July and November. Breeding occurs from September to December at Albatross Island off Tasmania, Auckland Island, Bounty Island and The Snares, off New Zealand, The species feeds on fish, crustaceans, offal and squid and may forage in mixed-species flocks.	No
Ptilinopus regina	Rose-crowned Fruit-Dove	V	—	Tall tropical and subtropical, evergreen or semi-deciduous rainforests, especially with a dense growth of vines trees (Marchant and Higgins 1999). Also located in closed wet sclerophyll forest, gallery forests or sclerophyll woodlands with abundant fruiting trees, near or next to rainforest	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
				(DECC 2007). Is thought to prefer large areas of vegetation, but has been located in patches and occasionally in parks and gardens with fruiting trees (Marchant and Higgins 1999).	
Sterna albifrons	Little Tern	E, M	—	Almost exclusively coastal, preferring sheltered areas (DECC 2007), however may occur several kilometres inland in harbours, inlets and rivers (Smith 1990). Australian birds breed on sandy beaches and sand spits (Simpson & Day 1999).	No
Sterna fuscata	Sooty Tern	V	—	Forages offshore, usually only observed onshore in breeding season or when storms force them to shelter (DECC 2007)	No
Stictonetta naevosa	Freckled Duck	V	—	Associated with a variety of plankton-rich wetlands, such as heavily vegetated, large open lakes and their shores, creeks, farm dams, sewerage ponds and floodwaters (DECC 2007).	No
Xanthomyza phrygia	Regent Honeyeater	E	E, M	Associated with temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts, and riparian forests of River Oak (Casuarina cunninghamiana) (Garnett 1993). Areas containing Swamp Mahogany (Eucalyptus robusta) in coastal areas have been observed to be utilised (NPWS 1997). The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes (NPWS 1995). As such it is reliant on locally abundant nectar sources with different	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
				flowering times to provide reliable supply of nectar (Environment Australia 2000).	
Xenus cinereus	Terek Sandpiper	V	M	A rare migrant to the eastern and southern Australian coasts, being most common in northern Australia, and extending its distribution south to the NSW coast in the east (DECC 2007). The two main sites for the species in NSW are the Richmond River estuary and the Hunter River estuary (DECC 2007). In Australia, has been recorded on coastal mudflats, lagoons, creeks and estuaries (DECC 2007). Favours mudbanks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools (DECC 2007). Generally roosts communally amongst mangroves on dead trees, often with related wader species (DECC 2007).	No
NOCTURNAL BIRDS					
Ninox strenua	Powerful Owl	V	—	Powerful Owls are associated with a wide range of wet and dry forest types with a high density of prey, such as arboreal mammals, large birds and flying foxes (Environment Australia 2000, Debus & Chafer 1994). Large trees with hollows at least 0.5m deep are required for shelter and breeding (Environment Australia 2000).	No
Tyto capensis	Grass Owl	V	—	Reported habitats include tall grass, swampy, sometimes tidal areas, mangrove fringes, grassy plains, coastal heaths, grassy woodland, cane grass, lignum, sedges,	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
				cumbungi, cane fields and grain stubble (Pizzey and Knight, 1997). The Grass Owl nests on the ground within dense tall grass, sedges, reeds and even sugarcane plantations (Pizzey and Knight, 1997). The Grass Owl primarily feeds on rodents, hunting on the wing over heathland, grassland and sedgeland, as well as along the edge of sugar cane, crops and pastureland (Pizzey and Knight, 1997).	
Tyto novaehollandiae	Masked Owl	V	—	Associated with forest with sparse, open, understorey, typically dry sclerophyll forest and woodland (DECC 2007) and especially the ecotone between wet and dry forest, and non forest habitat (Environment Australia 2000). Known to utilise forest margins and isolated stands of trees within agricultural land (Hyem 1979) and heavily disturbed forest where its prey of small and medium sized mammals can be readily obtained (Kavanagh & Peake 1993).	No
MAMMALS (EXCLUDING BATS)					
Aepyprymnus rufescens	Rufous Bettong	V	—	Prefer forests with a grassy to sparse understorey including coastal forest, tall wet sclerophyll forest and dry forests west of GDR (DECC 2007). It is most commonly found on sites derived from sedimentary rock and in north eastern NSW in forests characterised by Spotted Gum (Corymbia maculata and C. henryi) (DECC 2007). It has been known to feed on introduced pasture species (DECC 2007).	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Dasyurus maculatus *Dasyurus maculatus maculatus*	Spotted-tailed Quoll Spotted-tailed Quoll (SE Mainland Population)	V —	— E	The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests (Mansergh 1984; DECC 2007j), more frequently recorded near the ecotones of closed and open forest. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in (DECC 2007). Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; burrows (Environment Australia 2000).	No
Petaurus australis	Yellow-bellied Glider	V	—	This species is restricted to tall mature forests, preferring productive tall open sclerophyll forests with a mosaic of tree species including some that flower in winter (Environment Australia 2000, Braithwaite 1984, Davey 1984, Kavanagh 1984; DECC 2007). Large hollows within mature trees are required for shelter, nesting and breeding (Henry and Craig 1984; DECC 2007).	No
Petaurus norfolcensis	Squirrel Glider	V	—	Associated with dry hardwood forest and woodlands (Menkhorst et al. 1988; Quin 1995). Habitats typically include gum barked and high nectar producing species, including winter flower species (Menkhorst et al. 1988). The presence of hollow bearing eucalypts is a critical habitat value (Quin 1995).	No
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Rocky areas in a variety of habitats, typically north facing sites with numerous ledges, caves and crevices (Strahan	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
				1995).	
Phascogale tapoatafa	Brush-tailed Phascogale	V	—	Preferred habitat is Dry Open forest with a sparse open understorey, however, has been located in heath, swamps and rainforest and wet sclerophyll forest (DECC 2007).	No
Phascolarctos cinereus	Koala	V	—	Associated with both wet and dry Eucalypt forest and woodland that contains a canopy cover of approximately 10 to 70% (Reed et al. 1990), with acceptable Eucalypt food trees. Some preferred Eucalyptus species are: Eucalyptus tereticornis, E. punctata, E. cypellocarpa, E. viminalis	Yes
Planigale maculata	Common Planigale	V	—	Subtropical to dry rainforest, dry sclerophyll forest, heathland and grassland up to 400m elevation (DECC 2007; Strahan 1998). Habitat selection is dependant on surface cover (DECC 2007).	No
Potorous tridactylus *Potorous tridactylus tridactylus*	Long-nosed Potoroo Long-nosed Potoroo (SE Mainland Population)	V —	— V	Associated with dry coastal heath and dry and wet sclerophyll forests (Strahan 1998) with dense cover for shelter and adjacent more open areas for foraging (Menkhorst & Knight 2004).	No
Pseudomys gracilicaudatus	Eastern Chestnut Mouse	V		In NSW the Eastern Chestnut Mouse is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps (DECC 2007). Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously (DECC 2007). By the time the heath is mature, the larger Swamp Rat	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
				becomes dominant, and Eastern Chestnut Mouse numbers drop again (DECC 2007).	
MAMMALS (BATS)					
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	The Large-eared Pied Bat has been recorded in a variety of habitats, including dry sclerophyll forests, woodland, sub-alpine woodland, edges of rainforests and wet sclerophyll forests (Churchill 1998; DECC 2007). This species roosts in caves, rock overhangs and disused mine shafts and as such is usually associated with rock outcrops and cliff faces (Churchill 1998; DECC 2007).	No
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	—	Prefers moist habitats with trees taller than 20m (DECC 2007). Roosts in tree hollows but has also been found roosting in buildings or under loose bark (DECC 2007).	No
Miniopterus australis	Little Bent-wing Bat	V	—	Prefers well-timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests (Churchill 1998). This species shelter in a range of structures including culverts, drains, mines and caves (Environment Australia 2000). Relatively large areas of dense vegetation of either wet sclerophyll forest, rainforest or dense coastal banksia scrub are usually found adjacent to caves in which this species is found (DECC 2007). Breeding occurs in caves, usually in association with M. schreibersii (Environment Australia 2000, DECC 2007).	No
Miniopterus schreibersii	Eastern Bent-wing Bat	V	—	Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
oceanensis				woodland, paperbark forests and open grassland (Churchill 1998). It forages above and below the tree canopy on small insects (AMBS 1995, Dwyer 1995, Dwyer 1981). Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter (Environment Australia 2000, Dwyer 1995).	
Mormopterus norfolkensis	East Coast Freetail Bat	V	—	Most records of this species are from dry eucalypt forest and woodland east of the Great Dividing Range (Churchill 1998). Individuals have, however, been recorded flying low over a rocky river in rainforest and wet sclerophyll forest and foraging in clearings at forest edges (Environment Australia 2000; Allison & Hoye 1998). Primarily roosts in hollows or behind loose bark in mature eucalypts, but have been observed roosting in the roof of a hut (Environment Australia 2000; Allison & Hoye 1998).	No
Myotis adversus	Large-footed Myotis	V	—	Will occupy most habitat types such as mangroves, paperbark swamps, riverine monsoon forest, rainforest, wet and dry sclerophyll forest, open woodland and River Red Gum woodland, as long as they are close to water (Churchill 1998). While roosting is most commonly associated with caves, this species has been observed to roost in tree hollows, amongst vegetation, in clumps of Pandanus, under bridges, in mines, tunnels and stormwater drains (Churchill 1998). However the species apparently has specific roost requirements, and only a small percentage of available caves, mines, tunnels and	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
				culverts are used (Richards 1998).	
Pteropus poliocephalus	Grey-headed Flying-Fox	V	V	Inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas (Churchill 1998, Eby 1998). Camps are often located in gullies, typically close to water, in vegetation with a dense canopy (Churchill 1998).	Potential
Scoteanax rueppellii	Greater Broad-nosed Bat	V	—	Associated with moist gullies in mature coastal forest, or rainforest, east of the Great Dividing Range (Churchill, 1998), tending to be more frequently located in more productive forests (Hoye & Richards 1998). Within denser vegetation types use is made of natural and man made openings such as roads, creeks and small rivers, where it hawks backwards and forwards for prey (Hoye & Richards 1998).	No
Syconycteris australis	Common Blossom-bat	V	—	The combination of heathland and coastal rainforest is essential for this species (Churchill 1998). Breeding and sheltering habitats are in subtropical and littoral rainforests and a diverse range of nectar producing plant communities are required year round; it will occasionally eat some rainforest fruits (Churchill 1998; Environment Australia 2000).	No
INVERTEBRATES					
Petalura gigantea	Giant Dragonfly	E	—	Swamps, streamlines and seepages in mainly natural condition with short to moderate vegetation and a relatively deep soil base (Trueman 2005). Larvae permanently burrow into soil and so do not survive in	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
				permanent ponds or other open water (Trueman 2005).	
MIGRATORY TERRESTRIAL SPECIES LISTED UNDER EPBC ACT					
Haliaeetus leucogaster	White-bellied Sea-Eagle	—	M	Forages over large open fresh or saline waterbodies, coastal seas and open terrestrial areas (Marchant & Higgins 1993, Simpson & Day 1999). Breeding habitat consists of tall trees, mangroves, cliffs, rocky outcrops, silts, caves and crevices and is located along the coast or major rivers. Breeding habitat is usually in or close to water, but may occur up to a kilometre away (Marchant & Higgins 1993).	No
Hirundapus caudacutus	White-throated Needletail	—	M	Forages aerially over a variety of habitats usually over coastal and mountain areas, most likely with a preference for wooded areas (Marchant & Higgins 1993; Simpson & Day 1999). Has been observed roosting in dense foliage of canopy trees, and may seek refuge in tree hollows in inclement weather (Marchant & Higgins 1993).	No
Merops ornatus	Rainbow Bee-eater	—	M	Resident in coastal and subcoastal northern Australia; regular breeding migrant in southern Australia, arriving September to October, departing February to March, some occasionally present April to May (Pizzey and Doyle 1988). Occurs in open country, chiefly at suitable breeding places in areas of sandy or loamy soil: sand-ridges, riverbanks, road-cuttings, sand-pits, occasionally coastal cliffs (*ibid*). Nest is a chamber a the end of a burrow, up to 1.6 m long, tunnelled in flat or sloping ground, sandy back or cutting (*ibid*).	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Monarcha melanopsis	Black-faced Monarch	—	M	Rainforest and eucalypt forests, feeding in tangled understorey (Blakers et al. 1984).	No
Monarcha trivirgatus	Spectacled Monarch	—	M	Wet forests, mangroves (Simpson and Day 1999).	No
Myiagra cyanoleuca	Satin Flycatcher	—	M	Associated with drier eucalypt forests, absent from rainforests (Blakers et al. 1984), open forests, often at height (Simpson & Day 1999).	No
Rhipidura rufifrons	Rufous Fantail	—	M	The Rufous Fantail is a summer breeding migrant to southeastern Australia (Morcombe, 2004). The Rufous Fantail is found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation (Morcombe, 2004). Open country may be used by the Rufous Fantail during migration (Morcombe, 2004).	No
MIGRATORY WETLAND SPECIES LISTED UNDER EPBC ACT					
Ardea alba	Great Egret	—	M	The Great Egret is common and widespread in Australia (McKilligan, 2005). It forages in a wide range of wet and dry habitats including permanent and ephemeral freshwaters, wet pasture and estuarine mangroves and mudflats (McKilligan, 2005).	No
Ardea ibis	Cattle Egret	—	M	Cattle Egrets forage on pasture, marsh, grassy road verges, rain puddles and croplands, but not usually in the open water of streams or lakes and they avoid marine environments (McKilligan, 2005). Some individuals stay close to the natal heronry from one nesting season to the next, but the majority leave the district in autumn and	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
				return the next spring. Cattle Egrets are likely to spend the winter dispersed along the coastal plain and only a small number have been recovered west of the Great Dividing Range (McKilligan, 2005).	
Gallinago hardwickii	Latham's Snipe	—	M	A variety of permanent and ephemeral wetlands, preferring open fresh water wetlands with nearby cover (Marchant and Higgins 1999). Occupies a variety of vegetation around wetlands (Marchant and Higgins 1999) including wetland grasses and open wooded swamps (Simpson and Day 1999).	No
Numenius phaeopus	Whimbrel	—	M	Intertidal coastal mudflats, river deltas and mangroves, occasionally sandy beaches (DEH 2005a). Breeds Siberia and Alaska (*ibid.*).	No
Pluvialis fulva	Pacific Golden Plover	—	M	Breeds North Siberia, Alaska (DEH 2005a). Mainly coastal, beaches, mudflats and sandflats and other open areas such as recreational playing fields in Australia (*ibid.*).	No
Rostratula benghalensis s. lat.	Painted Snipe	—	M	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber (DECC 2007). Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds (*ibid.*). Breeding is often in response to local conditions; generally occurs from September to December (DECC 2007). Roosts during the day in dense vegetation (NSW Scientific Committee 2004). Forages nocturnally on	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
				mud-flats and in shallow water (DECC 2007). Feeds on worms, molluscs, insects and some plant-matter (*ibid*.).	
Disclaimer: Data extracted from the Atlas of NSW Wildlife, Bionet and DEWAH Protected Matters Report are only indicative and cannot be considered a comprehensive inventory. Note that the EPBC Protected Matters and Bionet searches identified a number of marine species (turtles, cetaceans, sharks, migratory marine species) as potentially occurring within a 10 kilometre radius of the site. Given the terrestrial nature of the proposed redevelopment, these species have been excluded from the list as they are unlikely to be in indirectly or directly impacted by the action.					

E = Endangered; E2 = Endangered Population; V = Vulnerable; M = Migratory.

FLORA

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act (NSW)	EPBC Act (Cwlth)		
Allocasuarina defungens	Dwarf Heath She-oak	E	E	Found only in NSW from the Nabiac area, north-west of Forster, to Byron Bay on the NSW north coast (DECC 2007). *A. defungens* is a straggly oak about 2m high with blue-green foliage found in heath on sand (sometimes clay and sandstone soils), and swamp sclerophyll forest margins (DECC 2007). The species also extends onto exposed nearby-coastal hills or headlands adjacent to sandplains (DECC 2007).	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act (NSW)	EPBC Act (CwIth)		
Asperula asthenes	Trailing Woodruff	V		This small herb occurs only in NSW. It is found in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens/Wallis Lakes area. Found in Damp sites, often along river banks. (DECC 2007).	No
Acronychia littoralis	Scented Acronychia	E1		Scented Acronychia is found between Fraser Island in Queensland and Port Macquarie on the north coast of NSW. Grows in littoral rainforest on sand (DECC 2007)	No
Chamaesyce psammogeton	Sand Spurge	E	—	*C. psammogeton* is a prostrate perennial herb, which grows on foredunes and exposed sites on headlands often with Spinifex (DECC 2007). Flowers in Summer.	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act (NSW)	EPBC Act (CwIth)		
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	It is known from a range of vegetation communities including swamp-heath and woodland (DECC 2007). The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); where it appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*) (DECC 2007). Bell (2001) has identified Coastal Plains Scribbly Gum Woodland and Coastal Plains Smoothed-barked Apple Woodland as potential habitat on the Central Coast. Flowers between November and February, although may not flower regularly (DECC 2007; Bell 2001).	No
Cynanchum elegans	White-flowered Wax Plant	E1	E	Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. Usually occurs on the edge of dry rainforest vegetation. Flowering occurs between August and May, with a peak in November (DECC 2007)	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act (NSW)	EPBC Act (Cwlth)		
Dendrobium melaleucaphilum	Spider Orchid	E1		Occurs in coastal districts and nearby ranges, extending from Queensland to its southern distributional limit in the lower Blue Mountains. In NSW, it is currently known from seven recent collections. Grows frequently on Melaleuca styphelioides, less commonly on rainforest trees or on rocks in coastal districts. Flowers from July–October (DECC 2007)	No
Oberonia titania	Red-flowered King of the Fairies	V		Red-flowered King of the Fairies occurs on the NSW north coast north from Kendall. It is known from 10 locations in NSW, two of which occur within Dorrigo National Park and Washpool National Park. Red-flowered King of the Fairies occurs in littoral and subtropical rainforest and paperbark swamps, but it can also occur in eucalypt-forested gorges and in mangroves (DECC 2007)	No
Maundia triglochinoides		V	–	Restricted to coastal NSW and extending into southern Queensland. The current southern limit is Wyong; former sites around Sydney are now extinct (DECC 2007). *Maundia triglochinoides* is an aquatic herbaceous plant found in swamps or shallow fresh water on heavy clay on the north and central NSW coast.	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act (NSW)	EPBC Act (CwIth)		
Melaleuca biconvexa	Biconvex Paperbark	V	V	Associated with damp habitats, such as Coastal Narrabeen Moist Forest, Riparian Melaleuca Swamp Woodland (LMCC 2001). This species may occur in dense stands forming a narrow strip adjacent to watercourses, in association with other *Melaleuca* species or as an understorey species in wet forest (NSW Scientific Committee 1998). Flowering occurs over just 3-4 weeks in September and October (DECC 2007).	No
Sophora tomentosa	Silverbush	E1		Occurs in coastal areas in Queensland and northern NSW. The largest known population, at Port Macquarie, is estimated at up to 500 plants, other populations are of less than 20 plants. Occurs on coastal dunes (DECC 2007)	No
Taeniophyllum muelleri	Minute Orchid		V	Grows on outer branches and branchlets of rainforest trees; coast and coastal ranges, from sea level to 250 m alt., north from the Bellinger River in NSW.	No
Thesium australe	Austral Toadflax	V	V	Occurs in grassland or grassy woodland. Often found in damp sites in association with Kangaroo Grass (Themeda australis) (DECC 2007). Flowers in spring–summer. Widespread but rare. NSW subdivisions: NC, CC, SC, NT, ST, NWS, CWS. Other Australian states: Qld, Tas.	No

Scientific Name	Common Name	Conservation Significance		Habitat Associations	Likelihood of Occurrence
		TSC Act (NSW)	EPBC Act (Cwlth)		
Disclaimer: Data extracted from the Atlas of NSW Wildlife and EPBC Act Protected Matters Report are only indicative and cannot be considered a comprehensive inventory.					

Appendix B: Assessments of Significance

Part 3 A guidelines assessment per species and EEC.

Koala

Koalas are solitary and territorial (particularly males) yet live in established sedentary polygynous breeding aggregates arranged in a matrix of overlapping home ranges whose size varies according to sex (males tend to be larger so that they overlap the ranges of several females) and carrying capacity of the habitat (usually measured in terms of density of primary browse species) (Phillips and Callaghan 1995).

Nationally, koalas have been observed feeding or resting in about 120 eucalypt species (66 in NSW) and 30 non-eucalypt (seven in NSW) species. Usage may also be determined by site-dependant edaphic factors eg soil type (Sharp and Phillips 1999), which affects the nutrient quality of forage. Forest consisting of primary browse species associations located on deep, fertile soils on floodplains, in gullies and along watercourses are generally considered preferred koala habitat. This may possibly be a reflection of the nutritional value of the foliage.

The koala population aggregates basically consist of an alpha (dominant) male, with his harem of at least two to four females and their offspring (juveniles and/or sub-adult koalas) of varying stages of maturity and independency (Phillips 1997). Adult koalas appear to generally avoid each other except during mating season (generally warmer months from spring but as early as July-August) when the males actively seek females with most births occurring late November-March (Martin and Lee 1984). Social cohesion is maintained in a koala population by interactions through common tree usage, scent marking, vocalisations and antagonistic behaviour patterns (Phillips 1997).

The home range of a single koala is usually occupied for at least several years or more commonly throughout its life (Phillips 1997, Sharp and Phillip 1999). Size of a Koala home range may vary from a hectare to hundreds of hectares (eg Jurskis and Potter 1997 report home ranges of 38 ha to 520 ha with an average size of 169 ha, near Eden); varying with habitat quality (eg if primary browse species dominate the tree component, home range size is expected to be small and carrying capacity high), sex (males have larger territories and may make forays into other areas), age of the animals (eg sub-adults versus adults), and location (Jurskis and Potter 1997, Phillips 1997, Sharp and Phillip 1999).

Within a Koala home range, a few specific trees (home range trees) are used to mark territories and identify individual koalas. Such trees are recognisable by heavy scratching and collections of scats close to the tree base and may also have significant forage value (Phillips and Callaghan 1995, Hume 1989). Male Koalas may leave their scent by rubbing the gland on their chest against the bark. Koalas frequently return to these trees or deliberately seek them out during travel (koalas have been recognised to have the ability to know where they are and return to a discrete location

(Phillips 1997)). Such trees are very important as they maintain social cohesion through identification of population members and assist geographical location (Phillips 1997, Sharp and Phillips 1999).

1. How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Evidence of koala was observed along the western edge of the study area, outside of the proposed re-development footprint. Investigation into adjoining land to the east of Park St and north of the Settlement Point canal bridge also revealed evidence of koala, suggesting that some koala movement through the study are to the north east is occurring and, presumably, movement from remnants to the south of the study area. Any koala movement via corridors through the locality and study area islikely to be tenusous and subject to threatening processes (ie traffic collision and dog attack), particularly during the breeding season when koalas are most active. Such movements are none the less important in maintaining genetic viability of sub-populations and should be maintained and managed to threatening processes for koala.

The proposed re-development of settlement city is proposed to occur within the existing built footprint of settlement city, albeit with some alteration to the car parking area. This impact is likely to result in the removal of some primary koala browse trees representing isolated plantings within the car park (Zone 3 of Figure 3). It is expected that by increasing car parking spaces and facilities in the proposed complex, that increase vehicular and pedestrian traffic will increase.

The recommendations provided in this report include:

- Connectivity along the western edge of the study area will be retained and further enhanced by compensatory plantings along the northern edge of the study area.
- All primary koala browse tree plantings proposed to be removed will be compensated for by a planting ratio of 2:1.
- The use of vehicular traffic calming measures within and around Settlement City should be investigated (ie signage, speed bumps).
- Retention of the corridor function of High Constraint areas during construction and operation. Use of construction fences that allow koala under passage.

Providing the above recommendations are adopted, the proposed development will mitigate negative impacts and will potentially improve the current situation for koala and the lifecycle of the local population.

2. How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The proposal will result in the removal of some primary browse species plantings within the mapped Zone 3 vegetation. This is habitat is considered artificial (ie planted), but none the less provides forage resources, the loss of which will be compensated by strategic planting in areas that will improve connectivity for koala, with planting ratios of 2:1.

3. Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The koala has a patchy distribution throughout the coast, sub-coast and tablelands of NSW, with localised concentrated populations generally where preferred browse trees occupy productive soil types and where threats, historically and currently, are low. Occurrence of koala within the study area would not be at the limit of this species known distribution.

4. How is the proposal likely to affect current disturbance regimes?

Loud construction noise and obstruction by machinery presence is expected during construction. Measures such as appropriately place construction fencing has been recommended to avoid significant barriers to koala movement and construction noise, although not quantified, is not considered to represent a major deterance for koala.

Operation of the complex is likely to be similar to what currently occurs in terms of grounds maintenance; however, increased human traffic is likely. Given koala are already occupying this and other similarly disturbed environments, it is expected that koala will continue to utilise the study area, which will have, in time, improved function due to strategic compensatory plantings.

5. How is the proposal likely to affect habitat connectivity?

Currently evidence suggests that koala are using the western edge of the study area (ie High Constraint area), where primary browse tree plantings support koala presence, and may pass along the northern boundary where suitable plantings are scarce to absent. Offsite evidence suggests that koala are also utilising vegetation east of Park st and northeast of the Settlement Point canal bridge and, presumably, remnants to the south of the study area for movement. Any koala movement via corridors through the locality and study area islikely to be tenusous and subject to threatening processes (ie traffic collision and dog attack), particularly during the breeding season when koalas are most active. The proposal, with the recommended mitigation measures provided in this report, in particular strategic compensatory plantings, are likely to improve connectivity for koala through the study area.

6. How is the proposal likely to affect critical habitat?

The study area does not contain any areas of critical habitat.

GREY-HEADED FLYING-FOX

The grey-headed flying fox is a nectarivore and frugivore, reliant on a seasonably reliable and continuous nectar flow from Eucalyptus, Melaleuca and related genera, and primarily rainforest fruits (Eby, 2000a, 2000b). The Grey-Headed Flying Fox, particularly lactating females, has been recorded feeding on introduced flowers and fruits (eg orchards), which has been attributed to poor production of native forage resources (Eby, 2000a; Tideman et al. 1997).

During nocturnal activities, the grey-headed flying-fox travels long distances (ie generally within 20km but sometimes 50km) between roosts and foraging areas. Social grey-headed flying-fox roosts/camps are used diurnally, and locations are generally stable over many years. Grey-headed flying-fox roosts vary with function, with many forming an interrelated network. Roost selection in grey-headed flying-fox is poorly understood, though they mostly occur proximate to a watercourse with the dominant vegetation usually being rainforest, wet sclerophyll, Melaleucas, Casuarinas or mangroves (Eby 2000a).

Grey-headed flying-fox roosts are classified as follows: occupied continuously (key colonial roosts); occupied annually in certain seasons; or irregularly. Spring-Summer roosts are considered maternity sites (Eby 2001a). During poor seasons, individual grey-headed flying-fox or small groups may occupy temporary roosts often within or close to the food source plants.

The grey-headed flying-fox is a nomadic species, following fruiting seasons, with only a small portion being sedentary. The grey-headed flying-fox has been reported migrating hundreds of kilometres (Eby 2000a, 2000b). Slow breeding, extended longevity, and physiological inability to withstand food shortages are all factors limiting the success of the grey-headed flying-fox. This can result in high mortality, especially of young grey-headed flying-fox if shortages occur during spring, and also reduced reproductive success (Eby 2000b).

1. How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The grey-headed flying-fox was not recorded within the study area, but is considered a likely occurrence during seasonal flowering of myrtaceous species and considering the local known roost at Koolumbung Creek.

The proposed re-development of settlement city is proposed to occur within the existing built footprint of settlement city, albeit with some alteration to the car parking area. This impact is likely to result in the removal of some primary koala browse trees representing isolated plantings within the car park (Zone 3 of Figure 3).

The recommendations provided in this report include:

- All primary koala browse tree plantings proposed to be removed will be compensated for by a planting ratio of 2:1. This measure will have a comensurate compensatory result for suitable grey-headed flying-fox brwose trees.

Providing the above recommendations are adopted, the proposed development will mitigate negative impacts and will potentially improve the current situation for grey-headed flying-fox and the lifecycle of the local population.

2. How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The proposal will result in the removal of some seasonally flowering myrtaceous species suitable for grey-headed flying-fox foraging within the mapped Zone 3 vegetation. This is habitat is considered artificial (ie planted), but none the less provides forage resources, the loss of which will be compensated by strategic planting at ratios of 2:1.

3. Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The grey-headed flying-fox generally has a coastal distribution extending from victoria to central-northern queensland. Occurrence within the study area is not at the limit of this species distribution.

4. How is the proposal likely to affect current disturbance regimes?

The proposal will result in minor clearing of suitable forage species for these species. Loud construction noise and obstruction by machinery presence is expected during construction. Construction will occur during diurnal hours and, as such, is not considered to represent a major deterance for grey-headed flying-fox.

Operation of the complex is likely to be similar to what currently occurs in terms of grounds maintenance; however, increased human traffic is likely. It is expected that grey-headed flying-fox will continue to utilise the study area, which will have, in time, improved function due to strategic compensatory plantings.

5. How is the proposal likely to affect habitat connectivity?

The proposal, with the recommended mitigation measures provided in this report, in particular strategic compensatory plantings, are likely to improve connectivity for grey-headed flying-fox, a species capable of traversing over 50km in one night including cleared areas and areas of built environment.

6. How is the proposal likely to affect critical habitat?

The study area does not contain any areas of critical habitat.

DEWAH GUIDELINES FOR ASSESSMENT OF IMPACTS ON THREATENED AND MIGRATORY SPECIES

The EPBC Act Administrative Guidelines on Significance set out '**Significant Impact Criteria**' that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of national environmental significance. Matters listed under the EPBC Act as being of national environmental significance include:

- Listed threatened species and ecological communities
- Listed Migratory species
- Wetlands of International Importance
- The Commonwealth marine environment
- World Heritage properties
- National Heritage places
- Nuclear actions

Specific '**Significant Impact Criteria**' are provided for each matter of national environmental significance except for threatened species and ecological communities in which case separate criteria are provided for species listed as endangered and vulnerable under the EPBC Act.

Threatened and migratory species listed under the EPBC Act that are considered likely or potentially to occur within the study area are given in Appendix A of the Report. The relevant Significant Impact Criteria have been applied to these threatened and migratory species to determine the significance of impact of the project (Table 2).

Table 1: Significant Impact Criteria for matters of National Environmental Significance (*EPBC Act*)

Matters to be addressed	**Impact (Commonwealth Legislation)**
(a) any environmental impact on a World Heritage Property;	No
(b) any environmental impact on Wetlands of International Importance;	The proposal will not affect any part of RAMSAR wetland.
	Yes. One Commonwealth listed vulnerable species, the grey-headed flying fox was considered likely to occur in the study area at some stage. The guidelines in terms of the vulnerable species; grey-headed flying fox are discussed below: **Grey-headed flying fox (*Pteropus poliocephalus*)** *a. lead to a long-term decrease in the size of an important population of a species, or* Habitat within the study area offers seasonal forage habitat for the grey-headed flying-fox, in the form of seasonally flowering myrtaceous trees. No suitable roost habitat (ie wet sclerophyll forest or rainforest) is available within the study area or immediate locality. Individuals that potentially utilise seasonal resources within the study area are most likely those that occupy local populations roosting in the lower Hastings Valley, such as Koolembung Creek (Eby 2000) A fraction of available forage resources will be removed by the proposal, which will be compensated at a ratio of 2:1 in compensatory plantings. The grey-headed flying-fox has a large foraging homerange potentially up to a 50km radius around the site which includes large areas of vegetated areas, The proposal is thus not likely to result in a long term decrease in the size of an important population of the species. *b. reduce the area of occupancy of an important population, or* A fraction of available forage resources will be removed by the proposal, which will be compensated at a ratio of 2:1 in compensatory plantings. This is a small portion of available forage resources for the local population that utilises the study area and region. This will not result in a reduction in the area of occupancy for an important population of grey-headed flying-fox. *c. fragment an existing important population into two or more populations, or* The grey-headed flying-fox is a highly mobile species capable of flying up to 50km in one night, including over cleared areas. The species is commonly encountered foraging and, in some cases, roosting in and adjacent to urban landscapes. Hence, the species exhibits reasonable tolerance to disturbance and the proposal is not likely to cause habitat fragmentation for the grey-headed flying-fox. *d. adversely affect habitat critical to the survival of a species, or*

Matters to be addressed	**Impact (Commonwealth Legislation)**
	No roost habitat will be affected by the proposal and thus habitat that is critical to the survival of the species will not be affected. *e. disrupt the breeding cycle of an important population, or* No roost habitat will be affected by the proposal and thus breeding habitat and the breeding cycle of the grey-headed flying-fox will not be affected by the proposal. *f. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or* The proposed action will not result in a decline in the local population. *g. result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*, or* The proposal will not result in the introduction or facilitation of an invasive species that would be harmful to the grey-headed flying-fox. *h. interferes substantially with the recovery of the species.* The proposal will not substantially interfere with the recovery of the grey-headed flying-fox.
(c) any environmental impact on Commonwealth Listed Migratory Species;	No listed migratory species are considered likely to occur at the study area:
(d) does any part of the Proposal involve a Nuclear Action;	No. The project does not include a Nuclear Action.
(e) any environmental impact on a Commonwealth Marine Area;	No. There are no Commonwealth Marine Areas within the study area.
In addition, any direct or indirect effect on Commonwealth land.	No. The project does not directly or indirectly affect Commonwealth land.

Appendix C: Flora and fauna species list

Scientific Name	Common Name	Status		Methodology
		TSC Act	EPBC Act	
Plants				
Acacia longifolia	Sydney Golden Wattle			T3 T4 T5
Acacia sp.	Wattle			T3
*Agapanthus sp.**	Agapanthus			T2
*Andropogon virginicus**	Whisky Grass			T3
Araucaria heterophylla	Norfolk Island Pine			T2
Araucaria spp.	Pine			T4 T5
Avicennia marina	Grey Mangrove			T4
*Axonopus compressus**	Broad-leaved Carpet Grass			T2
Banksia integrifolia	Coast Banksia			T5
*Bidens pilosa**	Cobbler's Pegs			T1
*Bromus cartharticus**	Prairie Grass			T1
Cakile sp.	Sea Rocket			T1
Callistemon sp.	Bottlebrush			T5
Casuarina glauca	Swamp Oak			T1 T2 T3 T4
*Chloris gayana**	Rhodes Grass			T1 T4
*Chrysanthemoides monilifera subsp. rotundata**	Bitou Bush			T3 T4
*Conyza bonariensis**	Flaxleaf Fleabane			T1
Crinum pedunculatum	Swamp Lily			T2
Cupaniopsis anacardioides	Tuckeroo			T1 T3 T4 T5
Cynodon dactylon	Common Couch			T1 T2 T3
*Cyperus polystachyos**	Exotic Sedge			T1
Dianella caerulea	Blue Flax-lily			T3 T4
Eucalyptus grandis	Flooded Gum			T3
Eucalyptus maculata	Spotted Gum			T2 T3
Eucalyptus microcorys	Tallowwood			T3 T5
Eucalyptus robusta	Swamp Mahogany			T2
Eucalyptus signata	Scribbly Gum			T3
Eucalyptus tereticornis	Forest Red Gum			T2
Corymbia torelliana	Cadaghi			T3 T4 T5
Glochidion ferdinandii	Cheese Tree			T1 T3 T5
Grevillea robusta	Silky Oak			T2
Hibiscus sp.	Hibiscus			T3 T4
Ipomoea cairica	Coastal Morning Glory			T1 T4
Juncus kraussii	Sedge			T1 T4
Kennedia rubicunda	Red Kennedy Pea			T1

*Lantana camara**	Lantana			T3
Livistona australis	Cabbage Palm			T5
Lomandra longifolia	Spiny-headed Mat-rush			T3 T4 T5
Lomandra sp.	Lomandra			T5
Lophostemon confertus	Brush Box			T2
Melaleuca decora	White Feather Honeymyrtle			T3 T5
Melaleuca erubescens	Pink Honeymyrtle			T3
Melaleuca linariifolia	Flax-leaved Paperbark			T4
Melaleuca quinquenervia	Broad-leaved Paperbark			T2 T3 T4 T5
Mentha sp.	Peppermint			T5
Ochna serrulata	Ochna			T3 T4
Olea europaea	Common Olive			T3 T4
Paspalum dilatatum	Paspalum			T1
Plantago lanceolata	Lamb's Tongues			T1
Sarcocornia quinqueflora	Samphire			T1
*Schefflera actinophylla**	Umbrella Tree			T3
Sporobolus virginicus var. minor	Marine Couch			T1 T4
Suaeda australis	Austral Seablite			T5
*Syagrus romanzoffiana**	Cocos palm			T2 T5
*Verbena bonariensis**	Purpletop			T1 T4
Westringia fruticosa	Coastal Rosemary			T2 T3 T5
Birds				
Larus novaehollandiae	Silver Gull			observed
Todiramphus sanctus	Sacred Kingfisher			observed
Rhipidura leucophrys	Willie Wagtail			observed
Mammals				
Pseudocheirus peregrinus	Common Ringtail Possum			Scat
Phascolarctos cinereus	Koala	Vulnerbale		Scat/ Scratch
Rattus sp.	Rat			scat
Reptiles				
Lampropholis delicata	Dark-flecked Garden Sunskink			observed

Appendix D: Statement from the author

Key Staff, qualifications, role in project and rate.

Name	Qualifications and year of Graduation	Role in Project
Mark Adams	Bachelor of Science (Resource and Environmental Management) ANU, 1994 Masters of Environmental Law (with Distinction), Australian Centre for Environmental Law ANU, 2003	Project Director, Quality Assurance
Antony von Chrismar	BSc App Sci. Environmental Resource Management 2003. Certificate II. Bushland Regeneration TAFE NSW 1999	Ecologist, field investigations, assessment, mapping, report preparation.
Jennifer Pickering	Bachelor of Science (Honours). University of Queensland, Australia. First Class Honours, Marine Biology. 2004. Bachelor of Science in Environmental Biology. (Sub-major in Coastal and Marine Science). University of Technology, Sydney, Australia. - 2002	Environmental scientist/Aquatic ecologist, report preparation, consultation.

Licences and permits

Licence or Permit	Regulating Authority	Issue Number
Scientific Licence	National Parks and Wildlife (DECC)	S10805
ARA Ethics Licence	Animal Care and Ethics Committee (DPI)	07/3124