ANNEX Q

Response to Koala Plan of Management

Addendum

The approved Master Plan MP 20-4-2005 for Fern Bay Seaside Village was signed by the Minister on 8 August 2006. A number of technical assessments supported the Master Plan, including the attached response to Koala Plan of Management.

As the response to Koala Plan of Management report is a supporting document to the approved Master Plan, it has not been updated. The EA report in support of the Project Plan has however been prepared in accordance with the approved Master Plan (as detailed in Section 2.4 of the EA). The Project Plan application is essentially consistent with the items listed in Schedule 2 of the Master Plan, with minor amendments to the project plan to account of the requirements of government agencies and site constraints, including lot layout and configuration changes. These changes do not impact the assessment and outcomes of the attached Response to Koala Plan of Management assessment. The updated project plan is detailed in the EA.

FERNBAY
seaside village

Fern Bay Estate

Master Plan Study

WINTEN PROPERTY GROUP

CVC Limited

Fern Bay Estate

Response to the Port Stephens Comprehensive Koala Plan of Management

Winten Property Group & Continental Venture Capital Limited

April 2005

0012720 Final

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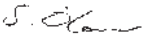
ERM

Delivering sustainable solutions in a more competitive world

Project Manager:	*Sally Crews*
	
Date:	*20 April, 2005*
Partner/ Project Director:	*Steve O'Connor*
Signed:	

Environmental Resources Management Australia Pty Ltd Quality System

Fern Bay Estate

Response to the Port Stephens Comprehensive Koala Plan of Management

Prepared by: Andrew Hamer

Winten Property Group & Continental Venture Capital Limited

April 2005

0012720 Final

CONTENTS

LIST OF FIGURES

1 INTRODUCTION

1.1 BACKGROUND

Environmental Resources Management Australia Pty Ltd (ERM) has been commissioned by the Winten Property Group (WPG) and Continental Venture Capital Limited (CVC) to prepare a response report to the performance criteria outlined in Appendix 4 of the *Port Stephens Comprehensive Koala Plan of Management* (CKPoM) (Port Stephens Council 2001), for a proposed residential subdivision within Lot 16, DP 258848, No. 85 Nelson Bay Road, Fern Bay (the 'study area'). The response to the CKPoM is herein referred to as the 'response report'. The location of the study area is presented in *Figure 1.1*.

The response report addresses the impact of the proposed residential estate on koala habitat within the study area. The estate is proposed to comprise:

- approximately 950 residential lots in total (some of which have development approval);
- open space lots, which will include formal parks and an Aboriginal heritage reserve within 2(a) zoned land and conservation reserves within 1(a), 2(a) and 7(a) zoned land. These areas of open space are designed to provide opportunities for passive and active recreation, stormwater management and the protection of sites of Aboriginal heritage significance and ecological corridors;
- a community nursery which will be used for the propagation of plants for use in the landscape areas of the estate;
- community, recreational and commercial facilities;
- new public roads, fire trails and pedestrian trails; and
- bushfire buffers (asset protection zones).

Figure 1.2 illustrates the proposed subdivision that is the subject of this assessment.

There is already an approval to subdivide part of the site into 208 residential lots and a school site (refer to *Figure 1.3* for the approved subdivision). Clearing and earthworks have already commenced for part of this subdivision. The approved lots form part of the proposed Fern Bay Estate however, those approved lots and roads within 200 metres of the northern boundary of the site are not proposed to be constructed. Instead this area is proposed to form part of a minimum 200 metre wide ecological corridor that will connect the site with the vegetated areas to the north and south. The school site is also now proposed to be developed for residential purposes

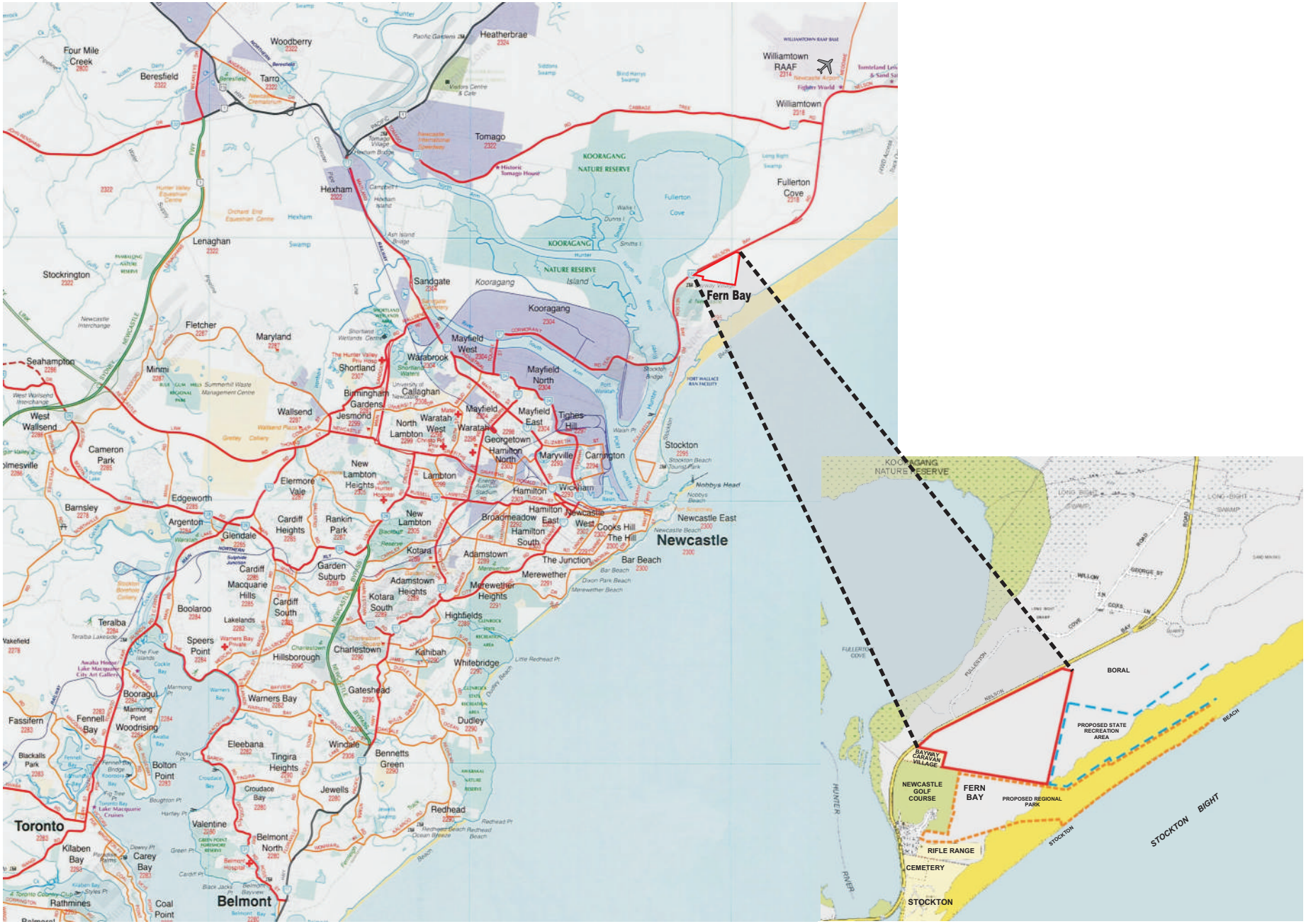


Figure 1.1 **Locality Plan**

Winten Property Group - CVC Limited - Fern Bay Estate

LEGEND

- Residential Integrated Housing
- Residential Villas 340m² to 399m²
- Residential Premium Villas 400m² to 449m²
- Residential Courtyard 450m² to 589m²
- Residential Conventional lots 590m² +
- Residential Duplex 750m² +
- Part of Existing DA
- Part of Approved Development Footprint
- Recreational Facilities/Community Centre
- Active Recreational Facility
- Open Space - conservation areas
- Open Space - Landscaped areas, playground
- Community Nursery
- Aboriginal Heritage Reserve
- Fern Bay Study Area
- Fire Trail
- Major Walking trail
- Asset Protection Zone
- 1(a) Rural Agriculture 1(a) Zone
- 2(a) Residential 2(a) Zone
- 7(a) Environment Protection 7(a) Zone

ALLOTMENT TYPES AND NUMBERS

Residential Integrated Housing 3.78ha x 25/ha	94 units
Residential Villas	123 lots
Residential Premium Villas	120 lots
Residential Courtyard	255 lots
Residential Conventional Lots	186 lots
Residential Duplex	20 units
Existing DA	149 lots
Total	**947**

Source: Robertsday, Town Planning Design

ERM

0 100m
Approximate only

Figure 1.2 **Concept Plan of Proposed Subdivision**

Winten Property Group - CVC Limited - Fern Bay Estate

Figure 1.3 **Approved Subdivision**

given the Department of Education and Training has confirmed that it is no longer required for educational purposes.

An assessment of the impact of the proposal on the habitat of threatened species, populations or ecological communities has been prepared by ERM as part of a Species Impact Statement for the site (ERM 2005a). This response report has been prepared to fully explore all the issues associated with koala habitat within the study area.

1.2 AIMS

The aims of this response report are to:

- review previous koala surveys and koala habitat assessments in the study area;
- compile information on koala threatening processes in the Port Stephens local government area (LGA);
- assess the proposed residential development against the performance criteria outlined in Appendix 4 of the CKPoM;
- provide mitigation measures in the design of the proposed development footprint; and
- outline how the development footprint has been designed having regard to the needs of koalas that may frequent the study area in the future.

1.3 STRUCTURE OF THE REPORT

Chapter 1 presents background information on the proposed subdivision and lists the aims of this response report. *Chapter 2* evaluates koala habitat and koala populations in the study area and locality within the Port Stephens LGA. *Chapter 3* provides information on processes that may threaten the long-term viability of koala habitat and populations in the study area and Port Stephens LGA. *Chapter 4* addresses the performance criteria listed in Appendix 4 of the CKPoM and presents recommendations to minimise the potential impacts of the proposal on koala habitat in the study area.

2 KOALA HABITAT EVALUATION

2.1 LITERATURE REVIEW

Several field investigations targeting the koala (*Phascolarctos cinereus*) have been conducted on site. Clements et al. (1992) conducted 15 hours of spotlighting on site in March and April 1992. Fanning and Clark (1993) conducted spotlighting searches in June 1993, and Gunninah Consultants (1996 revised 1997) conducted spotlighting and a koala habitat assessment (*State Environmental Planning Policy No. 44 – Koala Habitat Protection*) in September and October 1996. Gunninah Consultants (2002) conducted further nocturnal survey work in January and February 2001 for a total of 20 person hours. ERM conducted spotlighting searches on site in September 2002 for a total of 10.5 person hours. ERM also conducted nocturnal call playback of the vocalisation of the male koala during this time. ERM (2005a) provides a summary of all previous fauna survey effort on site. None of these surveys recorded the koala, or found evidence of koalas on site.

Clements et al. (1992) considered that the lack of koalas on site is due to the:

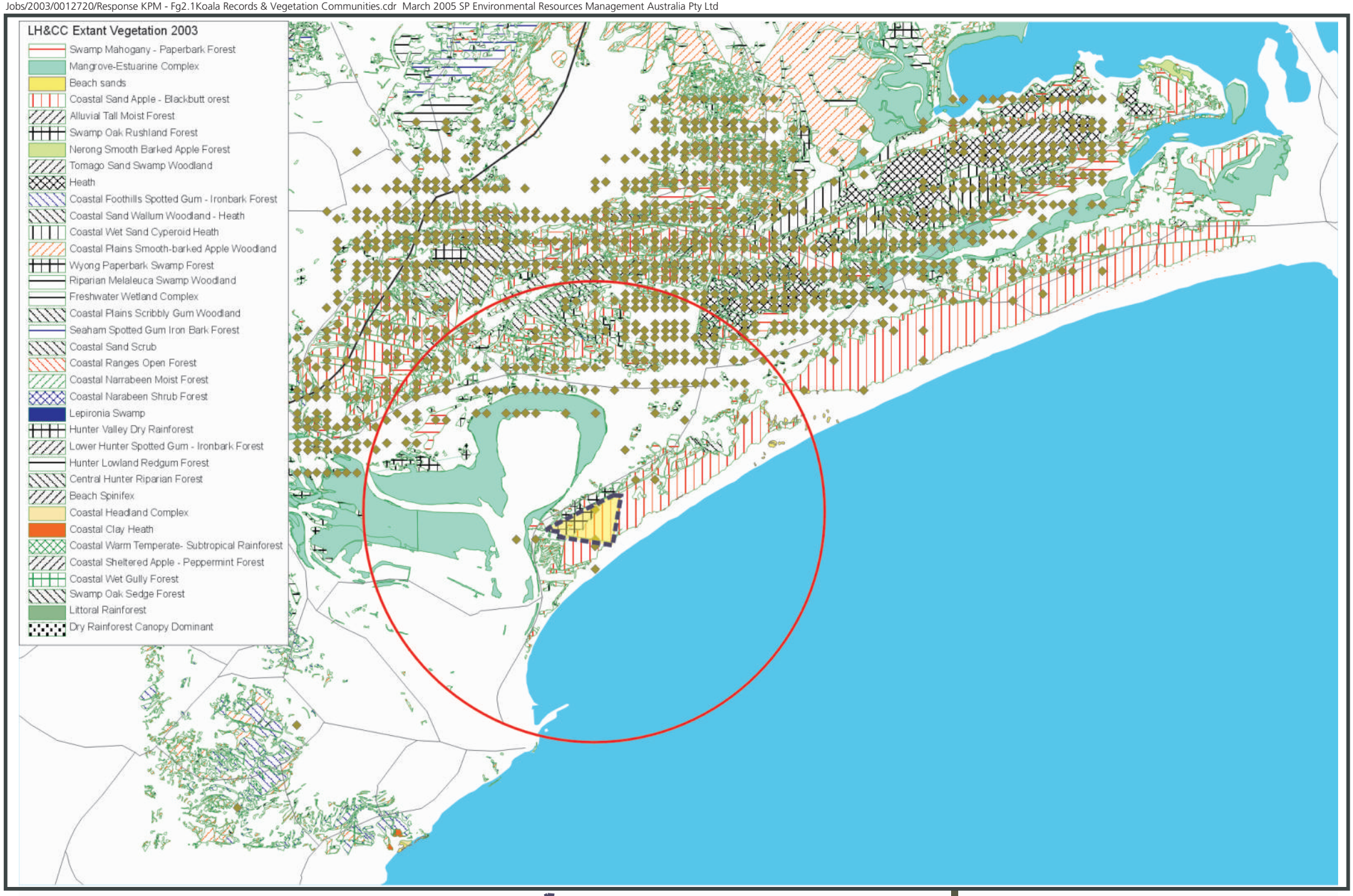
- frequency of bushfires;
- presence of Nelson Bay Road that bisects the core habitat;
- presence of domestic and feral dogs; and
- removal of safe corridors to other habitat areas within the locality.

2.2 DATABASE SEARCHES

A search of the Department of Environment and Conservation (DEC) Atlas of NSW Wildlife revealed a total of over 80 koala records in the locality of the site (ie. within 10 kilometres of the site; see *Figure 2.1*). Most records are from the Tomago sandbeds, where a significant local population resides. However, scattered records occur throughout Stockton Bight.

The most recent sighting of a koala on site was reported in 1992 by a local resident, although the exact location of this record is unknown. A confirmed road kill from Nelson Bay Road was reported in November 1989 although the location is unknown. It is not known if a breeding population has ever been resident on site. Likewise, it is not known what the size of any populations in the vicinity of the site was prior to European settlement.

Within the broader scale, Port Stephens is considered significant on a State wide basis as it represents the most southern concentration of koala sightings on the north coast (Reed et al. 1990). Recent studies estimate the Port Stephens koala population to be between 350 to 500 individuals largely



ERM

0 2km

Approximate Only

Legend

Study Area

Koala Record

Figure 2.1

Koala Records & Vegetation Communities

Winten Property Group - CVC Limited Fern Bay Estate

confined to the Tilligerry Peninsula and Tomago Sandbeds (Phillips et al. 1996). On a State wide and regional scale, the Port Stephens population is clearly endangered (Phillips et al. 1996).

2.3 *KOALA HABITAT REQUIREMENTS*

The koala (*Phascolarctos cinereus*) is an inhabitant of forests containing medium to tall trees, including rainforest genera (Reed et al. 1990). These forests typically occur along the coast on high nutrient soils from sea level to 1200 metres elevation and are characterised by preferred forage trees.

In New South Wales, the koala is associated with several forage trees, including forest red gum (*Eucalyptus tereticornis*), tallowwood (*E. microcorys*), ribbon gum (*E. viminalis*), grey gum (*E. punctata*), river red gum (*E. camaldulensis*), swamp mahogany (*E. robusta*), Sydney blue gum (*Eucalyptus saligna*), blackbutt (*E. pilularis*), flooded gum (*E. grandis*) and small-fruited grey gum (*E. propinqua*) (Reed et al. 1990).

A recent study of koala habitat in Port Stephens LGA found that forest red gum (*Eucalyptus tereticornis*), swamp mahogany (*E. robusta*) and Parramatta red gum (*E. parramattensis* subsp. *decadens*) are preferentially utilised feed trees (Phillips et al. 1996).

Koalas typically occur at low densities and a breeding population may consist of as few as five or six individuals (Callaghan et al. 1994). Estimates of home ranges in Victoria are 1.7 hectares for males and 1.18 hectares for females with extensive overlap where feed trees are relatively dense (Mitchell 1990). In an area where feed trees are relatively sparse, home ranges were found to be 3.14 and 2.08 hectares for males and females respectively (Mitchell 1990). In coastal NSW populations have been estimated to range from one animal every 45 hectares to one every 4.5 hectares (on average 20 to 25 hectares) (Austeco 1994). Most young disperse at two to three years old and females remain in their natal area (Martin and Handasyde 1995). If no suitable habitat is found by young individuals then they become nomadic.

2.4 *VEGETATION COMMUNITIES*

Broad vegetation communities in the locality have been mapped in the Lower Hunter and Central Coast Regional Environmental Management Strategy (LHCCREMS) (CRA Unit NPWS 2003). The site includes three vegetation communities: coastal sand apple – blackbutt forest, swamp oak rushland forest and swamp mahogany – paperbark forest (see *Figure 2.1*).

Refinement of the LHCCREMS mapping by ERM (2005a), based on the vegetation mapping of Clements et al. (1992), delineated these vegetation communities into dry sclerophyll forest (coastal sand apple – blackbutt forest) and swamp forest (swamp oak rushland forest and swamp mahogany –

paperbark forest) (see *Figure 2.2*). The 'wet heath' community described by Clements et al. (1992) was determined by ERM to correspond to the LHCCREMS mapping unit of 'Tomago sand swamp woodland'.

With regards to endangered ecological communities (EECs), it was determined by ERM that the EEC 'swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and south east corner bioregions' is present in the swamp forest on site where it adjoins Nelson Bay Road (refer to *Figure 2.1*).

2.5 *KOALA HABITAT MAPPING*

The CKPoM identified the site as predominantly supplementary habitat, with an area of preferred koala habitat corresponding with the swamp mahogany – paperbark forest mapped by LHCCREMS (see *Figure 2.3*). The CKPoM mapping of the site also includes a 50 metre buffer over supplementary around this preferred habitat, and a link over supplementary that connects the preferred habitat of the site to preferred koala habitat at Newcastle Golf Course to the south west of the site. Preferred koala habitat at the golf course is swamp mahogany – paperbark forest.

2.6 *KOALA HABITAT ASSESSMENT*

ERM carried out an assessment of the vegetation of the site to determine whether it supports *potential* or *core* koala habitat. These assessments were conducted within the swamp forest and wet heath vegetation communities, as they were reported to contain swamp mahogany (*Eucalyptus robusta*), which is a preferred koala food tree species in the Port Stephens LGA (see *Figure 2.2*).

The koala habitat assessment identified the areas mapped as swamp forest and wet heath on site as *potential* koala habitat as defined by SEPP 44 (see *Figure 2.2*). According to the vegetation associations of Lunney et al. (1998), these areas qualify as *preferred* koala habitat, as defined by the CKPoM (see *Figure 2.4*). Fifty metre habitat buffers have been mapped around this preferred habitat (over supplementary), with the remaining vegetation mapped as either cleared or as supplementary koala habitat (see *Figure 2.4*).

Searches for koala faecal pellets around swamp mahogany trees did not find any evidence of koala usage in these areas. Therefore, although the swamp forest and wet heath support *potential* koala habitat, the two vegetation communities do not support *core* koala habitat as defined by SEPP 44. *Core* koala habitat is therefore not present on site.

Legend

Powerful Owl Roost Tree

Threatened Species

	Easting	Northing
Powerful Owl	388115	6363629
	388236	6363826
Masked Owl	388330	6363740
Squirrel Glider	389070	6364160
	389550	6364330
	389790	6364200
	389720	6363880
	388330	6363740
	389288	6363352
	389262	6363316
	389265	6363221
Grey-headed Flying-fox	389000	6364110
	389820	6364300
	388300	6363570
Diuris praecox	389765	6364485
	389800	6364430
Greater Broad-nosed Bat	389107	6364193
	389019	6363782
	389019	6363782
Eastern Bentwing-bat	389107	6364193
	389019	6363782
Little Bentwing-bat	389107	6364193
Hoary Wattled Bat	389019	6363782
Wallum Froglet	388582	6363697

1(a) 1(a) Rural Agriculture Zone

2(a) 2(a) Residential Zone

7(a) 7(a) Environment Protection Zone

Approved Subdivision

Cleared VegetationCleared Vegetation

Swamp Mahogany - Paperbark Forest

Coastal Sand Apple Blackbutt Forest

Wet Heath - Tomago Sand Swamp Woodland

Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South-East Corner Bioregion

Nelson Bay Road

Fullerton Cove Road

Nelson Bay Road

Powerline Easement

7a

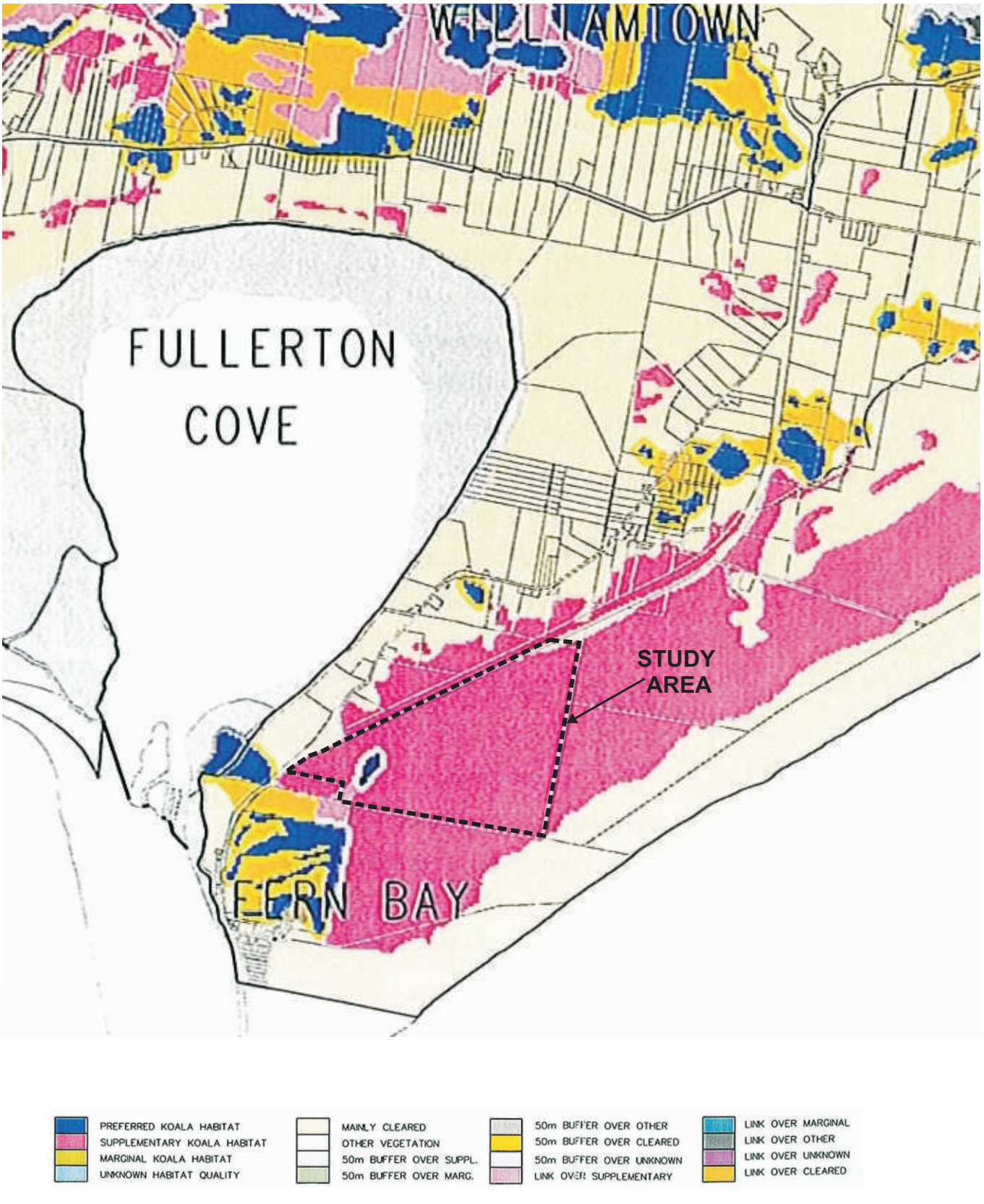
2a

1a

Figure 2.2 **Vegetation Communities and Threatened Species in the Study Area**

Winten Property Group - CVC Limited - Fern Bay Estate

ERM



Source: Port Stephens Council Comprehensive Koala Plan of Management (CKPoM) June 2001

ERM

0 900m

Approximate Only

Figure 2.3 **CKPoM Koala Habitat Mapping in the Study Area**

Winten Property Group - CVC Limited - Fern Bay Estate

Legend

- Cleared vegetation
- Preferred Koala Habitat
- Supplementary Koala Habitat
- 50m Habitat Buffer over Supplementary
- Habitat Linking Area over Supplementary
- Approved Subdivision

Nelson Bay Road

200m Ecological Corridor

Fullerton Cove Road

Nelson Bay Road

Powerline Easement

100 year Hind Dune Hazard Line

Figure 2.4 **Koala Habitat in the Study Area**

2.7 *KOALA HABITAT IN THE LOCALITY*

The site is part of the Fullerton Cove/Stockton Bight Koala Management Unit (KMU), as outlined in the CKPoM. The Fullerton Cove/Stockton Bight KMU is located in the south of the Port Stephens LGA and extends from the Hunter River just south of Heatherbrae to the Tomaree Peninsula. Many of the remaining patches of preferred koala habitat in this KMU occur as small, generally isolated patches in a predominantly cleared landscape (PSC 2001). This represents a sub-optimal situation for the safe movement of koalas between areas of preferred koala habitat. The small size and largely fragmented nature of these patches of preferred koala habitat renders them vulnerable to edge effects. There are large patches of supplementary koala habitat along Stockton Bight associated with large transgressive sand dunes. The quality of supplementary habitat is compromised by traffic volumes along Nelson Bay Road, and habitat loss caused by the inland movement of the sand dunes and sand mining and extraction. Proposed residential subdivision at Fern Bay has been identified as a threat to the long-term viability of supplementary koala habitat in the Fullerton Cove/Stockton Bight KMU (PSC 2001).

2.8 *KOALA CORRIDORS*

The site forms a local corridor of mainly supplementary koala habitat that extends along the coast north to the Tomago sandbeds, Stockton Bight and the Tomaree Peninsula (see *Figure 2.3*). Isolated patches of preferred koala habitat occur between the site and larger areas of preferred habitat around Williamtown.

A minimum 200 metre ecological corridor comprising preferred koala habitat is proposed to be retained between Nelson Bay Road and the residential subdivision (see *Figure 2.2* and *Figure 2.4*). This corridor will provide a local linkage between preferred koala habitat at Newcastle Golf Course and preferred and supplementary habitat to the north at Williamtown.

3 THREATENING PROCESSES FOR THE KOALA

The following chapter provides information on the factors that may lead to the decline of koala populations across the species' range, including populations in the Port Stephens LGA. The relationship of these threatening processes to the proposal is discussed.

3.1 HABITAT CLEARANCE AND MODIFICATION

Habitat clearance, modification and fragmentation represent major threats to koala populations. Fragmentation of habitat has the potential to isolate populations. These remnant populations are genetically isolated, probably nutritionally stressed, vulnerable to *Chlamydia* related diseases (Hume 1990), vulnerable to fire, weather and climatic changes including drought and harsh weather conditions (Reed and Lunney 1990). Clearance of habitat may lead to social instability through the removal of interactive home range trees and nutritional stress through removal of important feed trees impacting on the social stability of population, reducing reproductive potential, increasing susceptibility to disease and population decline (Phillips et al. 1996).

As stated in *Section 2.7*, residential subdivision at Fern Bay has been identified as a threat to the long-term viability of supplementary koala habitat in the Fullerton Cove/Stockton Bight KMU due to the loss of habitat (PSC 2001). However, the retention of preferred koala habitat in ecological corridors will mitigate the impact of habitat fragmentation within the site. The approved subdivision comprising 208 lots can be developed within this proposed corridor, thereby impacting on the koala movement corridor. However, the proposed subdivision, if approved, would retain this habitat as an ecological corridor and the development of the approved subdivision within the minimum 200 metre wide ecological corridor would not take place. Given that there is not a resident population on site, the clearance of habitat will not impact on koala home range trees and therefore the social structure of a koala population.

3.2 TRAFFIC MORTALITY

The koala is vulnerable to being killed when crossing roads especially in urban areas and/or areas where prime habitat has been fragmented. The annual koala road toll on New South Wales roads is estimated at 200 to 300 individuals (Fanning undated). In the Port Stephens area, 325 koalas were hit by vehicles between December 1987 and March 1998 of which 241 were fatal (Port Stephens Council 2001). A necropsy study of free-living koalas (1980-1987) from the central and north coast of New South Wales recorded trauma, due mainly to motor vehicle collision as the most common cause of death (Canfield 1990). These koalas were typically healthy with no underlying disease (Canfield 1990).

Nelson Bay Road bisects a large tract of supplementary koala habitat at Fern Bay. Although the last record of a road-killed koala was made in 1989, this road poses a significant threat to the movement of koalas through the site from koala habitat at Williamtown.

The proposed minimum 200 metre wide ecological corridor on site adjacent to Nelson Bay Road comprises preferred koala habitat and will provide a linkage between preferred koala habitat at Newcastle Golf Course and preferred and supplementary habitat to the north. A corridor of this width is necessary to allow for edge effects penetrating 50 metres either side of the corridor, which leaves an effective minimum corridor width of 100 metres for movement. Most edge effects disappear over the first 50 metres into a remnant of native vegetation (Murcia 1995), although edge effects may penetrate for up to 150 metres in some instances (Laurance 2000). The Department of Environment and Conservation (DEC) has advised that 200 metres is generally accepted as a minimum corridor width to assist in minimising edge effects and other disturbance. Edge effects may affect koala usage of preferred habitat due to increased noise, or more seriously, may increase the spread of koala predators into preferred koala habitat. The width of this corridor may also remove the need for koalas to cross Nelson Bay Road, which improves their survivorship.

3.3 BUSHFIRE

High intensity bushfires are known to kill many animals, as they are generally unable to escape. Koalas do not move away from the fire but instead climb as high as they are able to. They also suffer from smoke inhalation that severely damages their eyes and lungs. In the short term, surviving individuals are faced with the problem of finding food. In the long term, recolonisation of an area is dependent on the extent of the fire and fragmentation of suitable habitat, the size and health of the surviving population and their ability to recolonise the burnt areas.

Koala habitat on site is presently subjected to a high frequency fire regime. The implementation of bushfire hazard reduction measures associated with the proposed residential development will reduce the risk of bushfire in koala habitat on site (see ERM 2005b). This will improve the quality of preferred and supplementary koala habitat on site over the long-term. Furthermore, residents will respond immediately to bushfire threat to ensure bushfire is minimised and koala habitat is protected.

3.4 DISEASE

The range of diseases caused by the bacterium *Chlamydia psittaci* are the most common diseases found in koalas. In free ranging koalas these include eye infections and urogenital infections. The koala has probably had a long

history of association with *Chlamydia*. It is present in almost all mainland populations (Martin and Handasyde 1990).

Koala populations under environmental pressures, primarily habitat fragmentation, are more susceptible to the development of *Chlamydia* related diseases (Hume 1990). Fragmentation of habitats may result in koalas being nutritionally stressed, increasing the susceptibility to disease.

It is not known to what extent disease is currently affecting koalas in the Fullerton Cove/Stockton Bight KMU. However, koala habitat to the north and south of the site will be linked given the retention of the minimum 200 metre wide ecological corridor. This measure will reduce the potential for a koala population to become fragmented, and hence, become more susceptible to disease.

3.5 DOG ATTACKS

The other threat to koalas near urban and rural-residential environments arises as a result of the increased presence of dogs, in particular large dogs or dogs in packs. Stressed koalas are likely to be more susceptible to dog attacks as evidenced by necropsy findings where koalas traumatised by wild or domestic carnivores were often in poor condition (Canfield 1990).

Within urbanised areas dogs are known to contribute substantially to koala deaths and injuries. Studies in Port Macquarie have shown dogs account for approximately five percent of koala deaths and 13 percent of koala injuries (Mount King Ecological Surveys, 1992), while in Warringah Shire dog attacks account for 24 to 40 percent of koala deaths (Smith and Smith 1989).

Mitigation measures that are proposed to reduce the likelihood of dog attack on site are outlined in *Section 4.2* (see performance criteria *h*). These measures are generally aimed at encouraging responsible dog ownership.

4 PORT STEPHENS COMPREHENSIVE KOALA PLAN OF MANAGEMENT 2001

4.1 INTRODUCTION

The CKPoM identifies areas of preferred, supplementary and marginal koala habitat based on community consultation, historical records, vegetation mapping, field based surveys and identification of movement corridors between habitat areas. Development standards and assessment criteria are outlined in the CKPoM for proposals either overlapping or adjacent to areas of preferred or supplementary koala habitat, habitat buffers or habitat linking areas (Port Stephens Council 2001).

All developments in the Port Stephens LGA are required to comply with performance criteria listed in Appendix 4 of the Port Stephens CKPoM (Port Stephens Council 2001). The general aims and objectives of these performance criteria are:

- to ensure that the koala population in the Port Stephens LGA is sustainable over the long-term;
- to protect koala habitat areas from any development which would compromise habitat quality or integrity;
- to ensure that any development within or adjacent to koala habitat areas occurs in an environmentally sensitive manner;
- to encourage koala habitat rehabilitation and restoration;
- maintain interconnection between areas of preferred and supplementary koala habitat and minimise threats to safe koala movements between such areas;
- to ensure that development does not further fragment habitat areas either through the removal of habitat or habitat links or through the imposition of significant threats to koalas;
- to provide guidelines and standards to minimise impacts on koalas during and after development, including any monitoring requirements; and
- to provide readily understandable advice to proponents preparing development applications and for Council officers involved in the assessment of those applications.

4.2 PERFORMANCE CRITERIA

The CKPoM *Appendix 4 - Performance Criteria for Development Applications* has been used to assess the appropriateness of the proposed development by demonstrating consistency with the objectives of the performance criteria. The proposed development must:

a) Minimise the removal or degradation of native vegetation within Preferred Koala Habitat or Habitat Buffers.

The proposed development will remove approximately 24.7 hectares of preferred koala habitat (swamp forest and wet heath) (see *Table 4.1* and *Figure 4.1*). Habitat buffers of 50 metres around preferred koala habitat will in some cases also be removed. Approximately 42.0 hectares of preferred koala habitat and associated habitat buffers (ie 50 metre habitat buffer over supplementary) are to be retained within parts of the site by:

- retaining a minimum 200 metre wide ecological corridor between Nelson Bay Road and the proposed development; and
- retaining areas of wet heath and swamp forest in areas currently zoned 1(a), 2(a) and 7(a), respectively.

The 208 lot subdivision has approval to remove 4.0 hectares of preferred koala habitat within the ecological corridor along Nelson Bay Road. However, WPG and CVC are prepared to retain this area of habitat within the corridor, in order to demonstrate that the development is consistent with the objectives of the performance criteria, and to provide a vital link between Newcastle Golf Course and land to the north.

Degradation of preferred koala habitat and habitat buffers on site has the potential to occur as a result of the proposed development, including weed invasion and increased feral animal access to these habitats. However, edge effects will be greatest in the habitat buffers, rather than in the preferred koala habitat, which is the function of habitat buffers. The implementation of a weed management plan will reduce the spread of weeds into habitat buffers. The landscape plan for open spaces within the proposed subdivision will incorporate native local plant species to reduce the risk of exotic species establishing within habitat buffers. Similarly, design guidelines on private land will require landscaping with native species only. Residents of the estate will also be educated about responsible dog ownership.

b) Maximise retention and minimise degradation of native vegetation within Supplementary Koala Habitat and Habitat Linking Areas.

The remaining vegetation on site has been mapped in the CKPoM as supplementary koala habitat. The proposed development will remove approximately 45.5 hectares of dry sclerophyll forest that is supplementary koala habitat. However, approximately 69.5 hectares of supplementary koala

Legend

- Cleared vegetation
- Preferred Koala Habitat
- Supplementary Koala Habitat
- 50m Habitat Buffer over Supplementary
- Habitat Linking Area over Supplementary

Nelson Bay Road

Fullerton Cove Road

Nelson Bay Road

200m Ecological Corridor

Powerline Easement

100 year Hind Dune Hazard Line

Figure 4.1 **Koala Habitat to be Impacted by Proposed Subdivision**

Winten Property Group - CVC Limited - Fern Bay Estate

ERM

habitat will be retained within the ecological corridor, land zoned 1(a), 2(a) and 7(a), and land east of the 100 year dune hazard line.

Table 4.1 ***Removal and Retention of Koala Habitat in the Study Area (approximate hectares)***

Vegetation Community	Koala Habitat	Total hectares native vegetation in study area	Hectares removed by approved subdivision	Hectares removed by this subdivision proposal	Hectares retained in study area
swamp forest	preferred	43.5	3.3	9.7	30.5
wet heath	preferred	26.0	4.0	15.0	7.0
dry sclerophyll open forest	supplementary/ 50 metre habitat buffer over supplementary	130.5	15.5	45.5	69.5
TOTAL		**200.0**	**22.8**	**70.2**	**107.0**

Although edge effects have the potential to occur within supplementary habitat, degradation of native vegetation will be minimised by the implementation of a weed management plan.

c) *Minimise the removal of any individuals of preferred koala food trees, wherever they occur on a development site. In the Port Stephens LGA these tree species are swamp mahogany (Eucalypts robusta), Parramatta red gum (Eucalyptus parramattensis) and forest red gum (Eucalyptus tereticornis) and hybrids or any of these species. An additional list of tree species that may be important to koalas based on anecdotal evidence is included in Appendix 8.*

Swamp mahogany is the preferred koala food tree that is present on site. It is proposed to minimise the removal of these trees by retaining approximately 30.5 hectares of swamp forest within ecological corridors zoned 2(a) and 7(a). Other tree species present in the study area that may be important to koalas in the Port Stephens LGA (Callaghan et al. 1994) include:

- smooth-barked apple (*Angophora costata*);
- red bloodwood (*Corymbia gummifera*);
- white mahogany (*Eucalyptus acmenioides*); and
- blackbutt (*Eucalyptus pilularis*);

These species occur predominantly in the dry sclerophyll forest (ie. supplementary koala habitat). These tree species will be retained within supplementary koala habitat in the ecological corridors zoned 1(a), 2(a) and 7(a).

Tree species that may also be important to koalas occur in the swamp forest (ie preferred koala habitat) and include:

- swamp she-oak (*Casuarina glauca*); and
- broad-leaved paperbark (*Melaleuca quinquenervia*).

These important tree species will be retained in vegetation communities outside of the development footprint. If clearing or felling of any preferred feed trees or other important habitat trees is required within the development footprint, pre-clearance surveys for threatened species (including the koala) will be undertaken.

It is recommended that the Department of Infrastructure, Planning and Natural Resources (DIPNR) be requested to waive the provisions of a), b) and c) as the proposed development footprint has been designed in a way to retain and enhance preferred koala habitat to comply with the objectives of the CKPoM.

Koala survey methods (as per the Guidelines for Koala Habitat Assessment in Appendix 6) have been used to determine the most appropriate location for the development footprint (so as to minimise the impact on koala habitat and any koala populations that might occur on the site).

d) Make provision, where appropriate, for restoration or rehabilitation of areas identified as Koala Habitat including Habitat Buffers and Habitat Linking Areas over Mainly Cleared Land. In instances where Council approves the removal of koala habitat (in accordance with dot points 1-4 of the above waive clause), and where circumstances permit, this is to include measures which result in a "net gain" of koala habitat on the site and/or adjacent land.

Koala habitat on site is contained within the swamp forest, the majority of which will be retained in ecological corridors. Although most of the swamp forest is currently in good condition, some areas have been cleared. There is potential for the restoration and rehabilitation of these areas, where they occur outside the development footprint, through the planting of swamp mahogany and other trees known to be frequented by koalas.

e) Make provision for long term management and protection of koala habitat including both existing and restored habitat.

It is proposed to retain existing preferred koala habitat within the ecological corridor and land zoned 1(a), 2(a) and 7(a). This habitat will be managed in the long-term through the implementation of a weed management plan. Habitat buffers around preferred koala habitat will reduce the likelihood of edge effects compromising the integrity of the habitat. A weed management plan will also be targeted at supplementary koala habitat. The proposal will reduce the risk of bushfire in supplementary habitat (dry sclerophyll forest) through the implementation of mitigation measures proposed in the Bushfire Hazard Assessment (ERM 2005b). Development and management of the

bushfire hazard interface and frequent monitoring of bushfire threat by residents will reduce the frequency of fires in the study area, which are currently high frequency.

f) Not compromise the potential for safe movement of koalas across the site. This should include maximising tree retention generally and minimising the likelihood that the proposal would result in the creation of barriers to koala movement, such as would be imposed by certain types of fencing.

Presently, no known koala movement corridors exist on site, as a local population is not resident. However, the establishment of a minimum 200 metre wide ecological corridor incorporating preferred koala habitat, in addition to a corridor within supplementary habitat, will ensure that koalas could move through the site from the north to access areas to the south, including preferred koala habitat at the golf course. Although two roads will traverse the minimum 200 metre wide corridor, the implementation of 40 kph low speed zones and signage will reduce the risk of traffic strike to dispersing individuals.

While it is generally recommended in the CKPoM that no fencing be used if dogs are prohibited within a proposed development, as dogs are not proposed to be prohibited the recommended design specifications for fencing are as follows:

- Colorbond® or similar fences where the bottom of the fence is a minimum of 200 millimetres above ground level that would allow koalas to move underneath;

- fences that facilitate easy climbing by koalas. For example, timber fences flush with the ground with timber posts on both sides at regular intervals of approximately 20 metres; or

- open post and rail or post and wire (definitely not barbed wire on the bottom strand).

g) Be restricted to identified envelopes which contain all buildings and infrastructure and fire fuel reduction zone. Generally there will be no clearing on the site outside these envelopes. In the case of applications for subdivision, such envelopes should be registered as a restriction on the title, pursuant to the Conveyancing Act 1919.

The development footprint, including asset protection zones, will be cleared.

h) Include measures to effectively minimise the threat posed to koala by dogs, motor vehicles and swimming pools by adopting the minimum standards outlined in the CKPoM.

Dog owners will be made aware of their responsibility and will be encouraged to erect fencing to ensure dogs are kept within the confines of backyards and are not permitted to roam free (see criteria *f*). For example, dog owners will be encouraged to walk dogs on leashes. Maximum motor vehicle speeds within the subdivision are likely to be 50 kph, although they will be reduced 40 kph

at the two ingress roads that traverse the ecological corridor. Appropriate measures to reduce the risk of mortality to koalas by drowning in backyard pools would include enclosing the pool with a fence that precludes koalas.

4.3 THREATENED SPECIES ASSESSMENT

ERM (2005a) has prepared a Species Impact Statement for the site to address significant impacts to a range of threatened species and ecological communities, including the koala.

4.4 MONITORING

The health of preferred koala food trees such as swamp mahogany will be monitored where they occur within the minimum 200 metre wide ecological corridor and at the interface with the development footprint. This will determine whether edge effects such as nutrient runoff are resulting in the deterioration of tree condition through, for example, die-back. This monitoring could be performed by a volunteer group of local residents in liaison with the Native Animal Trust Fund and the Hunter Koala Preservation Society, both of which are active groups within the Fullerton Cove/Stockton Bight KMU. However, an ecologist would need to be consulted in the event of significant tree die-back. This local community group could also monitor the incidence of weeds and report sightings of koalas.

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