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Ingleburn Logistics Park Stage 3 Koala Activity Assessment Report

Stockland Development Pty Ltd

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1. Introduction

1.1 Background

Eco Logical Australia Pty Ltd (ELA) was commissioned by Stockland Development Pty Ltd to prepare a Koala Activity Assessment Report (KAAR) to accompany a Development Application (DA) for the proposed redevelopment of Ingleburn Logistics Park Stage 3 at 35 - 47 Stennett Road, Ingleburn (Part Lot 1 DP 1092198 and Lot 26 DP 863617) in the Campbelltown City Council (CCC) Local Government Area (LGA) (Figure 1). The KAAR has been prepared as a supplement to the Biodiversity Development Assessment Report (BDAR) (ELA, 2021) for the proposed development.

The development site is 9.5 ha in size and is located within the Ingleburn Logistics Park, 36 km south-west of the Sydney CBD and 7 km north of Campbelltown Town Centre. The site is situated along the southern side of Stennett Road, Ingleburn. The site is partially occupied by Coates Hire machinery company. The site is predominantly a hardstand area with a comparatively thin strip of vegetation along three of the four sides comprised of planted, exotic and remnant vegetation. There are no buildings on the development site.

1.2 Purpose of the Report

The aim of this report is to address requirements of the *Campbelltown Comprehensive Koala Plan of Management* adopted by Council in 2016, the NSW Government *State Environmental Planning Policy (SEPP) (Koala Habitat Protection) 2021*.

1.3 Proposed works

The proposed development comprises the expansion of the existing logistics park at 35 - 47 Stennett Road Ingleburn. The development works are outlined in Table 1.

Table 1: Proposed development

Element	Proposed
Site Preparation	<ul style="list-style-type: none"> Vegetation clearing. Bulk earthworks and level alteration.
Development summary	<ul style="list-style-type: none"> Construction of a new warehouse in northern portion of site. Construction of a new warehouse in southeast portion of site. Construction of a new warehouse in southwest portion of site. Construction of truck suitable access roads. Landscaped setbacks along both street frontages.

1.4 Koalas

Phascolarctos cinereus (Koala) is an Australian arboreal marsupial. The Koala occurs in eastern Australian and has a fragmented distribution from north-east Queensland to the Eyre Peninsula in South Australia. They inhabit a range of eucalypt forests and woodlands and they may also utilise isolated paddock trees and plantations. Koalas feed on the foliage of over 70 eucalypt species and 30 non-eucalypt species, however, have preferred species within different regions. The Koala is listed as Vulnerable under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.5 SEPP (Koala Habitat Protection) 2021

The Koala Habitat Protection SEPP aims to “encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas to support a permanent free-living population over their present range and reverse the current trend of Koala population decline.”

State Environmental Planning Policy (Koala Habitat Protection) 2021 applies to land within Schedule 1 of the SEPP being the Campbelltown LGA, where the land is greater than 1 ha.

Under Section 10 of the SEPP, where an approved Koala Plan of Management (KPoM) applies, the Council’s determination of a development application must be consistent with the approved (KPoM).

1.6 Campbelltown Koala Plan of Management (CKPoM)

The CKPoM applies within the Campbelltown LGA and applies to the development site, being an area of greater than 1 ha. The definitions and requirements of the CKPoM and how it relates the development site are outlined in Table 2. The development site contains greater than 15% of (P)KFTs and requires the preparation of a Koala Activity Assessment Report as there is potential Koala habitat present on the site.

Table 2: CKPoM definitions and requirements relating to the development site

Definitions / requirements of CKPoM	How this applies to the development site
Potential Koala habitat is defined as ‘any area of native vegetation where the trees of the types listed in Schedule 2 of SEPP44 (KFTs) constitute at least 15% of the total number of trees in the upper or lower strata of the tree component; as identified in Figure 5.1 of this Plan, or any other land identified as such by other processes arising from the Plan (such as a VAR).’	The development site is not mapped as Potential Koala Habitat in the CKPoM.
Core Koala habitat is defined as: ‘any parcel of land that is either wholly or partly identified under SEPP 44 to contain 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; as identified in Figure 5.1 of this Plan, or any other land identified as such by other processes arising from the Plan (such as a KAAR).	The development site is not mapped as Core Koala Habitat in the CKPoM.
Strategic Linkage Areas (SLAs) are defined in the CKPoM as ‘important areas of core (and potential) koala habitat that support major movement corridors for koalas across the Campbelltown LGA as illustrated by Figure 5.3 of this plan’.	The development site is not mapped as being within an SLA in the CKPoM.
Koala Food Trees (KFTs) in the CKPoM include: <ul style="list-style-type: none"> • <i>Eucalyptus tereticornis</i> (Forest Red Gum) • <i>E. punctata</i> (Grey Gum) • <i>E. haemastoma</i> (Broad-leaved Scribbly Gum) • <i>E. viminalis</i> (Manna Gum). 	The development site includes planted and remnant examples of KFTs.
Preferred Koala Food Trees (PKFTs) in the CKPoM are recognised as important food trees for the Campbelltown LGA:	The development site includes planted and remnant examples of PKFTs and remnant PKFTs.

Definitions / requirements of CKPoM	How this applies to the development site
<ul style="list-style-type: none"> • <i>E. agglomerata</i> (Blue-leaved Stringybark) • <i>E. longifolia</i> (Woolybutt) • <i>E. moluccana</i> (Grey Box). 	
Vegetation Assessment Report assesses whether areas of native vegetation are potential Koala habitat.	The Vegetation Assessment has identified at least 15% of the total number of trees in the upper or lower strata of the tree component as (P)KFTs; therefore, the development site forms potential Koala habitat.
A KAAR is required to assess potential Koala habitat, where Koala population assessment procedures are standardised to ensure that best practice measures are applied to identify core Koala habitat.	The Koala Activity Assessment has found no Koala activity within the development site.
Significant Koala activity is identified where a Spot Assessment Techniques (SAT)-derived Koala activity level of 10% or greater is identified through a KAAR.	A variation of the Spot Assessment Techniques (SAT) found no Koala activity within the development site.
Minor development is a DA that relates to the construction of a single residential dwelling and/or the subdivision of land into \leq two lots and/ or requires the removal of no more than two (P)KFTs for each hectare of assessable land to which the DA relates.	A variation of the Spot Assessment Techniques (SAT) found no Koala activity within the development site hectare of assessable land to which the DA relates, with the removal of 19 (P)KFTs within 9.5 ha.
<p>Planning controls in potential koala habitat can be relaxed by Council as they apply to core koala habitat, where</p> <ul style="list-style-type: none"> • <i>retention of (P)KFTs > 200 mm DBH is maximised and</i> • <i>tree removal will not prejudice the overall vision, aims and objectives of the CKPoM</i> <p>Council can relax controls relating to swimming pools, domestic dogs and fencing on residential lots, and new roads and road upgrades, and to compensation for (P)KFT removal.</p>	<p>Discretionary development controls do not apply:</p> <ul style="list-style-type: none"> • As the land does not contain core koala habitat • There are no swimming pools or residential development in relation to dogs and fencing • It does not maximise retention of (P)KFTs due to site levels • No relaxation of compensation has been sought.
Compensation for loss of koala habitat	Minor development as 19 (P)KFTs will be removed within 9.5 ha. The compensation ratio of 1:20 applies to 18 large trees and 1:15 applies to one medium tree..

The CKPoM requires a Koala Activity Assessment for areas identified as potential Koala habitat. The Ingleburn Logistic Park Stage 3 development requires this assessment as the proposed development is located within an LGA to which the Koala Habitat Protection SEPP applies, and the development site contains more than 15% of (P)KFTs. The development site contains multiple planted and several remnant (P)KFT including as *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus punctata* (Grey Gum) and *Eucalyptus moluccana* (Grey Box).

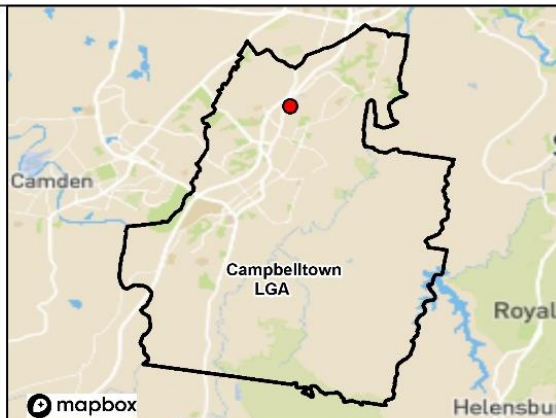
The proposed development does contain native canopy vegetation (19 (P)KFTs) that is expected to be removed, and requires the application of a Vegetation Assessment, and this requires the preparation a Koala Activity Assessment, and compensation for the loss of (P)KFTs in accordance with the CKPoM.



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Site Map

Development Site



0 20 40 80
Metres

Datum/Projection:
GDA 1994 MGA Zone 56
Project: 20175-JK Date: 10/14/2021



nearmap **eco logical**
AUSTRALIA
Imagery: 11/08/21 A TETRA TECH COMPANY

Figure 1: Location of the development site



Figure 2: Proposed development site and footprint

2. Description of the development site

The development site is known as 35 - 47 Stennett Road, Ingleburn and is legally described as Part Lot 1 DP 1092198. The site is located within the Ingleburn Logistics Park, 36 km south-west of the Sydney CBD and 7 km north of Campbelltown Town Centre. The site is situated along the southern side of Stennett Road and is located between the railway line, Ingleburn and Campbelltown Roads and the Hume Motorway at the southern part of Ingleburn industrial area. The development site has a total area of approximately 95,330 m² (9.5 ha).

The development site is currently zoned as IN1 General Industrial under the Campbelltown Local Environmental Plan (CLEP) 2015. The site is partially occupied by Coates Hire machinery. The site is predominantly a hardstand area with a thin strip of vegetation along three of the four sides comprised of planted, exotic and remnant vegetation. There are no buildings on the development site.

The development site lies between Bow Bowing Creek to the east and Bunburry Curran Creek to the west, which occur in channelised canals with some limited areas of riparian vegetation.

Native vegetation within the development site consists primarily of planted native vegetation around three sides of the perimeter. Landscaping works have incorporated planted native species as part of the previous industrial development.

The majority of the development site contains no habitat value as it is hardstand.

2.1 Koala habitat values

The Campbelltown Koala population is estimated to contain between 90 and 200 Koalas individuals (Campbelltown Council 2008) and is a significant disease-free Koala population in Sydney. There is a total of 352 Koala records within 5 km of the development site since 1993 (28 years) (Figure 3). The development site is located within the Ingleburn industrial area and therefore available habitat is sparse and has been fragmented by roads, the railway line and industrial development. The railway and Ingleburn Road are located to the east of the study area, and Campbelltown Road and Hume Highway to the west thereby greatly minimising any potential movement of Koalas to the west. Vegetation in the development site has poor connectivity to larger patches of vegetation to the south east, which further connects to large patches of habitat to the east.

A map of Koala records near the development site is shown in Figure 4. There is evidence of Koala activity with the closest records being approximately 1 km to the east of the development site in 2014 and 1.5 km to the south of the development site in 2011, according to the BioNet database search (DPIE 2021). There are numerous records within the connective vegetation 3 km to the east of the development site within the last 5 years, indicating that the available habitat within the Georges River area is well utilised by the local population.

Habitat within the study area consists of largely planted native trees, 19 of which are (P)KFTs, however is not considered to be of high value for the Koala for the following reasons:

- The development site has been cleared in the past with primarily planted native vegetation that are (P)KFTs present on the boundary of the development site.
- The understorey is regularly slashed reducing the quality of habitat.
- The development site contains fencing and is part of an industrial precinct.
- There is limited connectivity or suitable habitat located nearby to the west, north or east due to roads, railway and industrial development. Suitable foraging and dispersal habitat is located only to the south east of the development site.

Considering the factors listed above, it is unlikely that Koalas use the development site for foraging. The development site is also unlikely to be significant to the local population for breeding or dispersal across the landscape.

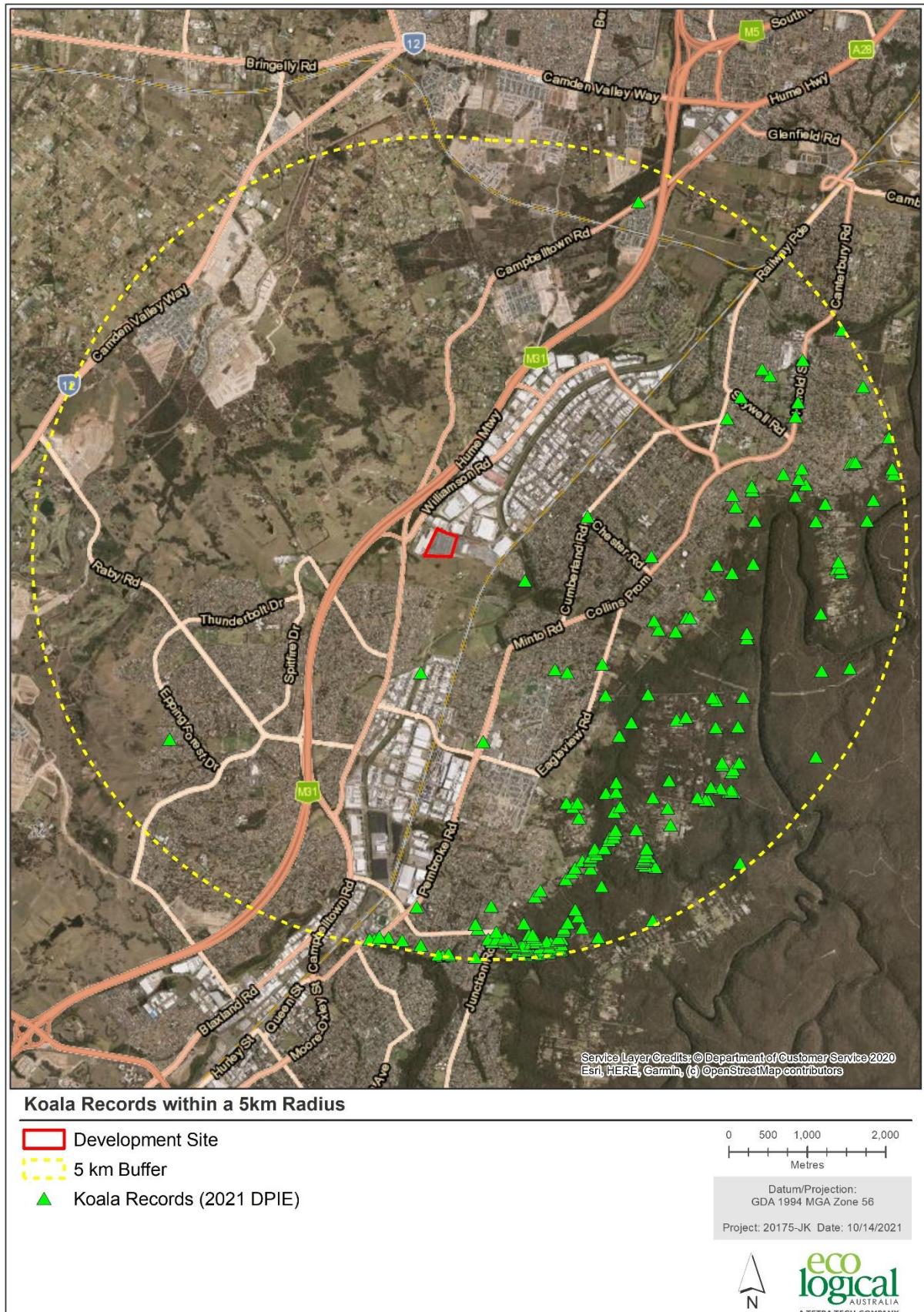


Figure 3: Koala records within 5 km of the development site



Figure 4: Koala records near the development site (BioNet 2021)

3. Vegetation Assessment under the CKPoM

The CKPoM requires a Vegetation Assessment to assess whether areas of native vegetation are potential Koala habitat. The vegetation was evaluated for the species present, the DBH, and the percentage of (P)KFTs within the development site in accordance with the CKPoM requirements as outlined in Table 3.

Table 3: VAR assessment requirements

VAR requirements	Section of this report where addressed
Description of the tallest stratum cover as well as details of the species composition of each vegetation community.	The tallest stratum (trees) are described in this section, in Table 4, mapped in Figure 5, photos are shown in Figure 6, Figure 7 and Figure 8.
A checklist of native vegetation species occurring in each vegetation patch, including any isolated paddock trees on partially cleared lands.	The native species present are described in this section, Table 4 and patches are mapped in Figure 5.
A stadia-metric survey that identifies the precise location, identity and dbh of all native vegetation proposed to be removed and/or within 20 m of the proposed development footprint, including any proposed infrastructure, easements and APZs.	The location of trees is shown in Figure 9, their identity and DBH in Appendix A and the area of native vegetation proposed to be removed is mapped in Figure 2. Vegetation proposed to be removed is described in Section 5.
A map of where (P)KFTs and shelter trees were recorded.	Figure 9.

3.1 Vegetation communities

Vegetation was assessed by field inspection by Ecologist James King on 17 September 2021 and by literature review including the arborist report. Vegetation communities described below.

The development site is predominantly a hardstand area with a comparatively thin strip of vegetation along three of the four sides comprising planted, exotic and remnant vegetation. It consists of landscaping works incorporating planted native species as part of the previous industrial development.

The majority of the vegetation on site is planted canopy trees with an understory of exotic grasses and weeds. The native canopy of planted and some remnant native trees includes *Casuarina glauca* (Swamp She-oak), *Eucalyptus tereticornis* (Forest Red Gum), *E. microcorys* (Tallowwood), *E. saligna* (Sydney Blue Gum) and *E. moluccana* (Grey Box). Vegetation along Stennett Road on the outside of the property fence (but still with the property boundary) consists of linear roadside vegetation of established *E. microcorys* (Tallowwood) and *Grevillea* cultivar 'Ivory Whip' with a mulched ground cover.

The exotic vegetation consists of two *Pinus* spp. individuals dispersed across the site. The exotic grasses and weeds include *Plantago lanceolata* (Plantain), *Vicia sativa* (Common Vetch), *Sonchus oleraceus*, *Pennisetum clandestinum* (Kikuyu), *Chloris gayana* (Rhodes Grass) and *Briza minor* (Little Quaking-Grass), among others.

The native vegetation within drainage ditches surrounding the hardstand is dominated by *Typha orientalis*. There was a single small stand of *Casuarina glauca* along the northern boundary of the site, likely progeny of the same species planted elsewhere on site. The development site also contained a single remnant tree, a large *Eucalyptus moluccana* (Grey box) which is being retained.

A map of vegetation communities within the development site is shown in Figure 5. Photos of the development site area are shown in Figure 6, Figure 7 and Figure 8.

Table 4: Vegetation communities within the development area

Vegetation community	PCT ID	PCT Name	Area within area	(ha) study	BC Status	Act	EPBC Status	Act
Native vegetation within man-made drainage line	1071	Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (degraded)	0.096		N/A		N/A	
Cumberland Plain Woodland – degraded condition	849	Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (degraded)	0.044		Critically Endangered		Critically Endangered	
Native (No PCT)	N/A	N/A	0.016		N/A		N/A	
Planted	N/A	N/A	0.046		N/A		N/A	
Exotic	N/A	N/A	0.009		N/A		N/A	
Total			0.623					

3.2 Presence of Preferred Koala Food Trees

Based on the field survey and analysis of the arborist report, three species of (P)KFTS were found to be present within the development site as planted trees, along with several remnant tree. The location of the (P)KFTs is shown in Figure 9.

The (P)KFTS formed 27.8 % of the tree canopy (Appendix A) and included the following species:

- *Eucalyptus moluccana* (Grey Box)
- *Eucalyptus punctata* (Grey Gum)
- *Eucalyptus tereticornis* (Forest Red Gum).

Therefore, the site forms potential Koala habitat and a KAAR is required in accordance with the CKPoM.



Figure 5: Vegetation communities in the development site area



Figure 6: Planted native canopy on western boundary



Figure 7: Planted native canopy on northern boundary



Figure 8: Planted native canopy along the southern boundary



Figure 9: Koala feed trees within and around the development site

4. Koala activity assessment

The CKPoM describes Koala population assessment procedures are standardised to ensure that best practice measures. Koala Activity Assessment survey was undertaken by Ecologist Annabelle McTaggart on 11 October 2021 using a variation of the methodology outlined in the *CKPoM Appendix B: Undertaking koala habitat assessments using Regularised Grid-based SAT (RG-bSAT) Sampling in accordance with 'The Spot Assessment Technique: a tool for determining localised levels of habitat use by Koalas Phascolarctos cinereus (Stephen Phillips and Callaghan) 2011*. Due to the absence of surrounding vegetation for a RG-bSAT and the linear nature of the vegetation, a targeted search was undertaken with the sampling intensity outlined in Table 5. This method was discussed with Council's Senior Ecologist Ms Alexandra Cave.

Due to the majority of grid cell intersection centre point locations falling within hardstand area where no trees are present, a targeted survey around the perimeter where trees are located was considered a more reliable method to collect data on koala usage. Council has queried why (P)KFTs were sampled rather than all trees, and the reason is that the CKPoM defines the trees that are important for koalas within the LGA, therefore these trees were prioritised for survey, rather than surveying trees not identified within the CKPoM as being important for koalas. Survey effort is shown in Figure 10.

Table 5: Koala activity sampling intensity

Area of land subject of DA	Area identified in the CKPoM	RG-b SAT initial and high SAT sampling intensity	Variation applied
9.5 ha	< 15 ha	<p>250 m intervals (initial) and 125 m intervals (high)</p> <p>High intensity grid-cell intersections are the centre points from which 30 trees of any species that have a DBH \geq 100mm sampled within a radius approx. equal to that of 50% of the sampling intensity being utilised (eg 150m = 75m radius, 250m = 125m radius).</p> <p>Tree searches include:</p> <ul style="list-style-type: none"> • Trees beneath which any Koala pellets have been observed • 30 trees • Search within 100 m of the base of the tree, leaf litter and ground cover for two person minutes. 	<p>Targeted survey of all (P)KFTs within the development site and within 20 m of all identified (P)KFTs.</p> <p>Identified all (P)KFTs within the development site and within 20 m of species that have a DBH \geq 100mm mapped and sampled.</p> <p>Search within 100 m of the base of the tree, leaf litter and ground cover for two person minutes.</p>

No Koala activity (scats or scratches) was detected during the field survey. The lack of Koala activity on the development site led to the conclusion that it does not form core habitat.

Because there is less than 10% Koala activity, the DA is required to conform to the planning controls for potential Koala habitat in accordance with Section 6.4.8 of the CKPoM, as outlined in **Error! Reference source not found..**



Figure 10: Survey effort Koala usage

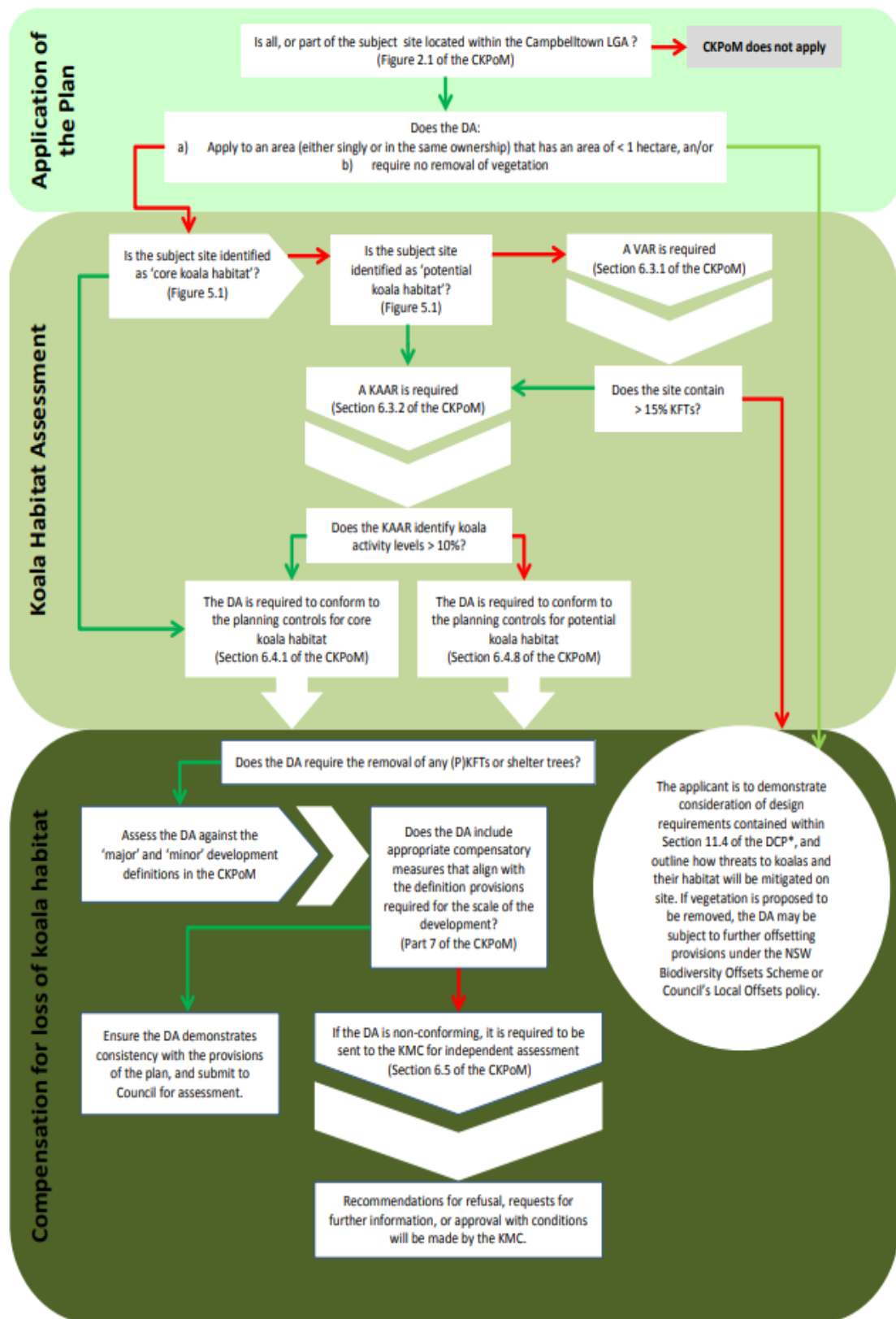


Figure 11: Flow chart from CKPoM indicating DA process

Section 6.4.8 of the CKPoM

The CKPoM flow chart requires compliance with Section 6.4.8 of the CKPoM, because there is less than 10% Koala activity. The controls in Section 6.4.8 are addressed in Table 6.

Table 6: Section 6.4.8 planning controls in potential koala habitat

Control	Response
In areas of potential koala habitat, consideration has been given to relaxing development standards of the Plan as they apply to areas of core koala habitat.	The area contains potential koala habitat, not core koala habitat therefore relaxed development standards do not apply.
(i) This section applies to all planning proposals, rezonings, and DA's that relate to areas of potential koala habitat.	Applies to DA
(ii) for the purposes of Section 6.4.2 of the Plan, Council may exercise discretion subject to the application demonstrating to the satisfaction of Council that that retention of (P)KFTs 200mm DBH has been maximised and that the proposed tree removal will not prejudice the overall vision, aims and objectives of the Plan.	The DA is a minor development under Section 6.4.2, as no more than 2 (P)KFTs will be removed per hectare. Due to level changes required, the retention of (P)KFTs cannot be further maximised. Hence discretion in relation to planning controls cannot be applied to the DA by Council.
(iii) for the purposes of Sections 6.4.3 – 6.4.6 of the Plan, Council may exercise discretion in terms of requiring the development to conform.	6.4.3 Swimming pools does not apply 6.4.4 Domestic dogs on residential lots does not apply 6.4.5 Fencing of residential lots does not apply 6.4.6 Road design outside of residential subdivisions where there are more than 1,500 vehicle movements/ day does not apply.
(iv) Part 7 of the Plan applies to any DA being considered for the purposes of this section.	Compensation for tree removal is applied without any relaxation of development standards.

5. Avoiding impacts to Koalas

5.1 Avoidance of impacts through site selection

The site was selected based on the pre-existing infrastructure and industrial nature of the development site. It is proposed that the existing hardstand be utilised for development of the Ingleburn Logistics Park Stage 3 with additional buildings to be constructed in primarily cleared areas and on the planted vegetation areas. Overall, the site contains only narrow strips of potential Koala habitat on the northern, western and southern boundaries of the development site where primarily planted native vegetation is present. This vegetation had been subject to ongoing disturbance including slashing. The majority of the site has been cleared and previously developed as hardstand and is suitable for future development with regard to Koala habitat. Avoidance of additional (P)KFTs cannot be achieved due to the required changes in ground surface levels. Avoidance of impacts through design has been discussed in Section 5.2.

5.2 Avoidance of impacts through development design

The existing hardstand, native and exotic vegetation will be utilised for the additional buildings. Within the development site, the development footprint has been located to minimise impacts on the one remnant tree, a large *E. moluccana* on the north west corner of the development site, which is a (P)KFT. The construction will impact on 0.62 ha of native vegetation and 0.009 ha of exotic vegetation. Avoidance of impacts on the tree is to be achieved by moving the stormwater infrastructure further to the east, or by under-boring of services to further avoid the Tree Protection Zone (TPZ) of the large *E. moluccana*.

6. Analysis of potential impacts

6.1 Direct impacts

An assessment of direct impacts on native vegetation is provided in Table 7 and Table 8.

Table 7: Impact on native vegetation

Vegetation Community	Area ha	Direct Impact Area ha	Area Retained ha
PCT 1071: Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (degraded)	0.096	0.096	0
PCT 849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (degraded)	0.044	0.013	0.031
Native (no PCT)	0.016	0.016	0
Planted	0.476	0.476	0
Exotic	0.009	0.009	0
Total	0.623	0.592	0.031

Table 8: Assessment of direct impacts

Nature of Impact	Extent of impact	Assessment of impact
Removal of 0.096 ha of PCT 1071, 0.013 ha of PCT 849, 0.016 ha of native vegetation, 0.476 ha of planted native vegetation and 0.009 ha of exotic vegetation	Approximately 0.62 ha of native vegetation and 0.009 ha of exotic vegetation will be removed for the proposed development to allow for the Ingleside Logistics Park Stage 3. 69 canopy trees will require removal as a result of the development, with 196 of these being (P)KFTs.	19 Koala feed trees will be removed as a result of the development. Due to the isolated nature of the development site and the primarily planted nature only minor impacts to dispersal habitat will occur as a result of the vegetation removal. Considering the poor habitat quality and the retention of the large (P)KFT within the development site, the impacts to native vegetation are considered negligible to the viability of a local Koala population.

6.1.1 Impacts on (P)KFTs

An assessment of direct impacts on (P)KFTs is provided in Table 9. The detailed tree numbers and DBH are provided in Appendix A.

Table 9: Impact on (P)KFTs

No Trees	Species	Size of DBH (Small <100mm, Medium >100<300mm, Large>300mm)
2	<i>Eucalyptus moluccana</i> (Grey Box)	Large
14	<i>Eucalyptus punctata</i> (Grey Gum)	Large
3	<i>Eucalyptus tereticornis</i> (Forest Red Gum)	2 Large, 1 small
19	Total	

The development removes of 19 (P)KFTs within the 9.5 ha development site.

6.2 Indirect impacts

Table 10: Assessment of potential indirect impacts

Nature of impact	Extent of impact	Assessment of impact
Dog attack	Potential injury or death of Koala due to dog attack on occasional basis.	Attacks by dogs are a significant cause of Koala death and injury (NSW Department of Environment & Climate Change (DECC) 2008). Considering the use of the proposed development as an industrial site, the incidence of dog attacks is unlikely to substantially increase as a result of the development and dog attacks are unlikely to impact the viability of the local population.
Vehicle strike	Potential injury or death of Koala due to vehicle strike on occasional basis.	The proposed development will remain at a similar number of vehicles driving through the site during both construction and operational phases. The vehicle speeds through the site would be low and increased risk of vehicle strike would be very low.
Bushfire	Impacts to Koala habitat due to bushfire.	Incidence of bushfire within the site or adjacent habitat is unlikely to increase as a result of the proposed development.
Introduction or spread of disease	Increased mortality resulting from disease spread.	Introduction or spread of disease within the site or adjacent habitat is unlikely to increase as a result of the proposed development.
Disturbance to Koalas during construction or operation	Potential injury or death of Koalas resulting from disturbance/machinery strike during construction or operation.	There is a very low potential for Koalas to be present within the site during construction works. Machinery strikes or removal of vegetation containing individual(s) has a low potential to result in injury/mortality of Koalas. Impacts would be unlikely to impact the viability of the population in the locality. If a Koala is identified within the site during vegetation clearance works, work should cease until the Koala has moved on.
Impediments to movement	Potential exclusion of habitat within the site from Koalas.	<p>Fencing installed within a site as a result of the development has the potential to impede Koala movement to or from the site.</p> <p>The loss of perimeter Koala habitat would be unlikely to be significant for the viability for the local population given the already fragmented nature of the site.</p> <p>Fencing installed is to be designed to exclude Koalas from the development site. Further information on exclusion fencing is provided in Appendix A.</p>

7. Management and protection of Koalas and their habitat

7.1 Management measures

Although the likelihood of Koalas utilising the site is extremely low, the proposed management measures to mitigate identified impacts are described in Table 11.

Table 11: Mitigation measures for direct and indirect impacts

Impact	Management measure	Key outcomes	Performance target
Removal of 0.62 ha of native vegetation resulting in a loss of potential dispersal habitat.	Clear delineation of habitat to be removed and fencing to protect the retained habitat tree.	Clearing limited to designated area.	Vegetation impacts limited to approved areas,
Degradation of habitat during operational and construction phase.	Tree protection fencing around habitat tree to be retained.	Protection of the retained habitat tree within site.	Large tree is retained as habitat within the site is maintained throughout life of project.
Dog attack.	No dogs to be allowed within site.	Injury/death of Koalas due to dog attack is avoided.	No dog attacks occur within the site during construction or operation of development.
Vehicle strike.	Speed limited to 20 km/h within the site during construction and operation.	Injury/death of Koalas from vehicle strike prevented.	No vehicle strikes occur within the site during construction or operation of development.
Disturbance to Koalas during construction.	A pre-clearance survey should be undertaken prior to native vegetation removal to ensure no Koalas are present in vegetation removed. The Project Manager and contractors must contact WIRES if injured Koalas or other wildlife is encountered during construction works. WIRES can be contacted on 1300 094 737.	No injury/death of Koalas during construction/vegetation clearance works.	No Koala injury or death during construction.
Impediments to movement.	There is no Koala habitat within the majority of the site and most of the perimeter planting is being removed, hence installing Koala friendly fencing to allow movement of Koalas across the site is not appropriate and Koala exclusion fencing should be installed as detailed in Appendix B.	Koalas able to move freely to or from site into adjacent habitat.	Koalas able to cross any fencing into/out of site.

8. Compensation for loss of Koala habitat

The proposed development is a minor development under the CKPoM because it requires the removal of no more than two (P)KFTs for each hectare of assessable land to which the DA relates, being 19 (P)KFTs within 9.5 ha.

For a minor development, the compensation required for the loss of Koala habitat is outlined in the CKPoM as follows:

To ensure that the provision of compensation is:

- *equivalent to the importance of habitat to be removed*
- *geographically appropriate so as to contribute to the long-term conservation and viability of Campbelltown's koalas*

the proponent shall be required to compensate for the loss of any (P)KFTs or shelter trees at the following ratio of replacement trees (or the monetary equivalent¹) for every individual tree that is removed:

- a. *Small (DBH<100 mm) 1:10*
- b. *Medium (DBH>100<300 mm) 1:15*
- c. *Large (DBH>300 mm) 1:20*

The monetary equivalent proposed as \$35 per replacement tree

Therefore, to compensate for the loss of 18 large trees a ratio of 1:20, and a ratio of 1:15 for the loss of one medium tree would need to be applied. This would require the provision of 375 trees at the cost of \$35 per replacement tree, totalling \$13,125.

9. References

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- NSW Government 2021. *State Environmental Planning Policy (Koala Habitat Protection) 2021*.
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Appendix A Vegetation Assessment

Table 12: Trees within the development site from the Arborist's report with (P)KFTs in bold and retained trees in red




Tree no.	Species	DBH
1.0	<i>Acacia decurrens</i> (Black Wattle)	10cm
2.0	<i>Casuarina glauca</i> (Swamp Oak)	20cm
3.0	<i>Casuarina glauca</i> (Swamp Oak)	10cm
4.0	<i>Eucalyptus moluccana</i> (Grey Box)	42cm
5.0	<i>Eucalyptus moluccana</i> (Grey Box)	80cm
6.0	<i>Casuarina cunninghamiana</i> (River Oak) multiple	5cm
7.0	<i>Eucalyptus punctata</i> (Grey Gum)	45cm
8.0	<i>Eucalyptus punctata</i> (Grey Gum)	45cm
9.0	<i>Eucalyptus punctata</i> (Grey Gum)	45cm
10.0	<i>Eucalyptus microcorys</i> (Tallowwood)	50cm
11.0	<i>Eucalyptus microcorys</i> (Tallowwood)	50cm
12.0	<i>Eucalyptus microcorys</i> (Tallowwood)	45cm
13.0	<i>Casuarina glauca</i> (Swamp Oak)	10cm
14.0	<i>Pinus radiata</i> (Monterey Pine)	40cm
15.0	<i>Eucalyptus microcorys</i> (Tallowwood)	50cm
16.0	<i>Casuarina glauca</i> (Swamp Oak)	10cm
17.0	<i>Eucalyptus punctata</i> (Grey Gum)	40cm
18.0	<i>Eucalyptus punctata</i> (Grey Gum)	30cm
19.0	<i>Eucalyptus microcorys</i> (Tallowwood)	30cm
20.0	<i>Eucalyptus microcorys</i> (Tallowwood)	25cm
21.0	<i>Eucalyptus microcorys</i> (Tallowwood)	45cm
22.0	<i>Casuarina glauca</i> (Swamp Oak)	10cm
23.0	<i>Casuarina glauca</i> (Swamp Oak)	10cm
24.0	<i>Casuarina glauca</i> (Swamp Oak)	10cm
25.0	<i>Eucalyptus microcorys</i> (Tallowwood)	30cm
26.0	<i>Eucalyptus microcorys</i> (Tallowwood)	41cm
27.0	<i>Eucalyptus microcorys</i> (Tallowwood)	40cm
28.0	<i>Casuarina glauca</i> (Swamp Oak) multiple	15cm
29.0	<i>Eucalyptus punctata</i> (Grey Gum)	30cm
30.0	<i>Eucalyptus punctata</i> (Grey Gum)	30cm
31.0	<i>Casuarina glauca</i> (Swamp Oak) Multiple	20cm
32.0	<i>Casuarina glauca</i> (Swamp Oak)	20cm
33.0	<i>Eucalyptus saligna</i> (Sydney Blue Gum)	30cm
34.0	<i>Eucalyptus saligna</i> (Sydney Blue Gum)	40cm

Tree no.	Species	DBH
35.0	<i>Pinus radiata</i> (Monterey Pine)	30cm
36.0	<i>Eucalyptus punctata</i> (Grey Gum)	45cm
37.0	<i>Eucalyptus punctata</i> (Grey Gum)	40cm
38.0	<i>Eucalyptus microcorys</i> (Tallowwood)	40cm
39.0	<i>Eucalyptus punctata</i> (Grey Gum)	30cm
40.0	<i>Eucalyptus punctata</i> (Grey Gum)	30cm
41.0	<i>Eucalyptus punctata</i> (Grey Gum)	40cm
42.0	<i>Eucalyptus punctata</i> (Grey Gum)	40cm
43.0	<i>Eucalyptus punctata</i> (Grey Gum)	40cm
44.0	<i>Casuarina glauca</i> (Swamp Oak) multiple	10cm
45.0	<i>Casuarina glauca</i> (Swamp Oak)	40cm
46.0	<i>Eucalyptus saligna</i> (Sydney Blue Gum)	55cm
47.0	<i>Eucalyptus saligna</i> (Sydney Blue Gum)	45cm
48.0	<i>Eucalyptus saligna</i> (Sydney Blue Gum)	30cm
49.0	<i>Eucalyptus saligna</i> (Sydney Blue Gum)	35cm
50.0	<i>Casuarina glauca</i> (Swamp Oak) multiple	10cm
51.0	<i>Casuarina glauca</i> (Swamp Oak)	32cm
52.0	<i>Casuarina glauca</i> (Swamp Oak)	30cm
53.0	<i>Eucalyptus saligna</i> (Sydney Blue Gum)	55cm
54.0	<i>Eucalyptus saligna</i> (Sydney Blue Gum)	10cm
55.0	<i>Casuarina glauca</i> (Swamp Oak) Multiple	10cm
56.0	<i>Eucalyptus saligna</i> (Sydney Blue Gum)	50cm
57.0	<i>Eucalyptus saligna</i> (Sydney Blue Gum)	55cm
58.0	<i>Eucalyptus saligna</i> (Sydney Blue Gum)	30cm
59.0	<i>Eucalyptus microcorys</i> (Tallowwood)	50cm
60.0	<i>Eucalyptus tereticornis</i> (Forest Red Gum)	93cm
61.0	<i>Eucalyptus microcorys</i> (Tallowwood)	57cm
62.0	<i>Eucalyptus microcorys</i> (Tallowwood)	50cm
63.0	<i>Eucalyptus microcorys</i> (Tallowwood)	50cm
64.0	<i>Eucalyptus microcorys</i> (Tallowwood)	50cm
65.0	<i>Eucalyptus tereticornis</i> (Forest Red Gum)	58cm
66.0	<i>Melaleuca styphelioides</i> (Prickly Paperbark)	54cm
67.0	<i>Eucalyptus moluccana</i> (Grey Box)	65cm
68.0	<i>Eucalyptus tereticornis</i> (Forest Red Gum)	17cm
69.0	<i>Eucalyptus microcorys</i> (Tallowwood)	10cm
70.0	<i>Eucalyptus microcorys</i> (Tallowwood)	60cm

Appendix B Koala Exclusion Fencing Design

Details of Koala exclusion fencing design are provided below as outlined in 'Koala Sensitive Design Guideline - A guide to koala-sensitive design measures for planning and development activities' (Department of Environment and Heritage Protection, 2012). Note the whole guide has been reproduced here for context, but only the exclusion fencing will apply to the development.

Table 1: Guide to Koala Sensitive Design - koala friendly fencing

Design specification	Additional supporting information
<p>Use koala-friendly fencing material</p> <p><i>Allow koalas to easily climb through or under a fence.</i></p> <p>Build using minimal materials such as post and rail or other fencing material with a minimum gap of 300 mm between rails.</p> <p>Alternately use solid fencing material that cannot be climbed by koalas but has a minimum gap of 300 mm between the ground and the lowest rail to allow koalas to move underneath the fence.</p> <p><i>Allow koalas to easily climb over a fence.</i></p> <p>Use rails or slats that have spaces of at least 10 mm between vertical slats and 20 mm between horizontal rails that koalas can climb.</p> <p>Alternately use materials such as timber posts or chain wire that a koala can easily grip and climb</p>   	<p>Koalas try to go through, under and then around a structure before attempting to climb over. Fencing raised off the ground is the best option for koalas.</p> <p>Koalas can become trapped in fencing as they try to squeeze through palings and rails.</p> <p>Fence design needs to ensure that gaps in the fence are:</p> <ul style="list-style-type: none"> • large enough to allow easy access to pass through • of a size (less than 10 cm) to allow koalas to climb over, but prevent koalas climbing through and getting stuck in the fence.

Incorporate koala-friendly fencing additions

Build the fence to incorporate existing vegetation or trees.

Leave vegetation on either side of the fence with canopies or trunks extending beyond the height of the fence and where canopies are connected or tree trunks are less than 1 m apart.

Install a timber post or log (of at least 125 mm in width or diameter) leaning against the top of the fence but positioned at an angle to the fence so that the log is not flush with the fence (i.e. the space between the base of the log and the bottom of the fence is at least 400 mm (Figure7))



Install ladders of the following dimensions and design:

- Timber ladder rungs are at least 300 mm in width, 50-100mm in height and a minimum of 20mm in depth to provide grip for koalas.
- Rungs are spaced horizontally with a 150-300mm gap between rungs for ease of climbing.
- Webbed or latticed material is attached to provide additional footholds for koalas.



Incorporate structures or designs in association with fencing material that provide a means for koalas to climb over fences, retaining walls or other structures.

If installing koala-friendly fencing additions they should be used at the following frequencies:

- At least once within a backyard to allow animals to exit a property.
- At least once every 50 m where the length of the impassable barrier or fencing is greater than 200 m.

Ladder rungs need to be solid and firmly attached to the structure.

Install a simple koala bridge (particularly suited to security fences) using timber logs of at least 125 mm in diameter of the following design:

- Timber logs are positioned adjacent to and within 1 m of each other on either side of the fence and extend for at least 1m above the fence.
- A cross piece of similar diameter to the logs connects the two vertical timber posts that are within 1-4m of each other on either side of the fence.



Koala exclusion fencing

Install fencing material that is unclimbable such as:

- brick, metal sheeting, perspex or timber fencing without gaps between palings.



Koala exclusion fencing stops koalas moving between areas. It reduces permeability so should only be used where there is a direct threat to koala safety. The following situations are suitable for using koala exclusion fencing:

- Domestic dog enclosures in larger properties (greater than 800 m²). Smaller properties should use other measures to reduce dog and koala interactions.
- High speed/volume roads or train lines - fencing funnels koalas to safe crossing structures (underpasses or overpasses).
- Swimming pools where pool design is unsafe for koalas.
- Areas where construction activities may cause harm to koalas such as pits or trenches. Temporary fencing that stops koala access would be appropriate.



- chain wire fencing material with a floppy top that falls in the direction that the koala will attempt to climb the fence or that has a smooth metal or perspex sheets of at least 600 mm wide on the top of the fence



Additional requirements for koala exclusion fencing are:

- Fence bracing or supports are on the side of the fence that's away from koala access.
- The top of the unclimbable section of fencing is at least 1.5 m from the ground to prevent koalas jumping and gripping the top of the fencing.
- Fencing should extend to ground level along uneven or undulating ground.
- Vegetation beside the fence is regularly maintained to:
 - exclude trees and shrubs from within 3 m of the fence
 - keep canopies of trees trimmed to remove links to tree canopies on the other side of the fence
 - remove fallen branches and vines growing on the fence which koalas may use to climb over the fence.

