NSW SCIENTIFIC COMMITTEE

Preliminary Determination

The Scientific Committee, established by the *Threatened Species Conservation Act* 1995 (the Act), has made a Preliminary Determination to support a proposal to list a population of the Koala *Phascolarctos cinereus* in the Tweed Local Government Area east of the Pacific Highway as an ENDANGERED POPULATION in Part 2 of Schedule 1 of the Act. Listing of Endangered populations is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. The Koala *Phascolarctos cinereus* (Goldfuss, 1817) (family Phascolarctidae) is not currently listed as an Endangered species in Part 1 of Schedule 1 or a Critically Endangered species in Part 1 of Schedule 1A and as a consequence populations of this species are eligible to be listed as Endangered populations.

2. The Koala is a medium-sized, stocky marsupial: head-body 674-820 mm (males), 648-730 mm (females); weight 4.2-14.9 kg (males), 4.1-11 kg (females). The tail is vestigial, the limbs are well developed and all paws are equipped with long robust claws. The woolly fur ranges from grey to brown dorsally, and is paler ventrally, often with irregular pale patches on the rump. The ears are large, oval and well furred, the nose is prominent, unfurred and black (Menkhorst and Knight 2001; Van Dyck and Strahan 2008; OEH 2013).

3. Koalas are arboreal and obligate folivores feeding predominately on leaves from *Eucalyptus* trees (over 70 species) but in any one area will have a small range of preferred species (Van Dyck and Strahan 2008; OEH 2013). Some other plants are also occasionally consumed including species of *Acacia*, *Corymbia*, *Angophora*, *Leptospermum* and *Melaleuca* (Martin and Handasyde 1999, CoA 2011). Koalas inhabit a variety of woodland and forests that are dominated by *Eucalyptus* tree species. Koalas generally occur at low altitudes (< 800 m) and are most common in the foothills of the ranges and coastal plains. In inland areas they often inhabit eucalypt forests along watercourses (Martin and Handasyde 1999; Van Dyck and Strahan 2008).

4. Koalas are largely sedentary and spend up to 20 hours per day resting or sleeping, often in a low fork of a tree. They are most active at night, climbing into the canopy to feed or moving within or between trees. Koalas spend most of their time in trees but will descend and traverse open ground to move between trees (Van Dyck and Strahan 2008). Koalas are generally solitary and home range size varies from less than 2 ha to over 100 ha depending on habitat quality (Van Dyck and Strahan 2008). Home ranges may overlap amongst individuals of the same sex in high quality habitat but are usually discreet in drier or less fertile areas. Males have larger home ranges than females and a dominant male's home range overlaps with those of several females and subordinate males (DECC 2008; Van Dyck and Strahan 2008; OEH 2013). Koalas show a high level of site fidelity (Mitchell 1990; Kavanagh *et al*. 2007). Sexual maturity in female Koalas is reached from eighteen months and in the wild they produce one offspring every one to two years (McLean & Handasyde 2006). Female Koalas live to around 15 years and males to 12 years (CoA 2011). The generation length is estimated to be 6 years (Phillips 2000). At 2-3 years of age, young adult Koalas of both sexes disperse from their natal range, typically moving 0.3-11 km, to establish their own home range (Mitchell and Martin 1990; Dique *et al*. 2003a; DECC 2008).

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5. Koalas are widespread in eastern Australia, being distributed from north-east Queensland to south-east South Australia (CoA 2011). In New South Wales (NSW), the Koala was formerly widely distributed throughout the eastern half of the state (DECC 2008). Due to the extensive clearing of forest and woodland for agriculture and urban development, the distribution of the Koala is now highly fragmented (Van Dyck and Strahan 2008). In NSW, Koala populations are now concentrated on the central and north coast and west of the Great Dividing Range in the north of the state. Smaller isolated populations also occur on the tablelands and the south coast (DECC 2008; OEH 2013). Studies of factors influencing the distribution of Koalas in south-east Queensland indicate that the likelihood of Koala presence declines rapidly as forest cover drops below 60-70% of the landscape (McAlpine *et al*. 2006, 2007). In addition, Koala presence starts to decline when patches of habitat are <150 ha and Koalas are likely be to absent from habitat patches smaller than 50 ha (McAlpine *et al*. 2007).

6. In far north-eastern NSW records of Koalas in the Tweed Local Government Area (LGA) are concentrated in the coastal lowlands which occupy the eastern 20% of the Tweed LGA. Only scattered low density Koala populations occur elsewhere in the Tweed LGA. Within the Tweed LGA over 44% of the original vegetation cover has been removed or heavily disturbed over the last 150 years (Kingston *et al*. 2004). Most clearing of native vegetation has occurred on the flatter and more fertile land and has been particularly extensive in the coastal lowlands (Kingston *et al.* 2004). The Tweed LGA contained almost 83,000 human residents in 2006 but is one of the fastest growing areas in NSW and is estimated to exceed 120,000 residents by 2025 (Phillips *et al*. 2011). Almost all of this growth has occurred, and is expected to continue, in the coastal lowlands between Tweed Heads and Pottsville (Phillips *et al.* 2011). Declines in Koala distribution and abundance within Tweed LGA have previously been noted and concern for the species' long term persistence expressed for some decades (Faulk 1990; Summerville 1990; Phillips and Callaghan 1996; Phillips 2002; Phillips *et al*. 2011).

7. Approximately 4,368 ha of fragmented but otherwise suitable Koala habitat remains in the Tweed LGA coastal lowlands (Kingston *et al.* 2004). Of this, 306 ha of mapped vegetation is considered to be primary Koala habitat where the preferred Koala food trees Swamp Mahogany *Eucalyptus robusta*, Forest Red Gum *E. tereticornis* and/or Tallowwood *E. microcorys* grow on medium to high nutrient soil landscapes (Kingston *et al*. 2004). A further 2,676 ha of mapped vegetation is considered to be secondary (Class A) Koala habitat where Swamp Mahogany, Forest Red Gum and/or Tallowwood are sub-dominant elements (Kingston *et al*. 2004). Around 1,386 ha of mapped vegetation is considered secondary (Class B) Koala habitat containing Tallowwood and /or Grey Gum *E. propinqua*, growing on low nutrient soils (Kingston *et al*. 2004). The remainder of the Tweed Coast area contains mapped vegetation with no preferred Koala food trees, has been cleared or may contain only scattered Koala food trees (Kingston *et al*. 2004).

8. A remnant population of Koalas occupies the coastal lowlands of the Tweed LGA east of the Pacific Highway. To the east the population is bounded by the Pacific Ocean, to the south by the Tweed/Byron LGA boundary, to the north by the NSW-Queensland border and to the west by the Pacific Highway. The population is mostly associated with the largest areas of natural vegetation remaining in the Tweed coastal lowlands from north of Bogangar to south of Pottsville (Phillips *et al*. 2011). Some scattered signs of Koala activity (e.g. scats, scratch marks) also occur in the Tweed coastal lowlands west of the

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Pacific Highway and north of the Tweed River, for example near Cobaki and Bilambil but these are no longer thought to represent resident populations (Phillips *et al*. 2011) and are not included in this listing.

9. On the southern boundary of the Tweed LGA Koala population east of the Pacific Highway, potential Koala habitat is unoccupied (Phillips *et al*. 2011) as is the adjoining area of the Byron LGA south to the Brunswick River (Hopkins and Phillips 2011). Along the population's northern boundary, the densely urbanised Tweed Heads area represents a hostile environment and a significant barrier to dispersal (Dique *et al.* 2003a). Although populations of Koalas are present in the adjoining Gold Coast LGA, there has been no recent evidence of recruitment into the Tweed LGA population from Queensland (Phillips *et al*. 2011) suggesting that any movement of animals is limited. The Pacific Highway, a four lane dual carriageway, represents the western boundary of the population. Major roads are considered a significant barrier to the movement of Koalas, functioning both as a substantial habitat gap that resident Koalas are reluctant to cross and as a significant source of mortality (Dique *et al*. 2003a, 2003b; Lassau *et al.* 2008; Rhodes *et al.* 2014). Although some fauna exclusion fencing, as well as several fauna under- and over-passes are present along the Pacific Highway, their use by Koalas has been negligible (Phillips *et al.* 2011).

10. The Koala population in the Tweed LGA east of the Pacific Highway is fragmented into five sub-populations. North of the Tweed River a small, relict subpopulation occurs in the Tweed Heads South area. This population is predicted to become locally extinct in the near future (Phillips *et al*. 2011). South of the Tweed River, there are four additional sub-populations; the Bogangar-Kings Forest–Forest Hill sub-population (inhabiting an area of 358 ha; 71% vegetated); the Tanglewood-Round Mountain-Koala Beach sub-population (inhabiting an area of 578ha; 80% vegetated); the Pottsville Wetlands-Black Rock-Dunloe Park sub-population (inhabiting an area of 316 ha; 79% vegetated) and the Duranbah-Eviron sub-population (inhabiting an area of 625 ha; 10% vegetated). The extent of connectivity within and amongst these sub-populations remains uncertain (Phillips *et al*. 2011) as roads, cleared agricultural land and/or urban development occur within and amongst them.

11 The geographic distribution of the Koala population in the Tweed LGA east of the Pacific Highway is highly restricted. The Extent of Occurrence (EOO) is estimated to be 124 - 192 km^2. The EEO estimate is based on the method of assessment recommended by IUCN (2014). The area of occupancy (AOO) was estimated to be 112-192 km^2, based on 28-48 2 x 2 km grid cells, the scale recommended for assessing AOO by the IUCN (2014). The EOO and AOO were estimated using koala records compiled by Phillips *et al.* (2011) of variable spatial accuracy. The lower estimates were obtained when including only recent records (2000-2009) with high spatial accuracy and the higher estimates were obtained when all records were included.

12 The estimated total number of mature individual koalas in the Tweed LGA population east of the Pacific Highway is considered to be low. Based on density estimates of 0.14 individuals per hectare and the area of occupied sites, the total number of individuals in the four southern sub-populations is estimated to be 144 individuals (9-64 for each sub-population) with an upper 95% confidence interval at 267 individuals (16-120 for each sub-population) (Phillips *et al.* 2011). The number of Koalas remaining in the northern sub-population has not been estimated but it is likely to comprise only a few individuals

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(Phillips *et al.* 2011). These estimates include an unknown proportion of juveniles and sub-adults so the number of mature individuals is likely to be less than these estimates.

13 The Koala population in the Tweed LGA east of the Pacific Highway, like those throughout NSW, are subject to a number of ongoing threats including habitat loss and degradation, increased mortality due to wildfire, dog attacks and vehicle strike, as well as disease (DECC 2008; Phillips *et al.* 2011). A significant threat to the Tweed LGA Koala population east of the Pacific Highway is continued habitat loss and fragmentation due to urban development. Approximately 965 ha of bushland in the Tweed LGA, including around 100 ha of Koala habitat, was cleared between 2000 and 2007 (BRS 2008). Development pressures continue in the Tweed Coast, with several approved and proposed developments likely to lead to further loss and fragmentation of Koala habitat. Habitat loss and fragmentation also have the potential to further impede dispersal and recruitment between sub-populations, and are associated with increased risks of vehicle strike and domestic dog attack (McAlpine *et al.* 2006; Phillips *et al*. 2011). 'Clearing of native vegetation' is listed as a Key threatening process under the *Threatened Species Conservation Act* 1995.

14 Inappropriate fire regimes, particularly high intensity or high frequency fires, also represent a significant threat to the Koala population in the Tweed LGA east of the Pacific Highway (Phillips *et al*. 2011). Fires impact Koalas directly through mortality of animals. Increased fire frequency may also reduce quality of Koala habitat and has the potential to exacerbate population decline (Starr 1990; Melzer *et al*. 2000; Lunney *et al*. 2007). The largest area of natural vegetation, and potential Koala habitat, remaining in the Tweed coastal lowlands occurs around Cudgen Lake/Round Mountain (Phillips *et al*. 2011). Much of this area has been burnt multiple times in the last 15 years with time between fires being as short as 3 years. The 2004 and 2009 fires were of high-intensity and much of the area burnt by these fires is currently unoccupied by Koalas, despite containing areas mapped as high quality Koala habitat (Phillips *et al.* 2011). 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' is listed as a Key Threatening Process under the *Threatened Species Conservation Act* 1995.

15 Mortality in the Koala population in the Tweed LGA east of the Pacific Highway Coast area is also exacerbated by vehicle strikes. Phillips (2002) reported that vehicle strike was responsible for 34% of known Koala mortalities on the Tweed coast between 1991 and 2002 and 19% of mortalities since (Phillips *et al.* 2011). Similarly, of 40 Koala mortalities in the Tweed coastal lowlands since 2007, recorded by Friends of the Koala Inc., nine (23%) were a result of vehicle strike (Phillips *et al*. 2011). Many local roads pass through the population and sections of four major roads (Tweed Coast Road, Clothiers Creek Rd, Round Mountain Road, Pottsville Road) have been identified as Koala 'blackspots' where Koalas represent a high proportion of native animals killed (Phillips 2002; Phillips *et al.* 2011). The total number of Koala deaths from vehicle strike is likely to be larger than that reported and the risk of vehicle strike can be expected to increase with increased urbanisation and human population growth. The long-term viability of Koala populations can be particularly sensitive to slight changes in mortality rates. For example, Phillips *et al*. (2007) concluded, on the basis of a Population Viability Analysis, that as little as a 2-3% increase in mortality rate (as a function of total population size), due to incidental factors such as road mortality would be sufficient to

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drive on-going population decline in an otherwise demographically stable Koala population in south-east Queensland.

16 Chlamydial disease and the Koala Retrovirus (KoRV) are common in Koala populations in eastern Australia (CoA 2011) and are present in the Tweed coastal lowlands Koala population (Phillips *et al.* 2011). Chlamydia can cause blindness, infertility and pneumonia (Polkinghorn *et al*. 2013) while KoRV has been linked to some cancers and suppression of the immune system (Denner and Young 2013). Both diseases impact the general health of populations and can exacerbate the effect of other environmental stressors. Of 40 Koala mortalities recorded from the Tweed coast area since 2007 by Friends of the Koala Inc., 20 (50%) were reported to be from disease (Phillips *et al*. 2011).

17 The Koala population in the Tweed LGA east of the Pacific Highway is also likely to be threatened by mortality due to dog attack (Lunney *et al.* 2007; DECC 2008). The record of dog attacks in this area is incomplete, with only three mortalities (7%) attributed to dog attacks over the last 20 years (Friends of the Koala Inc.). The actual incidence of dog attack however is likely to be higher, given the rural nature of much of the Tweed LGA, as well as increased rates of urbanisation and population growth in the area (Phillips *et al*. 2011). On the mid-north coast of NSW, attacks by dogs are the cause of *c*, 15% of admissions to the Port Macquarie Koala Hospital (Phillips *et al*. 2011).

18 The population of the Koala *Phascolarctos cinereus* (Goldfuss, 1817) in the Tweed Local Government Area east of the Pacific Highway is eligible to be listed as an Endangered population as, in the opinion of the Scientific Committee, it is facing a very high risk of extinction in New South Wales in the near future as determined in accordance with the following criteria as prescribed by the Threatened Species Conservation Regulation 2010:

Clause 11

The population is facing a very high risk of extinction in New South Wales in the near future as, in the opinion of the Scientific Committee, it satisfies any one or more of the following paragraphs and also meets the criteria specified in one or more of the following clauses:

(a) it is disjunct or near the limit of its geographic range.

Clause 13

The geographic distribution of the population is estimated or inferred to be highly restricted and either:

(a) a projected or continuing decline is observed, estimated or inferred in either of the key indicators:
  (a) an index of abundance appropriate to the taxon, or
  (b) the geographic distribution, habitat quality or diversity, or genetic diversity of the population, or

(b) at least two of the following three conditions apply:
  (i) the population or habitat is observed or inferred to be severely fragmented;
  (ii) all or nearly all mature individuals are observed or inferred to occur within a small number of locations.

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Clause 14

The estimated total number of mature individuals in the population is low and either:

(a) a projected or continuing decline is observed, estimated or inferred in either of the key indicators:
  (i) an index of abundance appropriate to the taxon, or
  (ii) the geographic distribution, habitat quality or diversity, or genetic diversity of the population, or

(b) at least two of the following three conditions apply:
  (i) the population or habitat is observed or inferred to be severely fragmented,
  (ii) all or nearly all mature individuals are observed or inferred to occur within a small number of locations.

Professor Michelle Leishman
Chairperson
Scientific Committee

Exhibition period: 24/10/14 – 30/01/15 Proposed Gazettal date: 24/10/14

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