

Comprehensive Koala Plan of Management for south-east Lismore



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Executive Summary

It is generally acknowledged that koalas have an iconic role in both the perception and reality of Lismore's local environment and that both landholders and the wider community hold the key to the future of this special animal in Lismore's Local Government Area (LGA). The Comprehensive Koala Plan of Management for south-east Lismore (the Plan) provides an equitable blueprint for the continued coexistence of people and Koalas in and around Lismore. However, the Plan is a living document and can be reviewed at any time by Council.

This Plan is set out in six main sections (including appendices, described below), however, it is not a document that needs to be read from cover to cover. Depending on your purpose, you can enter it at different points to get all the information you need. Although every effort has been made to make this Plan easy to read in 'plain English' it is also, however, a technical document that provides guidance for preparing and assessing *development applications* that may impact on koalas and their habitat.

Section 1 Background sets out the purpose and objectives of the Plan and answers key questions about the legislative context of the Plan, who should read the Plan, the community consultation process underpinning the Plan's development, the status of koalas in Lismore and elsewhere and the processes threatening koalas and their habitat.

Section 2 General Provisions describes the parts of Lismore to which the Plan applies and does not apply, explains the purpose of the koala habitat mapping, advises that any koala habitat maps are indicative only and require verification at the time a *development application*¹ is lodged, details the duration of the Plan and notes that this Plan can be reviewed at any time at the discretion of Council.

Section 3 Management Activities is the most important section of the Plan. The management activities listed in this section are a prioritised range of predominantly non-regulatory initiatives with the intention to: effectively implement and monitor the Plan; minimise threats to koalas and their habitat (including important initiatives relating to road and traffic management, dog management, bushfire management); conserve, restore and

¹ Words and terms shown in italics are defined in the Definitions and Acronyms section of the Plan.

manage koala habitat; educate Lismore's community; improve koala health and welfare and identify opportunities for economic development and tourism.

Section 5 Development Assessment Framework is of particular interest to people requiring a *development application* for an activity or development. This section clearly states the Plan's Development Assessment Framework are only triggered when a *development application* is required and received by Council and that development activities that are permitted without consent under Lismore Local Environment Plan 2012 do not require a *development application* and do not need to comply with the Plan. This includes the majority of farm related activities across the Lismore Local Government Area. If you are not sure of whether the activity you are conducting or planning to conduct requires a *development application*, contact Council's Duty Planner. Initial advice is provided free of charge. For those developments that do require a *development application*, the Plan provides a transparent and consistent assessment pathway and criteria that explains how a *development application* is processed by Council. This section also presents guidelines for: *koala habitat* assessment; *food tree* and *koala habitat* retention; and compensation for the loss of *food trees* and *koala habitat*.

Appendices of the Plan provide additional information and resources relevant to the operation of the Plan including: an explanation of the legislative context of the Plan; indicative koala habitat maps within the koala planning area; a list of approved koala plans of management within the koala planning area; technical details regarding koala habitat assessment and the habitat compensation policy.

Acknowledgements

A working draft of this Plan was prepared with reference to a number of koala plans of management, including those prepared by Coffs Harbour City Council, Clarence Valley Council and Kempsey Shire Council. Of particular benefit was the draft plan prepared for Lismore City Council which was presented to Council in 2004 but was not adopted.

Then, the working draft of this Plan was presented to a panel of relevant koala and planning experts. These experts reviewed and provided comment on both the proposed Development Assessment Framework and management activities presented in the working draft. The following people from Lismore City Council and other organisations formed the panel: Steve Bennetts (Rural Works Engineer), Steve Jensen (Department of Planning), Matt Kelly (Compliance Coordinator), Damian Licari (Environmental Strategies Officer, Ecologist), Rodney Mallam (Senior Development Assessment/ Heritage Planner), Joe Monks (Senior Ranger), Dr Steve Phillips (Biolink Ecological Consultants), Nick Stephens (Environmental Strategies Coordinator), John Turbill (Office of Environment and Heritage), Chris Watts (Development Assessment Coordinator), Greg Yopp (Strategic Planner).

Following review by the panel, a discussion draft of this Plan was prepared. This draft was presented to a stakeholder reference group of representatives from industry and environmental interest groups operating in Lismore. This reference group provided substantial comment on the contents of the Plan. The members of the group were: Steve Denize (Chairperson, Lismore City Council), Georgia Beyer (Nature Conservation Trust of NSW), Jolyon Burnett (Australian Macadamia Society), Kel Graham (Cooee Property Rights), Sandra Heuston (Northern Rivers Wildlife Carers Inc), Julie Reid (Envite Environment), Kath Robb (NSW Farmers Association), Malcolm Scott (Consultant Town Planner), Lorraine Vass (Friends of the Koala Inc), Tony Walker (Richmond Landcare Inc) and Jeffrey Zanelle (Richmond Banana Growers).

In addition, this Plan has been informed by the scientific background study commissioned by Council as part of the development of this Plan (Biolink Ecological Consultants, 2011).

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1 Background

1.1 *Why do we need a comprehensive koala plan of management?*

The purpose of this Koala Plan of Management or KPoM is;

1. To ensure that activities threatening koalas and their habitat, within the *koala planning area* (Figure 1) in the south-east of the Lismore Local Government Area (LGA) are avoided, minimised, mitigated and/or compensated;
2. To maintain or improve Lismore's koala population and their habitat by working with landholders and industry and pursuing appropriate relevant partnership and funding opportunities;
3. *State Environment Planning Policy 44 – Koala Habitat Protection* (SEPP44) encourages Councils to adopt comprehensive plans of management to effectively meet the aims of the policy and to facilitate the processing of *development applications* otherwise required.
4. To provide a transparent and consistent development assessment framework for Council and people intending to prepare an application to develop land determination of *development applications* that may have a potential adverse impact on koalas and their habitat.

1.2 *What are the objectives of this Plan?*

The overall objectives of this Plan, as it applies to the *koala planning area*, are to:

1. identify and list the *preferred koala food tree* species likely to be found in the Lismore LGA and to map preferred *koala habitat* in the *koala planning area*;
2. minimise the effect of those processes within Council's sphere of control and influence which threaten koalas and their habitat;
3. ensure that there is no net loss of *preferred* or *core koala habitat* in the area and allow for safe koala movement across the landscape;
4. create, manage and/or restore koala habitat linkages and corridors;
5. provide a transparent and consistent assessment pathway and criteria for the processing of *development applications*, as well as present guidelines for: *koala*

habitat assessment; *food tree* and *koala habitat* retention; compensation for the loss of *food trees* and *koala habitat*.

6. promote koalas as an asset for Lismore's economic development and tourism.

The above objectives will be realised through both the management activities and Development Assessment Framework detailed in this Plan and should be considered in the context of the findings and recommendations identified in the scientific background study that accompanies this Plan (Biolink Ecological Consultants, 2011).

Note, although this Plan provides development assessment framework for the determination of *development applications*, the Plan does not give rise to a need for *development applications* over and above what is required by the Lismore Local Environment Plan 2012 (Lismore LEP). As such, the Development Assessment Framework within this Plan are only triggered when a *development application* is required/received by Council.

1.3 What is the legislative context of this Plan?

It is recognised that the statutory planning system in which Lismore City Council (Council) operates is complex and often difficult to understand. Appendix 1 provides an overview of the main legislation and planning instruments relevant to the management and conservation of koalas and their habitats in the Lismore Local Government Area (LGA).

1.4 Is this Plan another layer of bureaucracy?

No. The Plan brings koala related *development application* assessment matters and non-regulatory koala management initiatives together in one place. In doing this, the Plan provides greater transparency, certainty and more consistent outcomes in regards to how Lismore will manage koalas and their habitat. As the single point of reference for koala related matters, the Plan provides a greater level of regulatory certainty for landholders and developers. Consequently, the Plan provides greatly improved equity and clarity for all stakeholders engaged in the development assessment process and a greater level of certainty for appropriate decision making.

1.5 Who should read this Plan?

If you are preparing a development application to develop land, this Plan provides guidance on how you will need to address potential impacts on koalas or their habitat in your *development application*. Remember, if you don't need a DA for any of the activities you conduct or plan to conduct on your land, this Plan does not apply and has no effect on what you are doing.

If you are a landholder, the Plan identifies a range of opportunities and benefits for landholders wanting to preserve and/or enhance koala habitat on their land. The Plan lists a raft of non-regulatory management activities to assist landholders such as the development of koala-based tourism opportunities and a wild dog control program. Locating your property within the maps of preferred koala habitat in the koala planning area (Appendix 2) will determine if your land may contain *koala habitat*. It is intended that these maps be employed as an initial guide for site assessment once a *development application* is lodged with Council. If you have mapped *preferred koala habitat* on your land and you intend to lodge a *development application*, a site inspection by one of Council's planning staff will verify if your proposal has any adverse impacts on koala or their habitat. If you don't need a DA for any of the activities you conduct or plan to conduct on your land, this Plan does not apply and these maps have no effect on what you are doing or planning to do.

If you are determining a development application this Plan provides you with a set of transparent and consistent processes and guidelines for assessing DAs.

If you have an interest in the future of koalas this Plan includes non-regulatory management activities to help protect and enhance Lismore's koala population and a means of engagement with landholders and Lismore's broader community who are the stewards of Lismore's environment. A large number of people and organisations within Lismore's community indicate that many people are passionate about the need to care for koalas and their habitat.

1.6 How was this Plan developed?

Council recognised that any endeavours to ensure a future for Lismore's koalas and their habitat required the involvement of the whole of Lismore's community including urban and rural landholders, local industry as well as proponents for the koala and the environment.

The extensive community consultation process underpinned the development of this Plan involving landholder, industry and environmental interest groups as well as the broader community. A nine-member stakeholder reference group with representatives from landholder, agricultural, development and environmental interest groups was convened by Council. The group was mandated by its charter to help ensure the Plan would create a positive legacy for the whole of Lismore's community. Over the course of eight meetings this group worked on developing mutually agreed outcomes, integral to production of this Plan. Although the stakeholder reference group was not a decision making body, this group:

- represented community views regarding local issues and impacts as well as the costs and benefits associated with koala conservation;
- provided Council with advice on how best to integrate koala conservation principles with local land management activities;
- provided information about the project to other community members.

Lismore's broader community was engaged through a community consultation workshop (attended by more 60 members of the community) and the public submissions process. Council received over 900 submissions on the draft of this Plan from individuals as well as landholder, agricultural, development and environmental interest groups, with 64% of submissions supportive of the Plan. Issues raised in the submissions were considered and in many cases incorporated into the Plan adopted by Council.

1.7 What is the status of koalas in Lismore and elsewhere?

The status of koalas nationally varies from region to region. For example, on the 'Koala Coast' of south-east Queensland, the adverse impact of urbanisation has reduced koala numbers to about a quarter of the population in the 1990's. Elsewhere, on Kangaroo Island (South Australia), the introduced and booming koala population is actively controlled through sterilisation and translocation programs. This wide variation in koala

numbers from one region to another is one of the major issues confronting the Australian Government's current assessment of koalas as a nationally threatened species.

The analysis of historical koala records undertaken as part of this Plan (Biolink Ecological Consultants, 2011) is one of eight similar studies across NSW (seven) and south-east Queensland (one). On the whole, the results of these studies suggest there has been an average range contraction of about 30% over the last three koala generations. Moreover, there has been an alarming decrease of about 45% in the amount of otherwise suitable habitat that is actually being used by koalas (about 20 years; pers. comm. S. Phillips).

Interestingly, the analysis for Lismore indicated that although the local population was significantly reduced in the past, it now appears to have been recovering over the last three koala generations (Biolink Ecological Consultants 2011). This finding was due to the significantly greater area of the LGA being occupied by koalas since the 1993, compared to the three koala generations prior to 1993. However, it is noteworthy that this analysis of historical records has not been verified by a field-based assessment of the koala population.

Although the reasons behind the above finding remain uncertain, the evidence suggests two likely causes. First, there has been an overall lack of fire within the floodplain habitats that support the bulk of koala populations in the south of the LGA. Second, koalas have colonised the former "Big Scrub Rainforest" country in the north of the LGA. This 75,000 hectare area of lowland sub-tropical rainforest was cleared in the latter part of the 19th Century for agriculture and settlement. Now, the area is a largely agricultural landscape containing large areas of eucalypt habitat suitable for koalas.

Having free-ranging koalas within the Lismore LGA is a privilege Council wishes to continue into the future. Consequently, these positive results do not offer cause for complacency or inaction. With knowledge of the cause of koala declines in south-east Queensland, it is clear that human population growth and urban expansion can potentially turn this recovery trend around in a short time.

1.8 What are the threats to koalas?

The background scientific research study accompanying this Plan outlines the processes threatening koala populations and their habitat (Biolink Ecological Consultants, 2011). These processes include:

1. Clearing of koala habitat for urban development, roadwork, forestry, agricultural and mining activities;
2. Fragmentation of koala habitat which isolates individuals and populations, impedes gene flow and the ability to maintain effective recruitment levels;
3. Unsustainable mortalities caused by dog attack and vehicle strike;
4. Mortalities caused by random events such as fire ;
5. Degradation of habitat by logging of preferred food trees.

This Plan focuses on those threats which can be managed or influenced by Council, through a combination of regulatory measures (consistent with Council's core land-use responsibilities) and complementary non-regulatory management activities to help address the majority of threats facing koalas in Lismore.

The Plan's regulatory measures focus on points 1 and 2 above by aiming to avoid, minimise, mitigate and/or compensate for the clearing and fragmentation of koala habitat caused through urban development, roadwork and associated infrastructure. Council's regulatory role aligns with its core responsibility to assess *development applications* and apply conditions on development to minimise a wide range of potential environmental impacts.

The non-regulatory management activities in this Plan focus on points 3 and, to a lesser extent, 4 above (i.e. mortalities resulting from dog attacks, vehicle strike and fire). Records maintained by *Friends of the Koala* indicate that 15.5% of mortalities were caused by (or euthanised due to) vehicle strike and 8.3 % were caused by (or euthanised due to) dog attack between 2007 and 2011. This Plan includes specific actions to help address these threats.

The impacts of fire on koala populations have been well documented for areas such as the Tweed coast and south-east Queensland. Given the fragmented nature of *koala habitat* in the Lismore LGA fire is not seen as large an issue, however, specific actions are included in the Plan to develop best practices for fire management in *koala habitat*, due to the significant potential threat of fire to Lismore's koala population.

Disease is also recognised as having a major impact on koalas, with euthanasia of diseased animals accounting for the majority of known mortalities since 2003. The scientific background study (Biolink Ecological Consultants, 2011) identifies that increases in disease can naturally occur due to reduced metabolic/genetic fitness and/or immunity caused by natural stressors such as reduced *food tree* availability and/or increased interaction of threats to koalas.

With human development in and around *koala habitat*, koalas face additional stress from habitat loss, impediments to movement, vehicle strike, and dog attack, which consequently leads to increased levels of disease. From a management perspective, therefore, it is more effective for Council to focus on managing the stress factors that make koalas more prone to disease and are within Council's sphere of control and influence, than to directly manage disease. This is better done by care providers, researchers and universities.

In conclusion, this Plan identifies that for Lismore's human population to coexist with the koala population, an approach that ensures an adequate provision of food trees and reduced incidence of vehicle strike and dog attack is required.

2 General Provisions

2.1 *Land to which the Plan applies*

Land to which the Comprehensive Koala Plan of Management for south-east Lismore applies is *land* in the *koala planning area* located in the south-east portion of Lismore LGA as shown on Figure 1. The *koala planning area* is bounded by the Wilsons River in the north and west and the border with Ballina Shire in the east. In the south the boundary follows Delelvin Lane, Paff Lane, Maxwell Lane, Tuckean Island Road, then along the drainage canal south of Tuckean Island Road and across the southern boundary of Tuckean Nature Reserve.

2.2 *Land to which the Plan does not apply*

The Plan does not apply to:

1. Crown lands within the *koala planning area* that are dedicated as either a conservation reserve or a State Forest under the *National Parks & Wildlife Act 1974* (NPW Act) and *Forestry Act 1916* respectively;
2. Lands that are outside the *koala planning area*;
3. Existing allotments of land less than one hectare in area except where the land:
 - a. together with any adjoining land in the same ownership has an area of more than one hectare; or
 - b. is a *greenfield site* having capacity to be subdivided into five or more allotments.

2.3 *Koala habitat mapping*

The maps contained in Appendix 2 are indicative maps of *preferred koala habitat* within the *koala planning area* (McKinley *et al.*, 2011a, b). The purpose of these maps is to provide a landscape scale context for the location of koala habitat within the koala planning area. It is intended that these maps be used to inform management activities associated with koala habitat conservation, restoration and management and community education.

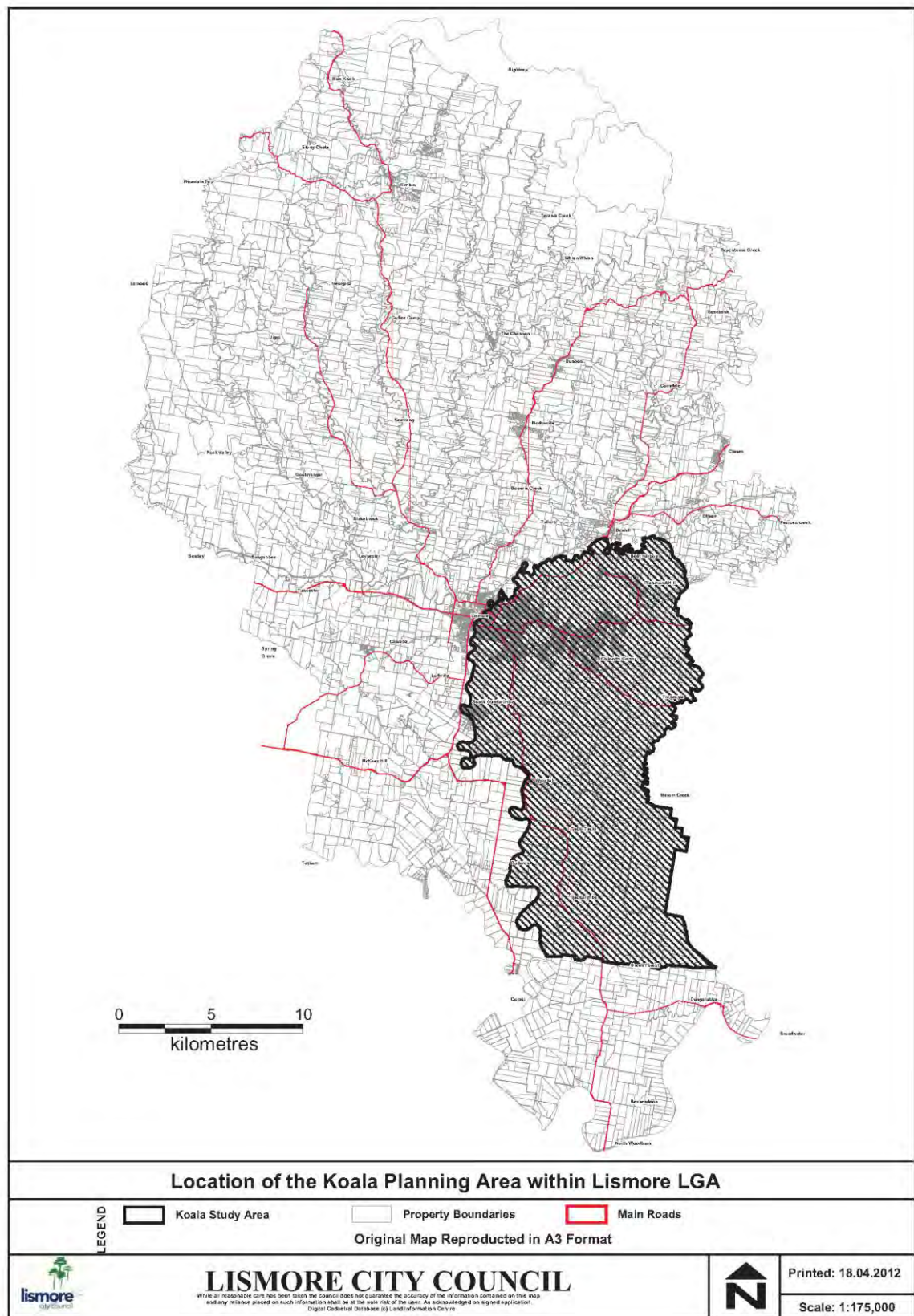


Figure 1. Map of the location of the Koala Planning Area within Lismore LGA

It is also intended that these maps be employed as an initial guide for site assessment once a *development application* is lodged. However, the mapping is subject to detailed field verification within the *study area* or *development footprint* of a proposed development to confirm the accuracy of vegetation boundaries and vegetation community types.

Detailed field verification is required because mapping may not have been verified by ground inspection. A large portion of lands within the *koala planning area* have not been classified (i.e. mapped) due to mapping scale. These lands are mostly rural lands which may contain scattered koala *food trees* which are important koala habitat and play a fundamental role in sustaining the koala population in south-east Lismore.

In addition, a large portion of mapped vegetation is mapped as *Unknown* habitat. For vegetation mapped as *Unknown* habitat, there was insufficient data to enable classification. This vegetation may include both individual trees and clumps of trees which are unmapped owing to the resolution of the mapping.

2.4 Relationship to other Koala Plans of Management

The Plan does not supersede any approved Koala Plans of Management that are currently in force in the *koala planning area*. Current approved and conditional Individual Koala Plans of Management currently are detailed in Appendix 3. Should any of these Individual Koala Plans of Management have a requirement to be reviewed or updated, that review or update should be in accordance with this Plan.

2.5 Duration of the Plan

The Plan will take effect on 22 January 2013 which is the date it was approved by the Department of Planning and Infrastructure. The Plan is to remain in effect for a period of 15 years unless amended and/or superseded. The Plan must be reviewed five and ten years after taking effect. However, the Plan may be reviewed at any time at the discretion of Council.

3 Management Activities

The aim of this section of the Plan is to provide a non-regulatory framework for management activities that complement the Development Assessment Framework presented in Section 4 of the Plan. It is necessary to undertake these management activities to:

- minimise threats to koalas and their habitat that are not related to development activity;
- increase the amount of *koala habitat* in the *koala planning area*;
- maintain and where possible improve the quality of existing *koala habitat* in the koala planning area;
- ensure effective implementation and monitoring of the Plan by Council.

Management activities to be conducted as part of this Plan are detailed in Table 1 and have been classified into the following categories: implementation and monitoring; regulatory processes; habitat conservation, restoration and management; communication and education; road and traffic management; dog management; koala health and welfare; bushfire management; funding; research and economic development and tourism. The development of this management framework has been informed by the scientific background study commissioned by Council as part of the development of this Plan (Biolink Ecological Consultants, 2011).

Many of the management activities and actions outlined in (Table 1) can be completed under existing Council service levels and recurrent budgets. However, it is noted that completion of activities and actions that require funding is subject to the allocation of budget via Council's Delivery Plan process and/or successful applications for external funding.

Table 1. Schedule of management activities and actions proposed to be conducted as part of this Plan.

Acronyms used in table: H = high; M = medium; L = low; N/A = not applicable; OEH = Office of Environment and Heritage

Activity / Action ID	Management Action	Priority H/M/L	Target Start	Indicative action Duration	Indicative budget	Funding Source
Implementation and monitoring						
1	Council to establish a Koala Advisory Group to oversee the implementation of management activities identified in this Plan	H	Within 3 months of Plan adoption	Quarterly, ongoing	\$1000 annually	Council
2	The Koala Advisory Group is to produce a regular monitoring report on the effectiveness of this Plan to Council. This report is to include details of: a. progress of implementation of the management activities identified in this Plan b. any additional activities that may be required c. the amount of <i>food trees</i> and <i>koala habitat</i> retained, removed, restored and/or replaced	L	1 year following Plan adoption	Annually	N/A	Council (under existing recurrent budget)
3	Council is to develop a process to monitor: a. long-term compliance of DA conditions of consent b. the quantity and quality of <i>food trees</i> and <i>koala habitat</i> removed, retained, restored and/or replaced under the plan's <i>food tree</i> and <i>koala habitat</i> compensation measures c. update GIS mapping to identify the location of koala habitat removed, restored and/or replaced	H	When Plan adopted	2 months	N/A	Council (under existing recurrent budget)
4	Council is to investigate development of an automated process and procedures to monitor the points in items 2 and 3 above	L	Within 2 years of Plan adoption	3 months	TBC on investigation	Council
5	Council to develop a process to update <i>koala habitat</i> mapping based on additional information becoming available (e.g. Koala Habitat Assessment Report for a <i>development application</i>).	H	When Plan adopted	2 months	N/A	Council (under existing recurrent budget)
6	Council is to investigate development of a compliance mechanism to ensure the long-term viability of food tree and habitat compensation measures.	M	Within 2 years of Plan adoption	12 months	TBC on investigation	Council
7	Council is to assess the effectiveness and the quality of compensation outcomes gained from implementation of the <i>food tree</i> and <i>koala habitat</i> detailed in this Plan.	H	1 year following Plan adoption	12 months	N/A	Council (under existing recurrent budget)
Regulatory processes						
8	Council is to amend the <i>Lismore LEP</i> to activate the Development Assessment Framework of this Plan.	H	When Plan adopted	12 months	N/A	Council (under existing recurrent budget)
9	Council is to amend the Tree Preservation Order (Lismore DCP Chapter 16) to reflect the tree species defined as <i>preferred koala food trees</i> in this Plan	H	When Plan adopted	1 month	N/A	Council (under existing recurrent budget)

Activity / Action ID	Management Action	Priority H/M/L	Target Start	Indicative action Duration	Indicative budget	Funding Source
10	Council to consider the Development Assessment Framework of this Plan as relevant to nature of any Planning Proposal to rezone land. The intent of this consideration is to ensure that any issues requiring resolution are identified and actioned at the initial planning stages if there is potential to adversely impact koala habitat or if they impose a significant cost on a proponent.	H	When Plan adopted	Ongoing	N/A	budget) Council (under existing recurrent budget)
11	Council is to include information regarding the presence of mapped <i>preferred koala habitat</i> on certificates issued under Section 149 (5) of the EP&A Act	M	When Plan adopted	1 month	N/A	Council (under existing recurrent budget)
12	Council is to develop and deliver a training program for Council staff involved in implementation of this Plan.	H	Within 3 months of Plan adoption	3 months	N/A	Council (under existing recurrent budget)
13	In conjunction with OEH, Council is to develop and deliver a training program for staff/consultants on the requirements Koala Habitat Assessment Reports, the Spot Assessment Technique and its application for assessment purposes	H	Within 6 months of Plan adoption	3 months	\$20,000	External grant funding, OEH, Council
Habitat conservation, restoration and management						
14	Council is to provide an extension service to support the implementation of voluntary <i>koala habitat</i> conservation, restoration and management by individuals and community groups by assisting with the search for grant funding and providing technical support	H	Within 12 months of Plan adoption	6 months	TBC	External grant funding and Council (under existing recurrent budget),
15	Council is to develop and implement a priorities for a koala habitat restoration program to restore, revegetate and/or appropriately manage <i>koala habitat</i> within the <i>koala planning area</i> . Once developed, Council is to apply for external grant funding in conjunction with landholder and industry groups and other stakeholders to implement the program.	H	When external grant funding rounds advertised	Ongoing	Dependent on successful grant applications	External grant funding
16	Council is to develop a register of landholders who are willing to use their land for habitat restoration	H	When Plan adopted	Ongoing	N/A	Council (under existing recurrent budget)
17	Council is to ensure that seedlings used in restoration and/or revegetation works are propagated from seed that is of local provenance	M	When Plan adopted	Ongoing	N/A	Council (under existing recurrent budget)
18	Council is to develop a register of local nurseries that propagate seedlings from seed that is of local provenance	M	When Plan adopted	1 month, ongoing	N/A	Council (under existing recurrent budget)
19	Council is to work with landholder and industry groups and other stakeholders to develop guidelines on koala sensitive windbreak management	H	When Plan adopted	6 months	N/A	Council (under existing recurrent budget)
Communication and education						

Activity / Action ID	Management Action	Priority H/M/L	Target Start	Indicative action Duration	Indicative budget	Funding Source
20	Council is to develop and implement an integrated communication program to inform and educate the community about threats to koalas and their habitat	H	Within 12 months of Plan adoption	3 months, ongoing	TBC on investigation	Council and external grant funding
21	Council is to make the Comprehensive Koala Plan of Management and associated maps available on the Council website and the online GIS system	H	Within 1 month of Plan adoption	1 month	N/A	Council (under existing recurrent budget)
22	Council is to update guidelines for vegetation management plans to reflect the preferred koala food tree and habitat compensation guidelines in Section 4.5 of this Plan	M	Within 12 months of Plan adoption	1 month	N/A	Council (under existing recurrent budget)
23	Council is to develop a fact sheet explaining Plan requirements for both <i>small</i> and <i>large impact development</i>	H	Within 3 months of Plan adoption	1 month	N/A	Council (under existing recurrent budget)
Road and traffic management						
24	For existing roads within the <i>koala planning area</i> , Council is to: a. audit existing koala road safety measures b. develop an integrated program of works for the implementation of a 'toolbox' of koala road safety measures (e.g. speed reduction, signage, lighting, road verge maintenance, exclusion fencing and underpasses) to target vehicle strike black spots identified in the scientific background study (Biolink Ecological Consultants, 2011) that accompanies this Plan as well as any other existing roads	M	Within 12 months of Plan adoption	6 months, ongoing	TBC on investigation	Council and external grant funding
25	For any new roads proposed by Council within the <i>koala planning area</i> , Council is to apply the Development Assessment Framework of this Plan.	H	When Plan adopted	Ongoing	N/A	Council (under existing recurrent budget)
26	For any RTA-funded road programs within the Lismore LGA, Council is to incorporate a 'toolbox' of koala road safety measures (e.g. speed reduction, signage, lighting, road verge maintenance, exclusion fencing and underpasses) in the design and construction of these roads	H	When Plan adopted	Ongoing	N/A	N/A
Dog management						
27	In relation to dog management within the <i>koala planning area</i> , Council is to: a. identify areas where koalas are at a high risk of contact with domestic dogs b. target monitoring of compliance in these areas in accordance with the provisions of the <i>Companion Animals Act 1998</i> c. target education on responsible pet ownership to new dog owners and dog owners in high risk areas d. review restrictions within existing dog exercise areas and ensure that use of these areas is compatible with the objectives of this Plan e. ensure any new leash-free areas are compatible with the objectives of the	H	Within 12 months of Plan adoption	6 months, ongoing	TBC on investigation	Council and external grant funding

Activity / Action ID	Management Action	Priority H/M/L	Target Start	Indicative action Duration	Indicative budget	Funding Source
Plan						
28	In consultation with the North Coast Livestock Health and Pest Authority, landholder and industry groups, Council is to: a. implement a wild dog control program on rural lands within the <i>koala planning area</i> b. seek external funding for implementation of the wild dog control program c. lobby the NSW Government to advocate suitable wild dog control methods on private land d. provide information to landholders for the management of wild dogs	H	Within 12 months of Plan adoption	6 months, ongoing	TBC on investigation	Council and external grant funding
Koala health and welfare						
29	Council is to conduct a study to estimate koala density and population size within the <i>koala planning area</i>	H	Within 12 months of Plan adoption	6 months	TBC on investigation	Council and external grant funding
30	Council is to identify and secure Council land appropriate for establishment of <i>food tree</i> plantations to supply leaf for koalas in the care of Friends of the Koala	M	Within 2 years of Plan adoption	12 months	N/A	Council (under existing recurrent budget)
31	Council is to consult with Friends of the Koala and other wildlife carer groups regarding: a. provision of records to the Atlas of NSW Wildlife b. standardising and improving the quality of data provided to the Atlas	L	Within 3 years of Plan adoption	6 months	N/A	Council (under existing recurrent budget)
Bushfire management						
32	Council is to: a. provide mapping of <i>preferred koala habitat</i> as a GIS layer to the Rural Fire Service and the Bushfire Risk Management Plan Committee b. develop best practice guidelines for fire management in <i>preferred koala habitat</i>	M	Within 2 years of Plan adoption	6 months	N/A	Council (under existing recurrent budget)
33	Council is to consult with the Rural Fire Service and the Bushfire Risk Management Plan Committee regarding: a. updating the Bushfire Risk Management Plan for Lismore LGA to take into account the location and significance of <i>preferred koala habitat</i> b. providing a GIS layer that maps fire history within the Lismore LGA c. implementation of best practice guidelines (identified in 30 above) by brigades located within the Lismore LGA	M	Within 12 months of Plan adoption	6 months	N/A	Council (under existing recurrent budget)
Funding						
34	Council is to investigate rate rebates and other incentives for landholders who have <i>koala habitat</i> on their land and/or conduct <i>koala habitat</i> restoration works	M	Include for consideration in the community strategic planning process to be conducted in 2012	6 months	N/A	Council (under existing recurrent budget)

Activity / Action ID	Management Action	Priority H/M/L	Target Start	Indicative action Duration	Indicative budget	Funding Source
35	Council will consider the introduction of an Environmental Levy, in consultation with the community	M	Include for consideration in the community strategic planning process to be conducted in 2012	6 months	N/A	Council (under existing recurrent budget)
Research						
36	The Koala Advisory Group is to identify and prioritise potential koala research projects on the basis of their application to <i>koala habitat</i> and population management, as well as implementation and monitoring of the Plan	L	Within 2 years of Plan adoption	6 months	N/A	Council (under existing recurrent budget)
Economic development and tourism						
37	Council is to provide in-kind assistance to Friends of the Koala to investigate the feasibility of a self-funding business model to upgrade the existing koala care facilities and to cater for tourists	H	Within 12 months of Plan adoption	6 months	N/A	External grant funding
38	Council is to seek external funding to investigate the feasibility of koala-based ecotourism opportunities within Lismore	M	Within 2 years of Plan adoption	6 months	N/A	External grant funding

4 Development Assessment Framework

4.1 *When is the Development Assessment Framework triggered?*

The Development Assessment Framework of this Plan only apply to development activities within the *koala planning area* that require development consent under the *Lismore LEP*. The Plan is 'triggered' when a development application is received by Council.

Development activities that are permitted without consent under the *Lismore LEP* do not require a development application. Such activities do not 'trigger' this Plan and do not need to comply with the Plan. These include development activities listed as exempt and complying development listed in any environmental planning instrument.

4.2 *Assessment Pathways*

4.2.1 What is the purpose of the Assessment Pathways

The Assessment Pathways identified in Figures 2 and 3 detail the process to be followed for the assessment of all DAs on *land* in the *koala planning area*. The purpose of:

- Pathway A is to determine if *this Plan* applies to the DA due to the DA's *development footprint* or *study area* containing *preferred koala food trees (food trees)* or *koala habitat* and/or the *study area* being part of a *koala movement corridor* (Figure 2);
- Pathway B is to determine that all options to avoid, minimise and/or mitigate the impact of the development on food trees and/or koala habitat have been exhausted; establish if clearing is proposed; determine that food tree or habitat compensation guidelines have been met and ensure that the proposal meets the assessment criteria detailed in the Plan (Figure 3).

4.2.2 How do I use the Assessment Pathways?

Individual flow chart steps illustrated in columns A, B or C of Figures 2 and 3 summarise the activity to be undertaken or decision to be made by the Council officer assessing the

DA. The work instruction for the same numbered flow chart step in column A', B' or C' of the above figures respectively provides specific detail on the activity to be undertaken or decision to be made by the officer. As a result, flow chart steps summarised in columns A, B or C must be read concurrently with the work instruction in column A', B' or C' identified with the same number. Note, work instruction provisions specified in columns A', B' and C' of the above figures take precedence over any summarised description provided in the flow chart steps in columns A, B and C.

In many cases, work instructions specified in columns A', B' and C' of Figures 2 and 3 may also refer to the provisions identified in Section 4 and/or the appendices of *the Plan*. These provide guidelines for information that is to be provided by the applicant to support a proposal and the detailed processes to be followed and/or assessment criteria that may be applied to a *development application* by the assessment officer. Consequently, provisions in the aforementioned sections and appendices should be read in conjunction with the Assessment Pathways otherwise they may be read out of context.

For example, flow chart step B2.1 (Figure 3, column B) relates to work instruction B2.1 (Figure 1, column B'). Flow chart step B2.1 identifies that in this step the assessment officer needs to determine '*Does the Assessment Report for a small impact development meet the guidelines?*'. Detailed work instruction B2.1 specifies how the assessment officer is to make this decision and refers the officer to the *Assessment Report* guidelines in Section 4.2.1 of the Plan.

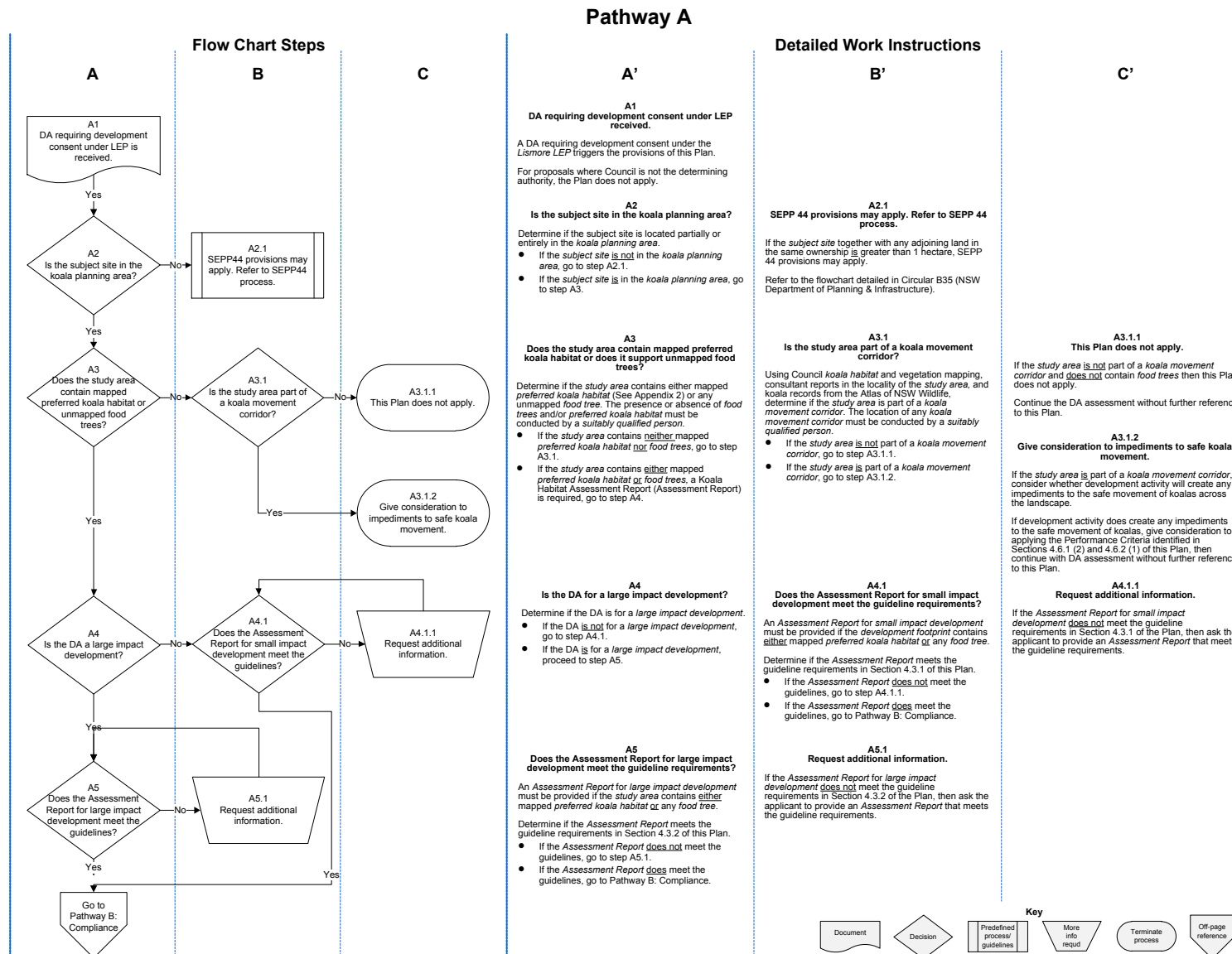


Figure 2. Assessment Pathway A

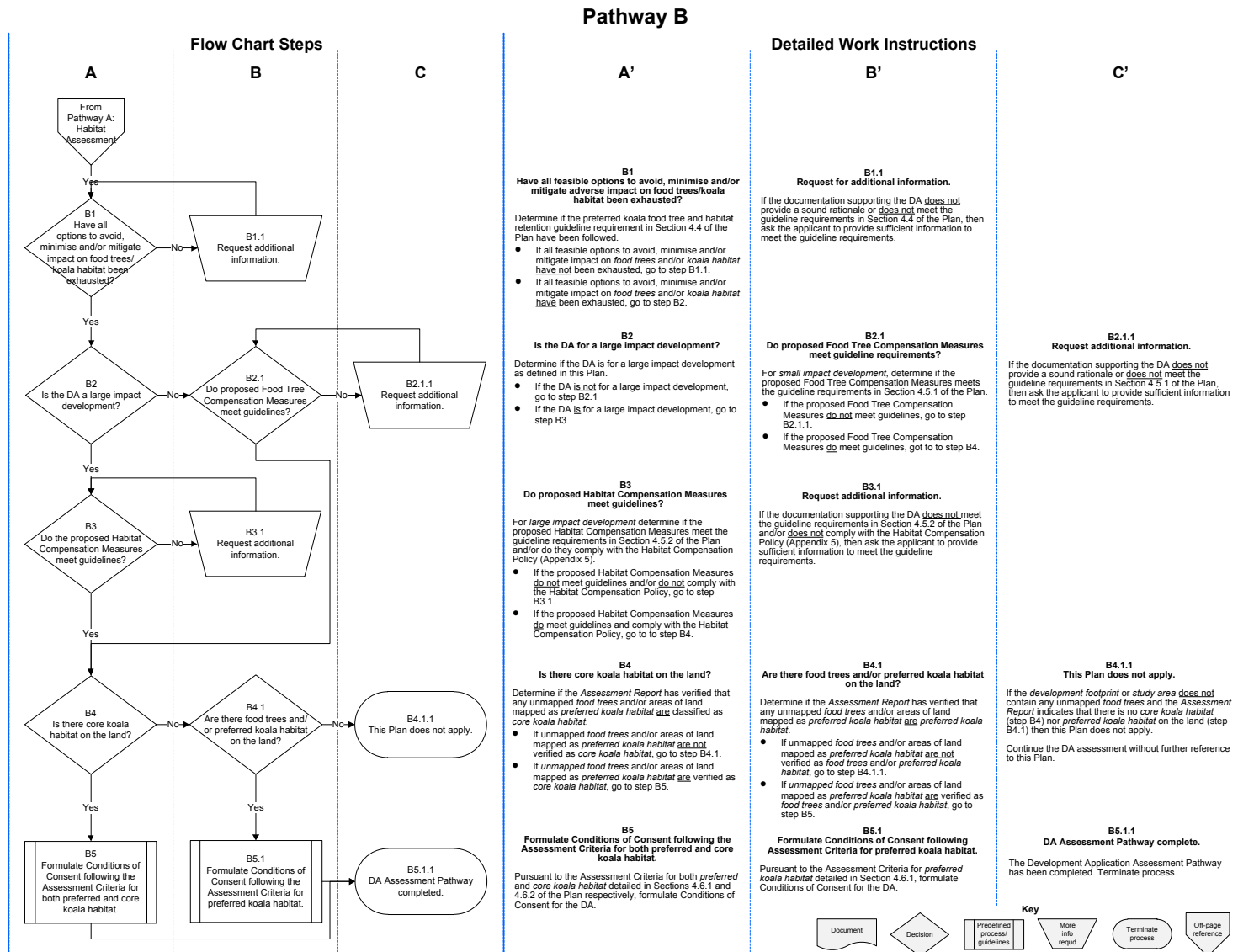


Figure 3. Assessment Pathway B

4.3 Koala Habitat Assessment Reports

4.3.1 Koala Habitat Assessment Report for small impact development

This section only applies to development proposals classified as *small impact development*. A Koala Habitat Assessment Report (Assessment Report) for *small impact development* must be included in the documentation supporting the development application and must be consistent with the following guidelines:

1. Method

- a. any *food tree* greater than or equal to 100 mm diameter at breast height over bark (dbhob) that occurs within the *development footprint* of the proposed *development* must be assessed for evidence of koala activity in accordance with the Spot Assessment Technique (SAT) approach as described in Appendix 3 (Phillips & Callaghan 2011; p.775-776);
- b. the assessment must be undertaken by a Council officer or a *suitably qualified person* with relevant experience and training in both the application and interpretation of the Spot Assessment Technique;

2. Classification of core koala habitat

- a. any *food tree* where koala activity has been recorded must be classified as *core koala habitat* within the meaning of SEPP 44;

3. Content guidelines

For *small impact development* the Assessment Report must include the following:

- a. an accurate plan and/or aerial photograph indicating the location of:
 - i. the *subject site* and proposed *development footprint*;
 - ii. all *food trees* including those that are proposed to be removed, lopped or isolated from koala use (e.g. fenced). Each tree should be marked with a unique identifier;
 - iii. any trees classified as *core koala habitat* at the time of the survey;
- b. a table detailing the species, diameter at breast height over bark (dbhob) and the unique identifier of all trees proposed to be removed, lopped or isolated from koala use;
- c. a summary table detailing the species, size class (<100 mm dbhob, 100–300 mm dbhob and >300 mm dhob) and number of *food trees* that are proposed to be removed, lopped or permanently isolated from koala use.

4.3.2 Koala Habitat Assessment Reports for large impact development

This section only applies to development proposals classified as *large impact development*. An *Assessment Report* for *large impact development* must be included in the documentation supporting the development application and must be consistent with the following guidelines:

1. Survey guidelines

A *stadia survey* of all *food trees* greater than or equal to 100 mm dbhob within the *development footprint* of the *study area* must be conducted;

2. Method

For *large impact development*, the koala habitat assessment must:

- a. identify the spatial extent and type (i.e. structure and floristic composition) of all vegetation communities within the *study area*;
- b. be undertaken in accordance with both the SAT and Regularised Grid-based Spot Assessment Technique (RG-bSAT) approaches described in Phillips & Callaghan 2011 (Appendix 3) and at the sampling intensities specified in Table 2;
- c. the assessment must be undertaken by a *suitably qualified person* with relevant experience and training in both the application and interpretation of the RG-bSAT approach;

3. Classification of core koala habitat

- a. any RG-bSAT grid cell where koala activity is categorized as 'medium (normal)' (greater than or equal to 22.52% but less than or equal to 32.84%) or 'high' (greater than 32.84%) must be classified as *core koala habitat* within the meaning of SEPP 44;
- b. where there are historic koala records over two or more koala generations within the *study area*, then this *land* should be classified as *core koala habitat* within the meaning of SEPP 44.

4. Structure and content guidelines

For *large impact development*, the Assessment Report:

- a. must include the minimum structure and content requirements as detailed in Table 3. Additional information over and above the structure and content requirements detailed in Table 3 may be required according to the nature of the proposed development and Council requirements;

Table 2. Regularised Grid-based Spot Assessment Technique (RG-bSAT) grid cell sampling intensities for three categories of land area

Area of study area	Initial RG-bSAT sampling intensity	Detailed RG-bSAT sampling intensity
<15 ha	150 m x 150 m	75 m x 75 m
15–50 ha	250 m x 250 m	125 m x 125 m
>50 ha	350 m x 350 m	175 m x 175 m

- b. may be included with an Assessment of Significance report, provided the minimum structure and content requirements for the Assessment Report are addressed.

4.4 Preferred koala food trees and habitat retention guidelines

1. Strategies to ensure no net loss of food trees and koala habitat

- a. Council may grant development consent only if it is satisfied that:
 - i. development activity results in no net loss of *food trees* and/or *koala habitat*;
 - ii. the development is located, designed, constructed, and managed to avoid adverse impacts on *food trees* and/or *koala habitat*;
- b. Avoidance, minimisation and mitigation impacts are the three strategies employed to reduce the scale and/or intensity of any adverse impact of development activities on koalas and their habitat;
- c. The three strategies identified in (1a) above must be applied for all development activities and at all stages of the proposed development for both *small* and *large impact development*;
- d. Council may grant approval for clearing of *food trees* or *koala habitat* only if it is satisfied that:
 - i. the intended measures to avoid, minimise and mitigate likely and potential impacts of the development activity are documented and presented with the DA;
 - ii. sound and logical reasons are provided as to why the retention of *food trees* or *koala habitat* is not feasible and clearing of *food trees* is proposed as a last resort;

Table 3. Minimum structure and content requirements for a Koala Habitat Assessment Report

1.0 Background	
• Briefly describe the nature of the proposed development.	<input type="checkbox"/>
• Identify the <i>Lismore LEP</i> zoning(s) of the <i>study area</i> and adjacent areas.	<input type="checkbox"/>
2.0 Links to legislation, other plans and documents	
• Demonstrate how the Assessment Report links to legislation, other plans and documents that relate to the proposed development.	<input type="checkbox"/>
3.0 Study Area	
• Identify the location and extent of the <i>study area</i> to be covered by the Assessment Report, including the <i>study area</i> and any other areas that may be directly or indirectly impacted by the proposed development.	<input type="checkbox"/>
• Describe the type, extent and current condition of existing <i>koala habitat</i> in the <i>study area</i> .	<input type="checkbox"/>
• Describe the broader context of other vegetation in the <i>study area</i> and the landscape in general.	<input type="checkbox"/>
• Detail any environmental constraints and any significant or sensitive environmental features of the <i>study area</i> .	<input type="checkbox"/>
4.0 Methods	
• Describe in detail the methodology used to sample the vegetation on the <i>study area</i> .	<input type="checkbox"/>
• Include a map/plan with the overlain grid used to identify detailed and initial RG-bSAT sampling sites (see Appendix 4 for method).	<input type="checkbox"/>
4.0 Results	
• Include a map/plan detailing the location of: <ul style="list-style-type: none"> the proposed development and associated <i>infrastructure</i> and any requirement for an asset protection zone; all vegetation including <i>food trees</i>, and any areas of <i>preferred koala habitat</i> or <i>core koala habitat</i> as determined by the RG-bSAT assessment (see Appendix 4 for method); any <i>food trees</i> and/or <i>koala habitat</i> that are proposed to be directly and/or indirectly impacted, removed, regenerated and/or revegetated. Each tree should also be marked with a unique identifier. 	<input type="checkbox"/>
• Include a table detailing the: <ul style="list-style-type: none"> area of all vegetation by vegetation type (including <i>koala habitat</i>), identifying any area of vegetation proposed to be removed, regenerated and/or revegetated; a table detailing the species, diameter at breast height over bark (dbhob) and the unique identifier of all trees proposed to be removed, lopped or isolated from koala use; species, size class (<100 mm dbhob, 100–300 mm dbhob and >300 mm dhob) and number of <i>food trees</i> that are proposed to be removed, lopped or permanently isolated from koala use. 	<input type="checkbox"/>
5.0 Conclusion	
• Identify limitations to the assessment and further issues that might need to be addressed.	<input type="checkbox"/>
• Interpret and discuss the results of the koala habitat assessment.	<input type="checkbox"/>
• Include discussion on any alternative options considered and why these options have been rejected as not feasible.	<input type="checkbox"/>
• Include a proposal for a Habitat Compensation Plan that meets the habitat compensation guidelines in this Plan.	<input type="checkbox"/>
6.0 References	
• Include a list of all references cited in the report.	<input type="checkbox"/>
7.0 Appendices	
• Include any additional information or supplementary material pertinent to the DA proposal.	<input type="checkbox"/>

2. Avoidance and/or minimisation of adverse impacts on food trees and koala habitat

- a. Avoiding and/or minimising adverse impacts on *food trees* and *koala habitat* may be achieved through suitable site selection, sound development design and comprehensive planning:
 - i. for the purposes of this Plan, retaining *food trees* and/or *koala habitat* are seen as avoiding and minimising strategies, not mitigating/compensating measures;
 - ii. where adverse impacts on *food trees* and/or *koala habitat* cannot be avoided by site selection, development design and planning, tree retention must be undertaken in a hierarchical manner as follows: firstly, retain *food trees* and native trees >300 mm dbhob; secondly, retain *food trees* and native trees 100–300 mm dbhob; thirdly, retain *food trees* and native trees <100 mm dbhob;
- b. On land to which the NV Act applies:
 - i. where clearing is for a single dwelling, any clearing must be the minimum extent necessary to carry out the development (in line with the *Native Vegetation Regulation* 2005 Clause 6);
 - ii. where development consent is required under the EP&A Act, pursuant to the provisions of the NV Act, the maximum clearing distances detailed in *Native vegetation management in NSW Info Sheet 7b* apply;
- c. Examples of avoiding and/or minimising the impact of development activity include:
 - i. changing the route of an access road or transmission line to avoid clearing *koala habitat*;
 - ii. changing the location and/or design of a development to avoid clearing *food trees*;
 - iii. retaining *food trees* on Council- and/or community-owned land in road reserves, parks or community allotments;
- d. After all feasible ways to avoid and/or minimise impacts have been identified and/or implemented, mitigation of any residual impacts must be undertaken.

3. Mitigation of residual impacts of development activity

- a. Mitigation measures must be implemented through site selection, development design and planning to reduce the residual impacts of development activities where the impacts are unavoidable;
- b. Examples of mitigation of residual impacts of development activity include:

- i. establishing a *tree protection zone* that is at least 12 times the dbhob distance from the trunk of any retained *food trees*;
 - ii. erecting temporary fencing 1.8 metres high around the *tree protection zone* of any retained *food trees* to protect retained trees during construction works
 - iii. precluding activities such as construction, excavation, storage of materials and the parking of vehicles and plant within any tree protection zone;
 - iv. lopping or pruning diseased tree limbs which may reduce the long-term viability and structural integrity of retained *food trees* which would have otherwise been cleared;
- c. Only after all feasible mitigation measures have been identified and/or implemented will compensation for loss of trees identified as *food trees* or *koala habitat* be considered.

4.5 Preferred koala food tree and habitat compensation guidelines

4.5.1 Food tree compensation measures for small impact development

The provisions within this section of the Plan only apply to *small impact development* and trees verified as *preferred koala food trees*. Where removal of *preferred koala food trees* is proposed, the following compensation measures apply:

1. Food tree replacement ratio

- a. any *food trees* removed must be replaced according to the ratio detailed in Table 4, or, at Council's discretion the applicant may conduct enhancement works which improve the integrity and viability of *food trees*, *koala habitat* or *koala movement corridors* on the *subject site*. These replacement ratios are higher than 1:1 because of the time lag before the ecological benefits of compensatory plantings are realised and risk of compensatory plantings failing;
- b. food tree replacement ratios detailed in Table 4 only apply to native tree species defined as *food trees* in this Plan;
- c. Examples of enhancement works include:
 - i. removal of woody weeds in an area of degraded vegetation containing *koala habitat* located on the *subject site*;
 - ii. temporarily excluding stock from an area of regenerating *food trees* located on the *subject site*;

Table 4. Replacement ratios for three size classes of preferred koala food trees. Note, these ratios only apply to preferred koala food tree species.

Food tree size class (dbhob)	Replacement ratio (loss:gain)
<100 mm	1:6
100–300 mm	1:8
>300 mm	1:10

- iii. lopping or pruning diseased tree limbs which may reduce the long-term structural integrity of a large, retained *food tree*;

2. Location of plantings

- a. Where there is sufficient land on the *subject site* to support the establishment and growth of mature *food trees*, any *food trees* removed should be replaced on the *subject site*;
- b. At Council's discretion and at the cost of the applicant, in cases where it is not feasible to plant replacement *food trees* on site, all or a proportion of the replacement trees may be planted on *receiving land* off the *subject site* either:
 - i. on Council-owned land; or
 - ii. on some other land approved by Council for use as *receiving land*;

3. Replacement food trees

- a. Any replacement *food trees* must be:
 - i. of the same species as those removed from the *subject site*;
 - ii. sourced from seed stock of local provenance;
 - iii. planted in a cluster and, where feasible, in the vicinity of any retained *food trees*;
- b. protected, nurtured and maintained until the trees have grown to a minimum height of 5 metres; The planting of replacement *food trees* as well as their ongoing protection, nurture and maintenance is at the cost of the applicant;

4. Ongoing protection, nurture and maintenance

- a. The applicant is required to state how seedlings are to be protected, nurtured and maintained (e.g. tree guards, fencing, exclusion of stock, program for weed suppression and removal);

- b. Any replacement trees that die before they have grown to a height of 5 metres must be replaced by the applicant and at the cost of the applicant;
- c. Pursuant to clauses (2b) above, if the *receiving land* is not located on the *subject site*, the owner of *receiving land* is responsible for meeting replacement food tree requirements detailed in provision (4a-b) above.

4.5.2 Habitat compensation measures for large impact development

The provisions within this section of the Plan only apply to *large impact development* and vegetation verified as *preferred* and/or *core koala habitat*. Where removal of *preferred* and/or *core koala habitat* is proposed, the following compensation measures apply:

1. Application of the Habitat Compensation Policy

- a. An activity to compensate for adverse impacts of development activity (in particular, the clearing of *koala trees* and *koala habitat*) should only be approved if Council considers that:
 - i. the requirements of all relevant legislation, planning instruments and policies have been applied;
 - ii. all feasible options to negotiate alternatives to avoid clearing, minimise clearing when clearing is unavoidable, and mitigate the adverse impacts of clearing have been exhausted and where appropriate undertaken;
 - iii. there are good prospects that proposed compensation works will lead to an improvement in the environmental values of *koala habitat*. In cases where compensation works are not feasible or there is a high risk that the works may fail, application of this framework is not appropriate and should not be considered;
 - iv. application of compensation works has been conducted in accordance with the principles outlined in the Habitat Compensation Policy (Appendix 5);
 - v. the Habitat Compensation Plan identified in the Koala Habitat Assessment Report complies with this policy;
- b. A *development application* is deemed to have complied with the Habitat Compensation Policy (Appendix 5) and met the guideline requirements for Habitat Compensation Measures detailed in Section 4.5.2 of this plan if:
 - i. the land to which the *development application* applies has been conferred Biodiversity Certification (TSC Act), or;

- ii. the proponent has entered into a BioBanking Agreement (TSC Act) or similar legal biodiversity offsetting agreement adopted by either the NSW or Australian Government;
- c. The minimum area required for compensation works for each class of koala habitat and for each category of compensation works defined in this Plan is to be calculated using the:
 - i. compensation multiplier formula detailed in the Habitat Compensation Policy (Appendix 5); or the
 - ii. BioBanking Assessment Methodology (TSC Act, *Threatened Species Conservation (Biodiversity Banking) Regulation 2008*) or similar methodology adopted by either the NSW or Australian Government;
- d. Where appropriate, habitat compensation works may be undertaken concurrently with other activities that protect, enhance or create habitat (i.e. on the same *receiving land*). These works may include the creation of riparian corridors (as defined in the *Water Management Act 2000*) and revegetation of areas reserved for stormwater management and biological buffers;
- e. With respect to Council *infrastructure* development and/or activities that fall under Part 5 of the EP&A Act, Council should ensure that the requirements of the Habitat Compensation Policy are met.

2. Receiving land

- a. For compensation works to be applied under this Plan, Council must ensure that the habitat on the *receiving land* is the same or a similar type of ecological community as the habitat that is lost to development activity;
- b. Subject to compliance with clause (2a) above:
 - i. *receiving land* should be within and/or adjacent to the *study area*, or;
 - ii. in cases where it is not feasible to comply with clause (2bi) above, the *receiving land* should be anywhere within Lismore LGA where a relationship between the proposed development, the direct/indirect impacts of the proposed development, and the *receiving land* can be fairly and reasonably established;
- c. For habitat creation to be applied as habitat compensation works there must be some sound ecological reason to create habitat. Habitat may be created:
 - i. within gaps of contiguous *koala habitat* or adjacent to *koala habitat*;
 - ii. on *land* determined to be a *koala movement corridor*;

3. Submission, implementation and monitoring of a vegetation management plan/plan of management

- a. For habitat compensation works to be applied under this Plan, Council must ensure that:
 - i. proposed compensation works are documented in a vegetation management plan (VMP) or, where appropriate, a plan of management (PoM);
 - ii. any VMP/PoM must be prepared in accordance with the structure and content of the most recently published Council guidelines for the preparation of VMP/PoMs;
 - iii. the VMP/PoM is to be prepared and implemented by *suitably qualified person(s)* with experience in current best practices for native vegetation rehabilitation, regeneration and revegetation;
 - iv. the VMP/PoM must include specific, measurable and time-bound performance criteria and a schedule of works by which to measure the success of the Plan;
 - v. Council must approve the VMP/PoM prior to the commencement of any works associated with the DA;
- b. In accordance with the performance criteria and the schedule of works referred to in clause (3a) above, Council should be satisfied that:
 - i. there are adequate resources and funds to develop and implement the VMP/PoM for both the initial habitat compensation works and the associated management activities required for a minimum five-year maintenance period following completion of the initial phase of habitat compensation works;
 - ii. the proponent will provide a monitoring report as evidence that implementation of the VMP/PoM has progressed to agreed performance criteria and schedule of works at completion of initial habitat compensation works and then annually until the end of the term of the VMP/PoM;
 - iii. compliance of initial habitat compensation works and associated ongoing management activities with the VMP/PoM is enforceable;
- c. Where the proposed development involves:
 - i. the erection of a building, rural land-sharing community and the like, initial habitat compensation works must be implemented prior to the release of the Occupation Certificate for the first building;
 - ii. a subdivision, initial habitat compensation works must be implemented prior to the release of the Subdivision Certificate;

4. Secure protection for receiving land

- a. For compensation works under this Plan, Council may grant development consent only if it is satisfied that compensation works on *receiving land*, are as a minimum, secured by all of the following mechanisms:
 - i. at least one of the primary protection mechanisms identified in Appendix 5;
 - ii. a VMP/PoM approved by Council with a minimum five-year maintenance period to follow completion of the initial phase of habitat compensation works;
 - iii. positive covenants or equivalent instrument that impose a legally enforceable restriction on the use of the *receiving land* that bind the current and future owners of the *land* to manage the *receiving land* for conservation of its habitat values;
- b. All *land* subject to the habitat compensation measures must be protected by a legally binding management agreement between Council, the proponent of the development, the lawful owner(s) of the *subject site* or other *receiving land* to which the habitat compensation measures apply;
- c. The legal agreement must:
 - i. clearly identify and include as an attachment the approved VMP/PoM referred to in clause (3ai);
 - ii. identify the performance criteria and schedule of works detailed in the approved VMP/KPoM identified in clause (3aiv);
 - iii. identify a bond and a bond return schedule linked to the successful completion of works as evidenced by the meeting of agreed performance criteria according to the schedule of works identified in clause (3aiv);
 - iv. be enacted (i.e. signed and registered, or otherwise as per the legal requirements for the relevant agreement) prior to the issue of development consent and prior to the commencement of any works related to the DA within the *study area*;
- d. It is the responsibility of the proponent to:
 - i. secure all resources and funds to implement the VMP/PoM;
 - ii. pay all costs associated with enacting the legal management agreement referred to in clause (4b);
 - iii. pay all inspection and assessment fees associated with the VMP/PoM and subsequent monitoring reports at the time these are lodged with Council;

5. Deferred commencement consent

- a. Pursuant to any requirement for habitat compensation works, Council may grant deferred commencement consent;
- b. In granting deferred commencement consent, Council must identify the legal agreements that are to be enacted and works within any VMP/PoM that must be completed before the consent can operate.

4.6 Assessment criteria

Conditions of development consent appropriate to the impact of the proposed development may be imposed by Council where they meet the assessment criteria detailed in this section of the Plan.

4.6.1 Assessment criteria for development applications for land verified as preferred koala habitat

The assessment criteria detailed in this section apply to both land verified as *preferred* and *core koala habitat*.

1. Potential direct and indirect impacts on food trees and/or koala habitat

- a. Council may grant development consent only if it is satisfied that:
 - i. the development does not result in any net loss of *food trees* and/or *koala habitat*;
 - ii. the development is located, designed, constructed, and managed to avoid adverse impacts on *food trees* and/or *koala habitat*;

2. Maintain habitat linkages and safe koala movement

- a. Council may grant development consent only if it is satisfied that the development:
 - i. maintains any linkages between areas of *koala habitat* across the *study area*;
 - ii. maintains any *koala movement corridors* across the *study area*;
 - iii. does not result in development which would impede safe koala movement across the *study area*;
- b. Measures which maintain habitat linkages and allow for safe koala movement may be incorporated into the design and construction of the development;
- c. Council must consider the need to revegetate cleared land within *koala movement corridors*;

3. Location of bushfire asset protection zones

- a. development consent may be granted only if Council is satisfied that any necessary bushfire asset protection zones to be created do not result in the clearing of *food trees* and/or *koala habitat*;
4. No-build zones
- a. In assessing a DA for a residential subdivision, rural land-sharing community and the like, Council should give consideration to:
 - i. establishing *no-build zones* of a minimum 15 metres distance from the trunk of retained trees such that retained trees do not pose a future hazard to persons or property;
 - ii. precluding the construction of dwellings and buildings and the like within *no-build zones*;
 - iii. identifying the location of any *no-build zones* on the deposited plan and registering them as a restriction on the land title;
5. Retention of replacement trees and/or koala habitat
- a. Council may grant development consent only if it is satisfied that:
 - i. where *food tree* replacement measures or habitat compensation measures (Section 4.5) are proposed, measures are in place to ensure the long-term retention of replacement *food trees* and/or *koala habitat*;
 - ii. such measures may include the erection of exclusion fencing and/or covenant restrictions on title;
6. Long-term management of koala habitat
- a. Council must consider the application of an environmental levy on the *subject site* of a *large impact development* for the long-term protection and management of *koala habitat* on the *study area*;
 - b. Application of an environmental levy for a *large impact development* is subject to approval from the Department of Local Government;
7. Protection of koalas, food trees and koala habitat during construction works
- a. Council may grant development consent only if it is satisfied that appropriate measures are in place to ensure retained *food trees* and/or *koala habitat* is/are protected during construction works on the site;
 - b. Appropriate protection measures include:
 - i. establishment of a *tree protection zone* that is at least 12 times the dbhob distance from the trunk of any retained *food trees*;

- ii. erection of temporary fencing 1.8 metres high around the *tree protection zone* of any retained *food trees* to protect retained trees during construction works;
 - iii. erection of signage to provide clear and accessible information to indicate that a *tree protection zone* has been established;
 - iv. preclusion of activities such as construction, excavation, storage of materials and the parking of vehicles and plant within any *tree protection zone*;
- c. A minimum of 7 days prior to approved clearing, temporary fencing that excludes koalas must be erected around trees approved to be cleared in order to minimise the risk of koalas occupying the trees on the day that clearing takes place;
- d. Where approved clearing of vegetation is proposed, development consent may be granted only if Council is satisfied that measures are in place to ensure that:
 - i. on the day of clearing and prior to any clearing taking place, all trees within 30 metres of those trees to be cleared are to be inspected for the presence of koalas from at least two locations by an experienced koala spotter;
 - ii. the koala spotter will not be involved in the vegetation clearing works whilst responsible for identifying koalas present on the site and will remain on site during any vegetation clearing works to ensure that any tree occupied by a koala is not accidentally cleared or interfered with;
- e. Should koalas be found on site during the clearing of native vegetation and/or earthworks:
 - i. must be temporarily suspended within a range of 30 metres from any tree which is occupied by a koala;
 - ii. must be avoided in any area between the koala and the nearest areas of habitat to allow the animal to move to adjacent undisturbed areas;
 - iii. must not resume until the koala has moved from the tree of its own volition.

4.6.2 Assessment criteria for development applications for land verified as core koala habitat

The assessment criteria detailed in this section apply to land verified as *core koala habitat* and are to be applied in conjunction with the assessment criteria for land verified as preferred koala habitat in Section 4.6.1.

1. Lot boundary fencing

- a. Pursuant to this clause, Council may grant development consent only if it is satisfied that any new lot boundary fencing on *land* containing *core koala habitat* does not impede safe koala movement across the *subject site*;
- b. Fences that do not impede safe koala movement may include:
 - i. hedges or screens of trees and/or shrubs;
 - ii. fences where the bottom of the fence is a minimum of 300 mm above the ground to allow koalas to freely move underneath;
 - iii. fences that are easy for koalas to climb (e.g. sturdy chain mesh fences not topped by barbed wire, or solid style fences with a timber 'post and bridge' system over the fence at regular intervals of less than 20 metres);
 - iv. open post and rail fences;
 - v. post and 4 or 5 strands of plain wire, barbed wire or some combination of plain and barbed wire, where the bottom strand of wire is a minimum 300 mm above the ground at any in-line fence post and/or dropper;
- c. Pursuant to clause (b) above, for *land* where livestock agriculture is a permitted activity, the design of new lot boundary fencing is subject to the landholders' requirements to secure livestock;

2. Swimming pools

- a. Before granting development consent for the installation of swimming pools on *land* containing or adjacent to *core koala habitat*, Council must include measures to ensure that all new swimming pools:
 - i. incorporate features that allow koalas to easily escape from the pool, namely, a shallow ramp and/or a stout rope (minimum 50 mm diameter) that trails in the pool at all times and is secured to a stable poolside fixture;
 - ii. notwithstanding the provisions of the *Swimming Pools Act* 1992, swimming pool fencing must exclude koalas (i.e. not be constructed of timber or have timber posts);
 - iii. shrubs and/or trees that koalas could use to climb over the pool fence must not be planted within 1 metre of the swimming pool fence;
- b. This clause does not apply to the installation of farm dams;

3. Keeping of domestic dogs

- a. Council may grant development consent to residential subdivisions, rural land-sharing communities and the like on *land* containing or immediately adjacent to *core koala habitat* only if it is satisfied that:

- i. the keeping of domestic dogs is prohibited by covenant restrictions on title; or
- ii. the movement of domestic dogs is restricted by a lot boundary fence or internal dog enclosure that effectively contains dogs and excludes koalas;
- b. pursuant to clause (3a)ii) above, any fence that is intended to contain dogs and exclude koalas should be located more than 2 metres away from any trees that koalas could use to cross the fence;

4. . Road design standards

- a. Council may grant development consent to residential subdivisions, rural land-sharing communities and the like on *land* containing or adjacent to *core koala habitat* only if it is satisfied that the proposed development has made provision for:
 - i. appropriate road design standards, warning signage, traffic calming devices, and roadside lighting which restrict motor vehicles to a maximum speed of 40 kilometres per hour within the *subject site* where possible;
 - ii. for roads where the maximum speed of motor vehicles must be greater than 50 kilometres per hour in urban areas or greater than 60 kilometres per hour in rural areas, appropriate measures are required to exclude koalas from roads and minimise the likelihood of impediments to safe koala movement;
 - iii. specifications for road design standards, signage, koala exclusion fencing, underpasses, traffic calming devices and any other mitigation measures must be explicitly included with the documentation supporting the DA;
 - iv. the maintenance of any mitigation measures detailed in (4a)iii) above.

Definitions and Acronyms

In this Comprehensive Koala Plan of Management, the following definitions apply:

“Assessment Report” means “Koala Habitat Assessment Report” for either “small impact development” or “large impact development” as detailed in Section 4.2 of this Plan.

“building envelope” means an area of land designated for construction of a dwelling, buildings and ancillary infrastructure as well as any land required to be cleared for a bushfire asset protection zone, ancillary gardens and landscaping.

“Comprehensive Koala Plan of Management” means a plan of management prepared in accordance with *State Environmental Planning Policy 44 – Koala Habitat Protection*.

“core koala habitat” means an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population. This is the same meaning as that defined by *State Environmental Planning Policy 44 – Koala Habitat Protection*..

“development” means:

- (a) the use of land, and
- (b) the subdivision of land, and
- (c) the erection of a building, and
- (d) the carrying out of a works, and
- (e) the demolition of a building or works, and
- (f) any other act, matter or thing referred to in section 26 (of the *Environmental Planning & Assessment Act 1979*) that is controlled by an environmental planning instrument, but does not include any development of a class or description prescribed by the regulations for the purposes of this definition.

This is the same meaning as that defined by the *Environmental Planning & Assessment Act 1979*.

“development application” or **“DA”** means an application for consent under Part 4 of the *Environmental Planning & Assessment Act 1979* to carry out development but does not include an application for a complying development certificate. This is the same meaning as that defined by the *Environmental Planning & Assessment Act 1979*.

“development footprint” means the land that is likely to be impacted by any “small impact development”, including any asset protection zone and ancillary infrastructure.

“diameter at breast height over bark” or **“dbhob”** is the diameter of a tree measured 1.4 metres above the ground.

“EP&A Act” means the *Environmental Planning and Assessment Act 1979*.

“greenfield site” means land that is substantially undeveloped (except for agricultural use) that has not been previously developed for an urban and/or residential land use.

“ha” means hectares.

“infrastructure” means all structures associated with the construction of a single dwelling, dual occupancy and/or secondary dwelling and includes gardens, landscaping, water tanks, on-site waste water management systems, any access route, road or driveway; but excludes farm dams.

“koala habitat” means “core koala habitat” and/or “preferred koala habitat”.

“koala movement corridor” means an area or tract of land that is used, or could be used, by koalas when moving between different areas of their home range or habitat. These areas may include cleared land; but. do not include “koala habitat”.

“koala planning area” means the land to which this Plan applies as described and mapped in Figure 1.

“land” includes:

- (a) the sea or an arm of the sea,
- (b) a bay, inlet, lagoon, lake or body of water, whether inland or not and whether tidal or non-tidal, and
- (c) a river, stream or watercourse, whether tidal or non-tidal, and
- (d) a building erected on the land.

This is the same meaning as that defined by the *Environmental Planning & Assessment Act 1979*.

“large impact development” means a development that has potential for large adverse impacts on the koala population, preferred koala food trees and/or preferred koala habitat within the *study area* of the proposal. This category of development requires both a Statement of Environmental Effects and an Assessment of Significance (Section 5A *Environmental Planning & Assessment Act 1979*, Section 94 *Threatened Species Conservation Act 1995*) to accompany the development application. This category of development includes designated development, integrated development and development requiring concurrence under the *Environmental Planning & Assessment Act 1979* but, depending on the nature and scale of the proposed development, this may be varied in writing at the discretion of Council.

“Lismore DCP” means Lismore Development Control Plan.

“Lismore LEP” means the Lismore Local Environment Plan 2012.

“**LGA**” means local government area.

“**mm**” means millimetre.

“**no-build zone**” means a designated area of land where the construction of dwellings, buildings and the like are precluded.

“**PoM**” means plan of management.

“**preferred koala habitat**” means any area identified as either Primary, Secondary A or Secondary B koala habitat as defined in the table below.

Vegetation	Category	Definition
Vegetation classified as Preferred Koala Habitat	Primary	Vegetation associations and/or communities wherein “primary food tree species” comprise the dominant or co-dominant (i.e. $\geq 50\%$) overstorey tree species.
	Secondary A	Vegetation associations and/or communities wherein “primary food tree species” are sub-dominant components of the overstorey tree species and usually (but not always) growing in association with one or more “secondary food tree species”.
	Secondary B	Vegetation associations and/or communities wherein “primary food tree species” are absent, habitat containing “secondary and/or supplementary food tree species” only.
Other Vegetation	Other	Native vegetation associations and/or communities within which “preferred koala food trees” are absent.
	Unknown	Vegetation for which there is insufficient data available to enable classification. This includes both individual trees and clumps of trees which are unmapped owing to the resolution of the mapping. These trees may be verified as <i>koala habitat</i> by a Koala Habitat Assessment.

“preferred koala food tree” or **“food tree”** means any of the following tree species:

	Common Name	Scientific Name
Primary food tree species	Orange gum	<i>Eucalyptus bancroftii</i>
	Forest red gum*	<i>E. tereticornis</i>
	Tallowwood	<i>E. microcorys</i>
	Swamp mahogany	<i>E. robusta</i>
Secondary and/or supplementary food tree species	Grey gum	<i>E. punctata**</i>
	Thin-leaved stringybark	<i>E. eugenoides</i>
	White stringybark	<i>E. globoidea</i>
	Small-fruited grey gum	<i>E. propinqua</i>
	Narrow-leaved red gum	<i>E. seeana</i>

* includes the naturally occurring *E. tereticornis* x *E. robusta* hybrid referred to as *E. patentinervis* (Bale, 2003). ** includes synonym *E. biturbinata*.

“receiving land” means the area of land receiving the benefit of food tree compensation measures and/or habitat compensation measures.

“RG-bSAT” means Regularised Grid-based Spot Assessment Technique.

“SEPP 44” means *State Environmental Planning Policy 44 – Koala Habitat Protection*.

“small impact development” means a development that has potential for small adverse impacts on the koala population, preferred koala food trees and/or preferred koala habitat within the *development footprint* of the proposal. This category of development requires a Statement of Environmental Effects to accompany the development application.

“stadia survey” means stadiametric survey, the recording of the precise location and species identity of all “preferred koala food trees” on a site, and is to be carried out by a registered surveyor and an appropriately qualified ecologist.

“study area” means the “subject site” and any additional areas that are likely to be directly and/or indirectly impacted by a “large impact development”, including any asset protection zone, ancillary and off-site works.

“subject site” means the allotment(s) to which a development application applies.

“suitably qualified person” means a person with a minimum undergraduate qualification in ecology, environmental management, forestry or similar from a recognised university and with experience in flora and fauna identification, survey and management, including experience in conducting koala surveys.

“the Plan” or **“this Plan”** means the “Comprehensive Koala Plan of Management for south-east Lismore”.

“TSC Act” means the *Threatened Species Conservation Act* 1995.

“tree” is defined as a woody stem of any plant species which:

- (a) has a height of more than 5 metres; or
- (b) has a girth (circumference) of 500mm or greater at a height of 1 metre above the natural ground surface: or
- (c) has a branch spread of 4 metres or more.

This is the same meaning as that defined in the Lismore Development Control Plan Part A, Chapter 14 – Tree Preservation Order.

“tree protection zone” means the area above and below the ground and at a given distance from the trunk set aside to protect a tree’s roots and crown from development activity.

“VMP” means vegetation management plan.

“VCA” means voluntary conservation agreement.

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- Phillips, S., Hopkins, M., and Warnken, J. (2011, In review). Splines in the sand: modelling the distribution of koala populations across the landscape in order to provide greater certainty for conservation and management purposes. Submitted to *Wildlife Research*.

Appendix 1 – Legislative context

Environmental Planning & Assessment Act 1979

The principal piece of planning legislation in NSW is the *Environmental Planning and Assessment Act 1979* (EP&A Act). This Act provides a legislative framework for environmental planning, including the assessment of proposed development. Council's assessment of a proposed development is guided by this legislation and relevant environmental planning instruments. The EP&A Act provides for preparation of environmental planning instruments, including State Environmental Planning Policies and local environmental plans. *State Environmental Planning Policy No. 44 – Koala Habitat Protection* is an environmental planning instrument which provides for the protection and conservation of koalas.

State Environmental Planning Policy No. 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) came into effect in 1995. Its objective is to halt the decline in koala populations and to provide for the recovery of koala populations. SEPP 44 applies to local government areas in NSW where koalas are found. The policy encourages protection and management of natural vegetation that provides food and habitat for koalas. The policy applies to any development application (DA) on contiguous areas of land under the same ownership that are greater than 1 hectare in area, and where 'potential' and/or 'core' koala habitat (as defined in SEPP 44) is found. In cases where such a DA proposes to disturb 'potential' or 'core' koala habitat, the DA assessment pathway identified in SEPP 44 must be followed.

Under SEPP 44, there is provision for preparation of plans of management which aim to protect areas of koala habitat and mitigate negative effects of a proposed development on resident koalas and their habitat. A Comprehensive Koala Plan of Management, such as this Plan, can be prepared for part of or the whole of an LGA. Individual Koala Plans of Management are prepared for specific land and developments. A DA on land that supports core or potential koala habitat cannot be approved by Council unless an approved Comprehensive or Individual Plan of Management is in place.

A Comprehensive Koala Plan of Management offers a number of significant advantages to both Council and applicants. For Council, a Comprehensive Plan:

- facilitates a strategic and coordinated approach to management of koalas and their habitat
- reduces the resources required to process individual DAs
- facilitates further government, non-government and community involvement in koala conservation in the Lismore LGA.

For applicants, a Comprehensive Plan:

- removes the need to prepare an Individual Koala Plan of Management (if required)
- reduces the time taken to process a DA
- provides transparent procedures and guidelines for assessing a DA
- ensures that requirements to compensate the loss of *preferred koala food trees*, and *preferred* and *core koala habitat* are documented and transparent.

Lismore Local Environmental Plan 2012 and Lismore Development Control Plan

The *Lismore LEP* and the Lismore Development Control Plan (Lismore DCP) provide the planning framework for encouraging orderly development within Lismore LGA while protecting the natural and built environments. The *Lismore LEP* identifies land use zones for all land in the LGA. For each zone, the *Lismore LEP* provides objectives and identifies what kinds of development that are permitted either with or without development consent from Council. For development that is permitted with consent, the Lismore DCP supplements the *Lismore LEP* by providing more detailed information and controls.

Threatened Species Conservation Act 1995

Council is required to consider a range of environmental matters, including the actual or likely impact of a proposed development on threatened species, populations, ecological communities or their habitats listed in the *Threatened Species Conservation Act 1995* (TSC Act). The koala is listed as a 'vulnerable' threatened species in Schedule 2 of the Act.

Native Vegetation Act 2003

In NSW, the *Native Vegetation Act 2003* regulates the clearing of native vegetation on Rural and Rural Residential lands. Urban areas and land in the conservation and forestry estates are not subject to the provisions of the NV Act. Clearing approvals under the NV

Act are determined by the Northern Rivers Catchment Management Authority. Approval for harvesting timber from native forests on private land is also determined by the Authority. In addition, the Office of Environment and Heritage is responsible for monitoring compliance.

Environment Protection and Biodiversity Conservation Act 1999

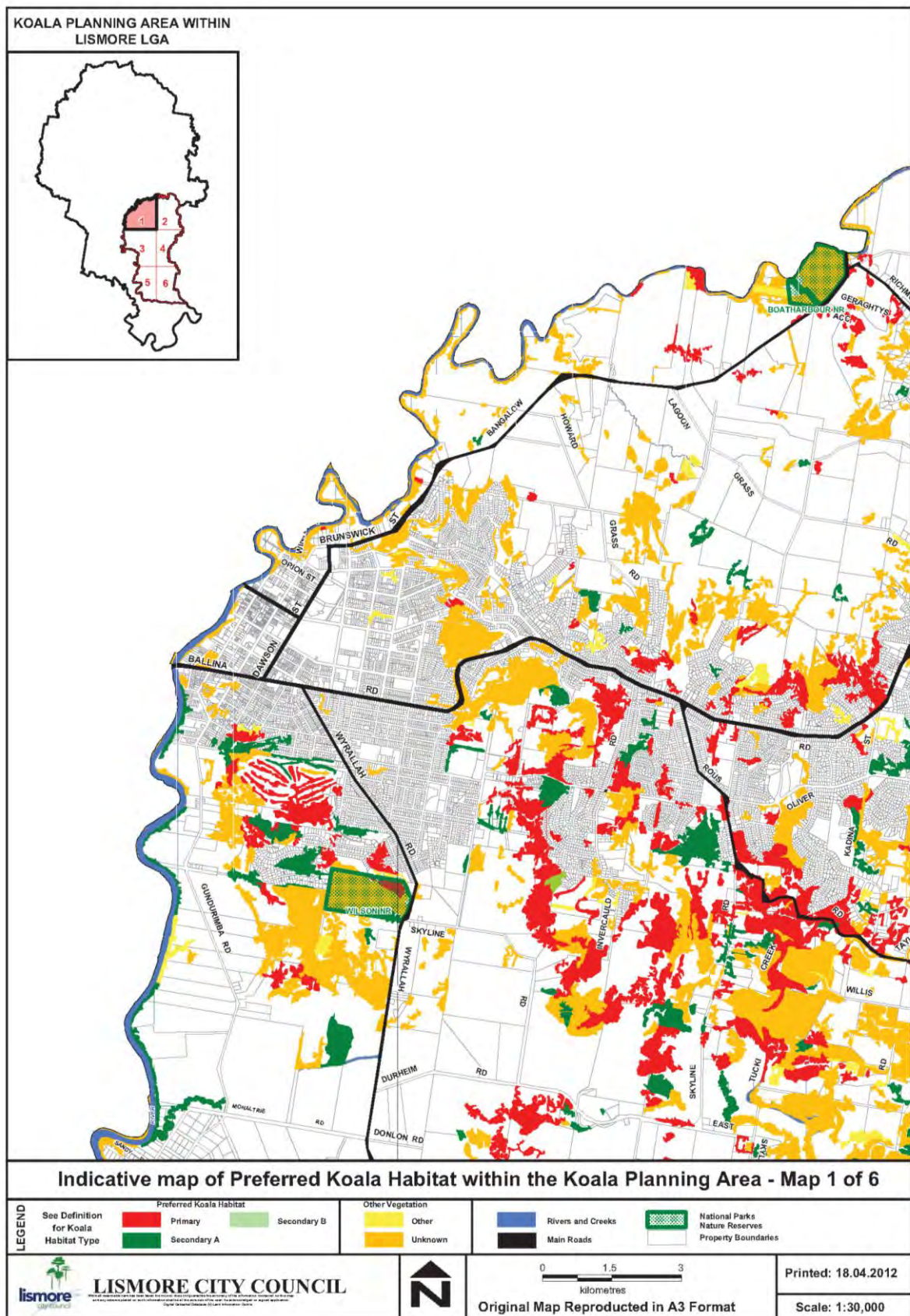
The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation that provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. These entities are defined in the EPBC Act as 'matters of national environmental significance'. As at 2 May 2012, koala populations in NSW have been recognised as under threat from extinction and are listed as 'vulnerable' under the EPBC Act.

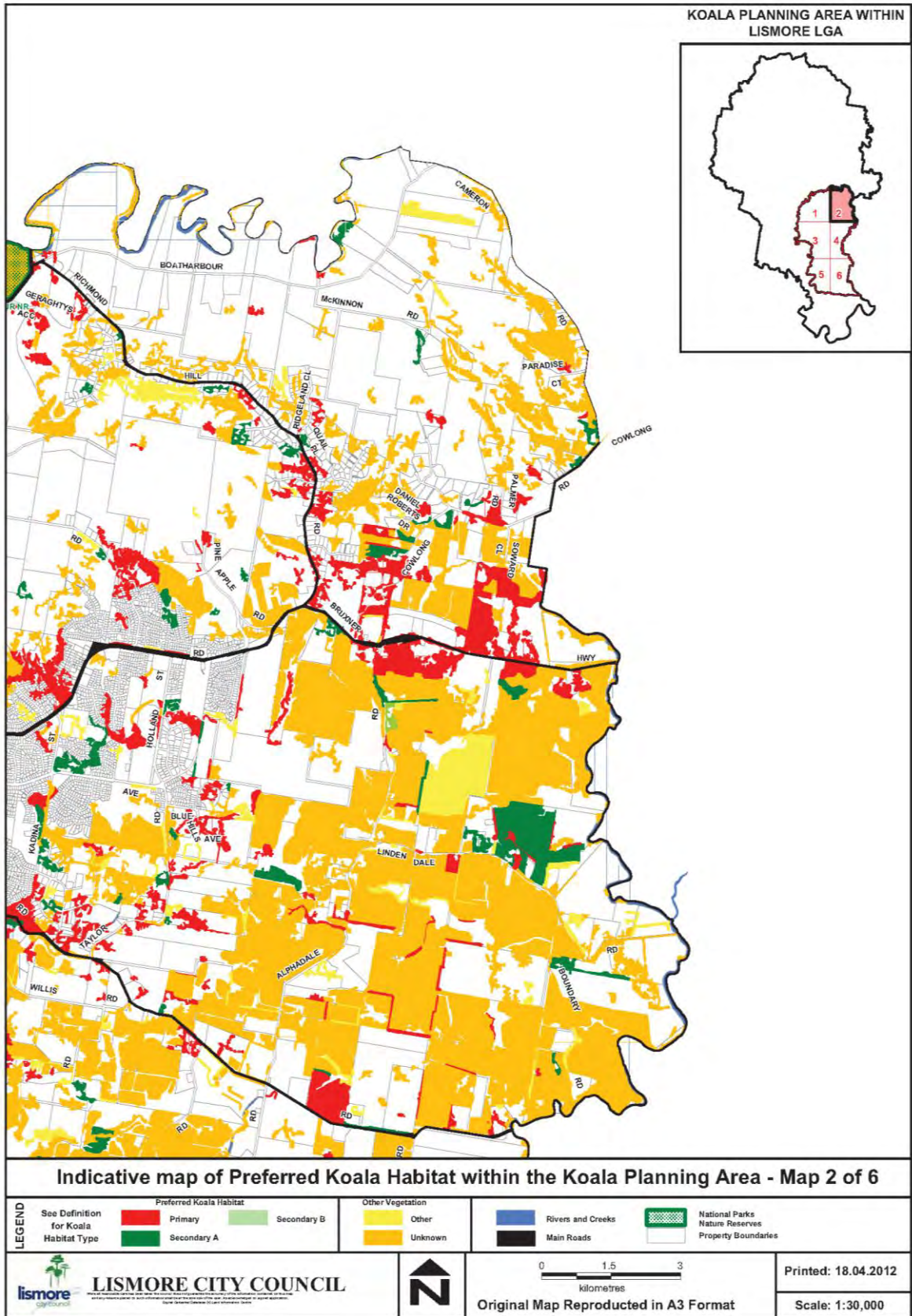
If a proposed development activity is likely to have a 'significant impact' on the koala, this activity must be referred to the federal environment minister through the Australian Government Department of Sustainability, Environment, Water, Population and Communities. However, it is the proponent's decision whether to refer the proposal in relation to the potential for a 'significant impact' on the koala or other matters of national environmental significance. Should a referred action be determined to have a 'significant impact', the action will be assessed under the provisions of the EPBC Act.

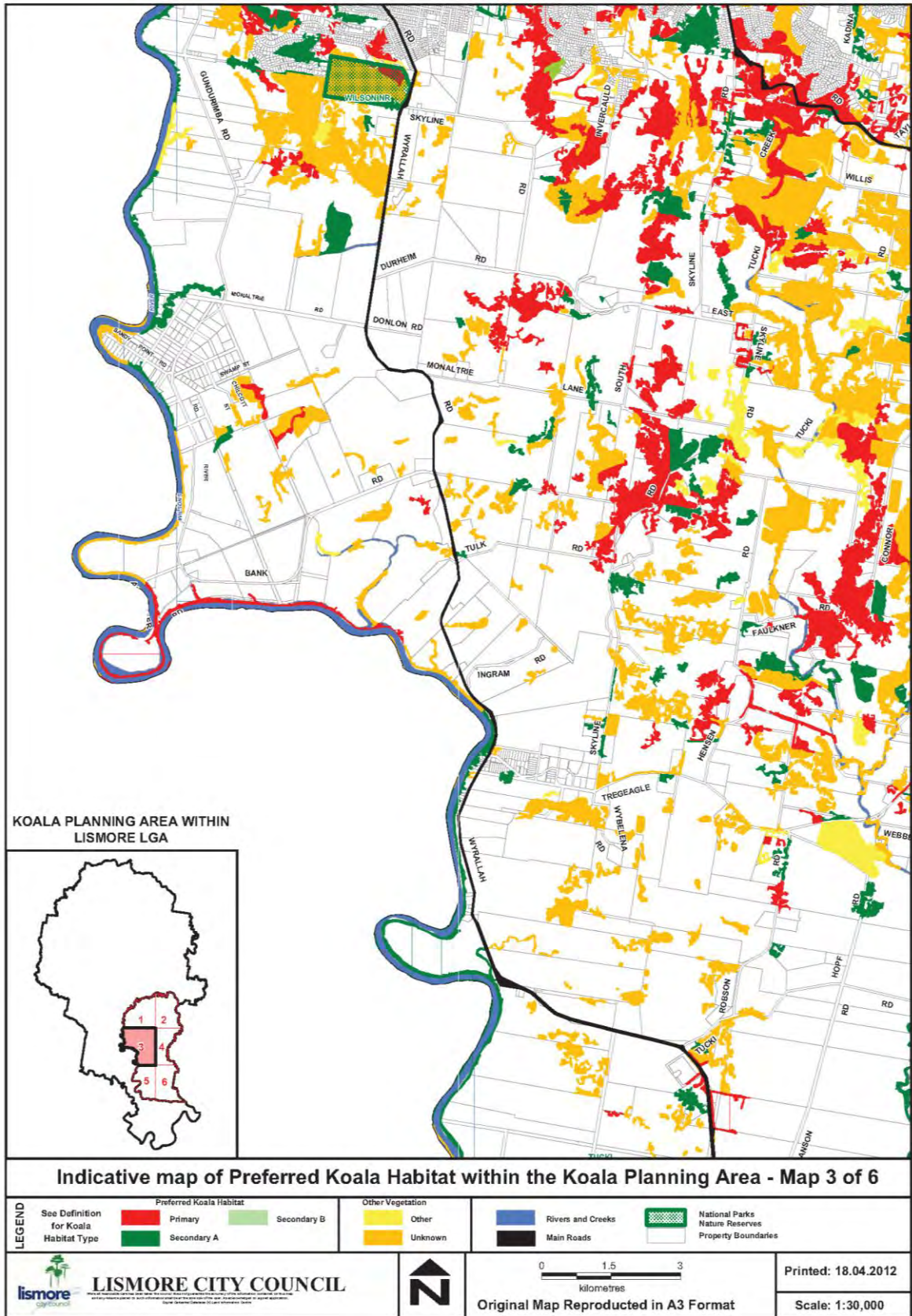
Note, at the time that this Plan was approved there was no bilateral agreement between the NSW State and Australian Governments that delegates responsibility for conducting environmental assessments and approvals under the EPBC Act to the State. Consequently, *development applications* that trigger both the TSC Act and EPBC Act are assessed under separate duplicate processes.

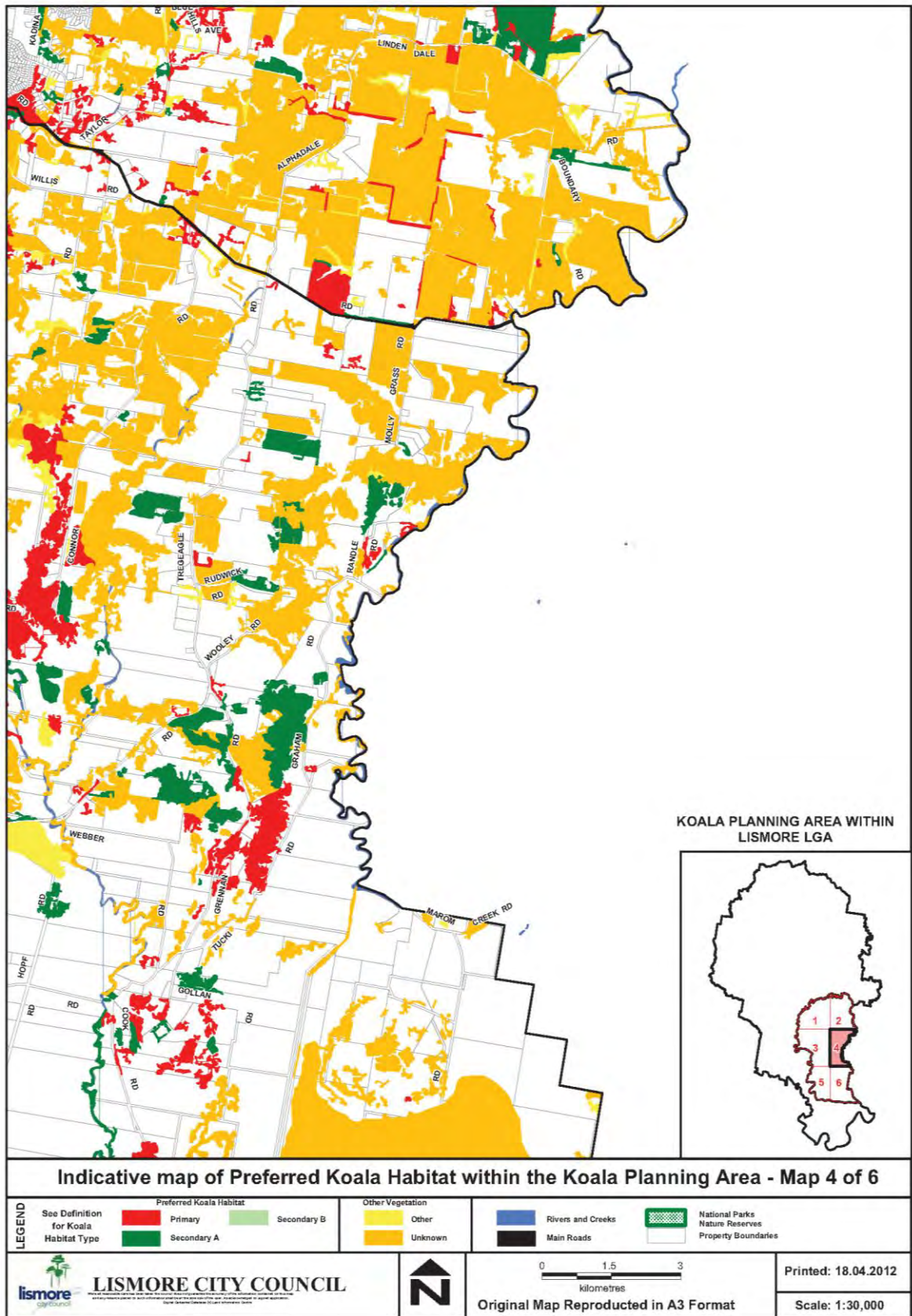
Appendix 2 – Indicative koala habitat maps within the koala planning area

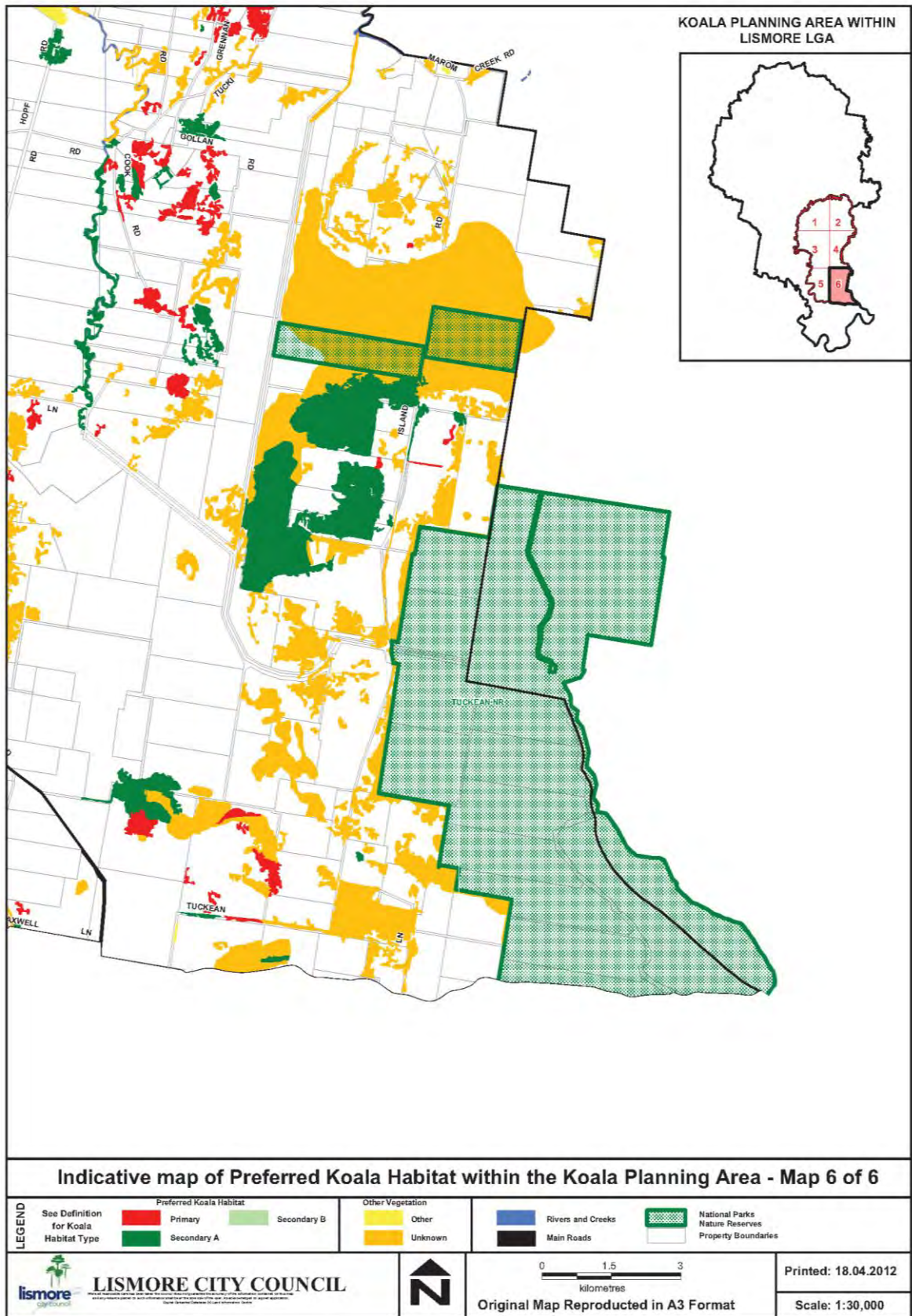
This section contains six indicative maps of *preferred koala habitat* and other vegetation within the *koala planning area*.











Appendix 3 – Table of approved Koala Plans of Management within the koala planning area

LCC DA No.	DoP File No.	Address	Lot(s)/DP(s)
96/271	G96/00236	Caroona Nursing Home 65 & 101 Rous Road, Goonellabah	Lot 291 DP 800777 Lot 23 DP 259391
01/297	G01/00168	6 Windsor Court, Goonellabah	Lot 3 DP 1031507
01/367	G01/00146	International Residential College Cynthia Wilson Dr & Rifle Range Road, Lismore	Lot 1 DP 625561
01/754	G02/00016	35 Greenwood Dr ,Goonellabah	Lot 45 DP 1031507
02/233	G02/00111	Communications Tower 49A John Street, Girards Hill	
02/516	G02/00127	Communications Tower Lismore Crematorium, Goonellabah	Lot 588 DP 728678
05/253	GRA6323753	29 Airforce Road East, Lismore	Lot 1 DP 715446
06/1	GRA6323917	Conner Road, Tregeagle	Lot 1 DP 731808 Lot 13 DP 734809
07/426	G07/00079	218A, 218B, 268B and 309A Henson Road, Wyrallah	Lot 105 DP 755705 Lot 111 DP 755705 Lot 5 DP 252788 Lot 10 DP 1092151
	11/02329	98 Ballina Road, Goonellabah	Lot 31 DP 1079954

Appendix 4 – Sampling and assessment of koala habitat using the Spot Assessment Technique and the Regularised Grid-based Spot Assessment Technique

The SAT and RG-bSAT approach (Phillips & Callaghan 2011) has been adopted by Council as a standardised sampling tool for Koala Habitat Assessment Reports for *large impact development* in the *koala planning area*. For the purposes of this Plan, it is intended that this assessment be undertaken by a *suitably qualified person* with relevant experience and training in both the application and interpretation of the RG-bSAT approach. The sampling principles of RG-bSAT, key elements of data analysis and modelling of associated koala activity data are currently the subject of a separate publication (Phillips *et al.*, 2011, in review).

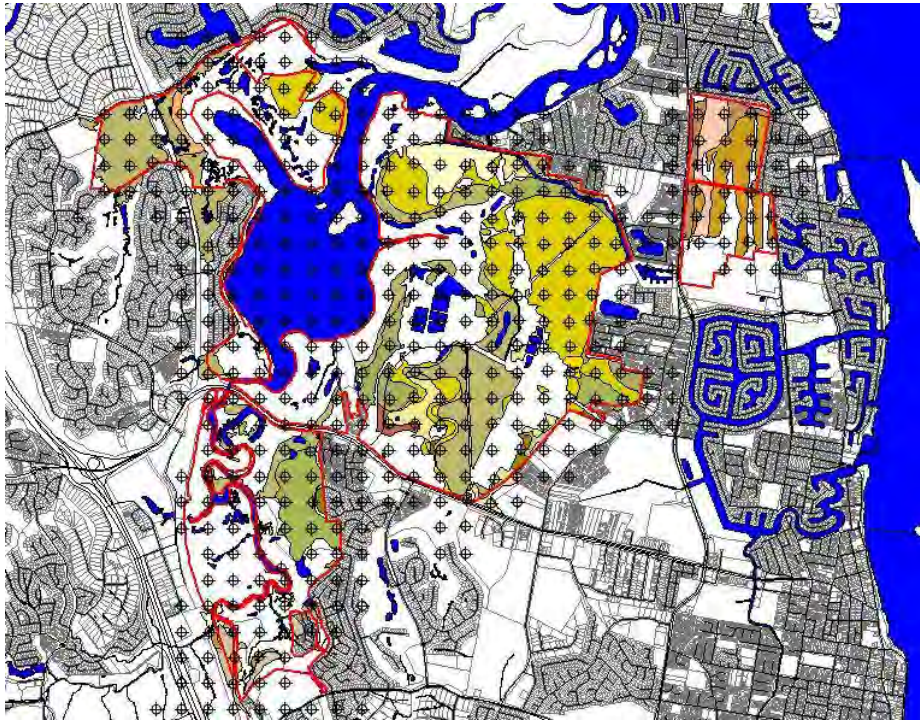
Following is a step-by-step account of how to work with the RG-bSAT approach using a notional 1500 hectare study site.

Step 1

Determine appropriate sampling intensities for the site to be assessed using Table 2 in this Plan:

Step 2

- a. Overlay a map/aerial photo of the *study area* with a square grid the dimensions of which correspond to the “high sampling intensity” detailed in Table 2;
- b. Then, use the resulting grid-cell intersections to identify those points that fall upon areas of land wherein 30 trees of any species that have a dbhob $\geq 100\text{mm}$ could theoretically be sampled within a radius approximately equal to that of 50% of the sampling intensity being utilised (e.g. 75m = 38m radius, 125m = 73m etc). The map/aerial photo should look like the diagram below (\oplus indicate sampling site locations);



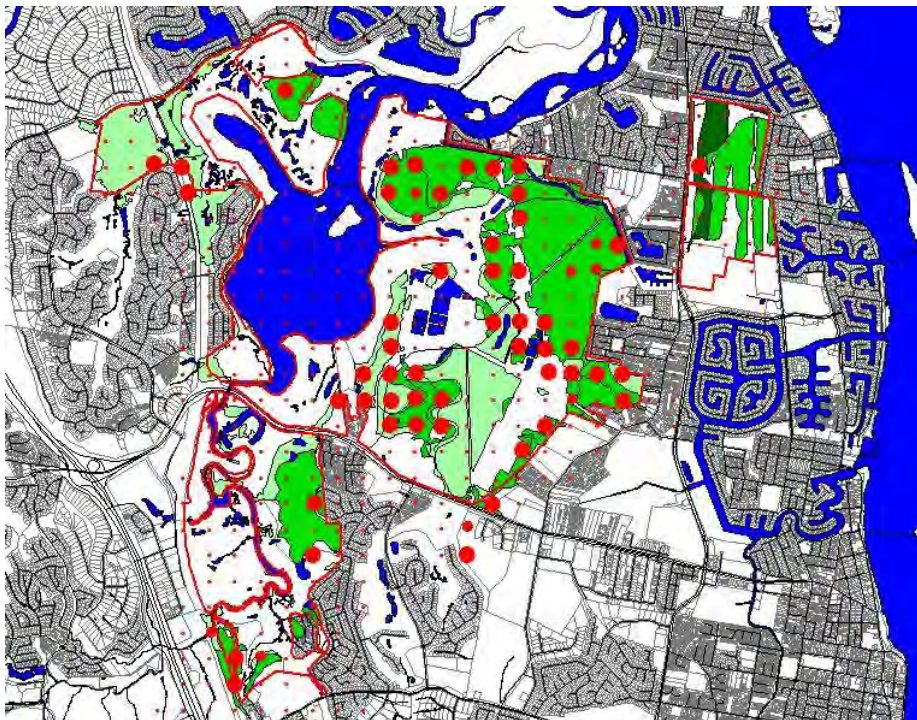
- c. Disregard any potential field sites that fall within areas such as water bodies or areas that do not have measurable forest cover;

Step 3

- a. Preliminary sampling of the *study area* should be undertaken at intervals commensurate with the “initial sampling intensity” sites specified in Step 1;
- b. Sampling is to be undertaken at each sampling point using the Spot Assessment Technique (SAT) (Phillips & Callaghan, 2011);
- c. Resulting koala activity levels at each field site are then interpreted as either “Low use”(less than 22.52%), “Medium (normal) use” (greater than or equal to 22.52% but less than or equal to 32.84%) or “High use” (greater than 32.84%) in line with the “East Coast (med-high)” activity thresholds specified in Table 2 of Phillips & Callaghan (2011);
- d. For any of the “initial sampling intensity” sites that returned “Medium (normal) use” or “High use” activity levels, sample the “high sampling intensity” sites surrounding these sites. It is not necessary to sample the “high sampling intensity” sites between any two sites with “Medium (normal) use” or “High use” activity levels. If no “Medium (normal) use” or “High use” sites are detected, no further assessment of the site is required.

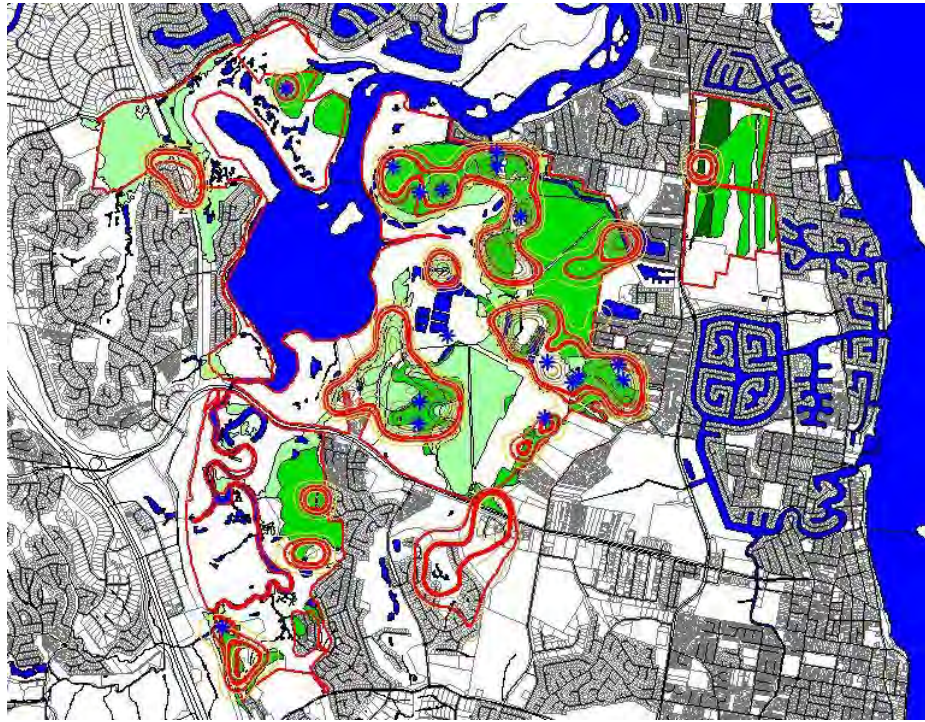
Step 4

- a. In the absence of a suitable spatial modelling technique such as splining, all SAT sites wherein significant koala activity has been recorded must become the central point of a grid cell, the size of which must be commensurate with sampling intensity as follows.
 - For 75m sampling intersections, the grid cell size will be 75m x 75m (0.56ha)
 - For 125m sampling intersections, the grid cell size will be 125m x 125m (1.56ha)
 - For 175m sampling intersections, the grid cell size will be 175 x 175m (3.06ha)
- b. The map/aerial photo should now look like the diagram below (red circles indicate sampling site locations, and the centre of grid cells referred to in (a) above, with size graduations indicating “Low use”(•), “Medium (normal) use”(•) and “High use” sites(•));
- c. All areas within a grid cell identified that returned “Medium (normal) use” or “High use” activity must be regarded as *core koala habitat* for the purposes of this plan;



Step 5

- (a) Koala activity data should then be interpolated to cover the assessment area using a suitable spatial modelling technique such as splining (see Phillips *et al.*, 2011, in review).
- (b) The map/aerial photo should now look like the diagram below. The model below was created using lightly weighted thin plate splining techniques to delineate the boundaries (red lines) of areas of *core koala habitat*.



The Spot Assessment Technique: a tool for determining localised levels of habitat use by Koalas *Phascolarctos cinereus*

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ABSTRACT

In order to more effectively conserve Koalas, the National Koala Conservation and Management Strategy 2009 – 2014 promotes the need for reliable approaches to the assessment of Koala habitat. This work describes a point-based, tree sampling methodology that utilises the presence/absence of Koala faecal pellets within a prescribed search area around the base of trees to derive a measure of Koala activity. Confidence intervals associated with Koala activity data from 405 randomly selected field plots within which faecal pellets were recorded have been utilised to assign threshold values for three population density/habitat biomes in eastern Australia. Subject to the need for a precautionary approach to data interpretation in areas that support naturally occurring, low-density Koala populations, the approach is expected to assist field-based assessments by researchers, land managers and others interested in clarifying aspects of habitat utilisation by free-ranging Koalas, especially where identification of important areas for protection and management is required.

Key words: Spot Assessment Technique, Koala, *Phascolarctos cinereus*, SEPP 44.

Introduction

The primary aim of the National Koala Conservation and Management Strategy 2009 – 2014 (NKCMS) is to conserve the Koala (*Phascolarctos cinereus*) by retaining viable populations in the wild throughout the species' natural range (Natural Resource Management Ministerial Council (NRMCC) 2009). In order to assist this aim, Action 1.06 of the NKCMS promotes the need for development of standard monitoring/habitat assessment protocols as a means of addressing the issue of inconsistency and disagreement over how koala populations should be surveyed and mapped (NRMCC 2009).

The primary responsibility for conservation of free-ranging *P. cinereus* populations rests with State, Territory and Local Government authorities. In this regard State Government authorities in New South Wales and Queensland have enacted specific planning policies and/or strategic planning measures to assist *P. cinereus* conservation efforts. However, the ability of such approaches to achieve their stated conservation objectives is impeded in part by the lack of standardised and reproducible methods that can be applied to the task of *P. cinereus* habitat/population assessment in the first instance.

In this paper we present a technique that we believe contributes to the need for a reliable approach to objectively assessing aspects of habitat use by *P. cinereus*. An unreviewed progenitor to this work (Phillips and Callaghan 1995) was originally circulated to a limited audience following the Australian Koala Foundation's

1995 conference on the status of Koalas, its purpose at that time to promulgate an approach that could potentially assist field-based assessments by ecological consultants, land managers and others interested in quantifying aspects of habitat utilisation by free-ranging *P. cinereus*. The purpose of this paper is to further refine the initial approach in the light of feedback and additional field studies and in so doing, formally supersede the earlier work.

Background to the approach

Traditionally, knowledge relating to habitat utilisation by free-ranging *P. cinereus* has been primarily reliant on opportunistic observations or radio-tracking data (Robbins and Russell 1978; Martin 1985; Hindell *et al.* 1985; Hindell and Lee 1987; 1988; White and Kunst 1990; Reed *et al.* 1990; Hasegawa 1995; Melzer and Lamb 1996; Pieters and Woodhall 1996). In other instances, emphasis has been placed on benign indicators such as accumulated faecal pellet counts (Moon 1990; Munks *et al.* 1996; Pahl 1996) and scratch marks. However, all of these approaches can be problematic. Firstly, existing models for determining tree preferences by free-ranging *P. cinereus* (Hindell *et al.* 1985) require a number of assumptions to be met which do not appear to hold in heterogeneous forest communities (Phillips 1999; Ellis *et al.* 2002). Secondly, while careful analysis of accumulated faecal pellet counts can elucidate issues of *P. cinereus* abundance (Sullivan *et al.* 2002, 2004), such

counts have proved to be of limited value when used to infer the importance of various tree species (Munks *et al.* 1996; Pahl 1996). The ability to census and interpret faecal pellet deposits can also be influenced by other variables including visibility, tree morphometrics and insect activity (Achurch 1989; Jones 1994; Melzer *et al.* 1994; Pahl 1996; Ellis *et al.* 1998; Sullivan *et al.* 2003). Scratch marks on trees are also an unreliable indicator of habitat use – they cannot be detected on some species whereas others retain them for long periods of time – nor is it always possible to confidently distinguish scratches made by *P. cinereus* from those of other arboreal animals.

Studies of free-ranging *P. cinereus* populations have established that those in stable breeding aggregations arrange themselves in a matrix of overlapping home range areas (Lee and Martin 1988; Faulks 1990; Mitchell 1990). Home range areas vary in size depending upon the quality of the habitat (measurable in terms of the density of preferentially utilised food tree species) and the sex of the animal (males tend to have larger home range areas than females). Long-term fidelity to the home range area is generally maintained by adult *P. cinereus* in a stable population (Mitchell 1990; Phillips 1999; Kavanagh *et al.* 2007). An additional feature of *P. cinereus* home range use is the repeated use of certain trees, some of which may also be utilised by other members of the population (Faulks 1990; Mitchell 1990; Phillips 1999; Ellis *et al.* 2002).

Given the preceding considerations, it follows that areas being utilised by socially stable/resident *P. cinereus* populations must also be characterised by a higher rate of faecal pellet deposition (see Lunney *et al.* 1998). For the purposes of this paper, we propose the term “areas of major activity” to describe such localities, regarding them as synonymous with the term “Core Koala Habitat” (in so far as this term relates to the presence of a “resident population of koalas”) as defined by the NSW Government’s *State Environmental Planning Policy No. 44 (Koala Habitat Protection)*, as well as being a fundamental element of “Koala Habitat Areas” as defined by the *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006 – 2016* (Environment Protection Agency/Queensland National Parks and Wildlife Service 2006).

The Spot Assessment Technique

The Spot Assessment Technique (SAT) is a truncated form of the methodology originally developed by the Australian Koala Foundation for purposes of the Koala Habitat Atlas project (Sharp and Phillips 1997; Phillips *et al.* 2000; Phillips and Callaghan 2000). The Atlas approach is probability-based and utilises a binary variable (presence/absence of faecal pellets within a prescribed search area around the base of trees) to determine tree species preferences, along with a commensurate measure of *P. cinereus* “activity” (number of trees with faecal pellets divided by total number of trees in the plot) within a 40m x 40m

(1600m²) plot. Given that the selection of Atlas field plots is primarily based on stratification and replication using soil landscape and vegetation association data in the first instance, the data presented for the purposes of this paper reflects a random selection of field sites within which *P. cinereus* faecal pellets were recorded. The SAT approach arose from observations of consistency within the four smaller (20m x 20m) sub-quadrats that otherwise comprise Atlas field plots and the consequent realisation that a smaller plot size essentially provided the same empirical outcomes in terms of both tree species/faecal pellet associations and activity *per se*. However, the number of trees sampled in a smaller site is critical in terms of ascribing meaningful variance to the activity estimate hence we have adopted this measure as the more important variable for the purposes of the technique. Thus, in order to establish a meaningful confidence interval for the activity level of a given SAT site, a minimum of thirty (30) trees must be sampled. For assessment purposes, a tree is defined as “a live woody stem of any plant species (excepting palms, cycads, tree ferns and grass trees) which has a diameter at breast height (dbh) of 100 mm or greater” (Phillips *et al.* 2000); in the case of multi-stemmed trees, at least one of the live stems must have a dbh of 100 millimetres or greater in order to qualify.

Table 1 provides a data summary from Atlas field plots undertaken across a variety of habitat types and landscapes utilised by *P. cinereus* in eastern Australia. To this end, while we consider significant differences between mean activity levels from low and medium – high density *P. cinereus* populations of the eastern seaboard to reflect real differences in habitat carrying capacity (Table 1 – Southeast Forests/Campbelltown vs Port Stephens/Noosa – Levene’s test: $F = 0.086$, $P > 0.05$; $t = -7.877$, $P < 0.001$), we speculate that similar differences between medium – high density populations of the eastern seaboard and those from more western areas (areas generally receiving less than 600mm of rainfall annually) (Port Stephens/Noosa vs Pilliga/Walgett – Levene’s test: $F = 0.925$, $P > 0.05$; $t = -4.743$, $P < 0.001$) more likely reflect differences in faecal pellet longevity as a consequence of aridity than they do habitat quality *per se*. This said, we acknowledge that there are also likely to be both low and medium-high density populations in western areas of the species’ range, the differentiation of which will require further investigation and evaluation.

Applying the SAT

The SAT involves a radial assessment of *P. cinereus* “activity” within the immediate area surrounding a tree of any species that is known to have been utilised by the species, or otherwise considered to be of some importance for *P. cinereus* conservation and/or management purposes. In the field the technique is applied as follows:

1. Locate and uniquely mark with flagging tape a tree (the centre tree) that meets one or more of the following selection criteria:

Table 1. Mean activity levels and related measures of central tendency (expressed as percentage equivalents) associated with habitat utilisation by Koalas from six areas in eastern Australia. Data relates to sites within which faecal pellets were recorded and has been pooled to reflect three major categories of activity which correspond to naturally occurring low and med-high density populations of the tablelands and areas east of the Great Dividing Range, and those of more western areas respectively. Koala densities for the east coast, low density category are arbitrarily defined at ≤ 0.1 Koalas/ha. (Data sources: ¹South-east Forests Conservation Council, unpub. data; ²Phillips and Callaghan 1997; ³Phillips and Callaghan 2000; ⁴Phillips et al. 1996; ⁵Phillips et al. 2000; ⁶AKF, unpub. data; ⁷Phillips 1999; ⁸AKF unpub. data).

Area	Pop. Density	No. sites	No. trees	A/level	SD	SE	99% CL
East Coast							
S/E Forests ¹	Low	111	2979	11.85	6.84	0.65	1.70
Campbelltown ^{2,3}	Low	20	1194	6.52	4.72	1.06	3.02
Pooled		131	4173	11.03	6.82	0.60	1.56
East Coast							
Port Stephens ^{4,5}	Med - high	76	3847	23.65	23.63	2.71	7.16
Noosa ⁶	Med - high	63	1647	32.55	22.05	2.78	7.38
Pooled		139	5494	27.68	23.27	1.97	5.16
Western Slopes & Plains							
Pilliga ^{7,8}	Med - high	98	3656	42.52	22.78	2.30	6.05
Walgett ⁹	Med - high	37	990	38.01	27.66	4.55	12.37
Pooled		135	4646	41.28	24.19	2.08	5.44

- a tree of any species beneath which one or more *P. cinereus* faecal pellets have been observed and/or
 - a tree in which a *P. cinereus* has been observed and/or
 - any other tree known or considered to be potentially important for *P. cinereus*, or of interest for other assessment purposes.
- identify and uniquely mark the 29 nearest trees to the centre tree,
 - undertake a search for *P. cinereus* faecal pellets beneath each of the 30 marked trees based on a cursory inspection of the undisturbed ground surface within a distance of 100 centimetres around the base of each tree, followed (if no faecal pellets are initially detected) by a more thorough inspection involving disturbance of the leaf litter and ground cover within the prescribed search area.

Strict adherence to the 100 cm search area is a fundamental component of the SAT methodology. As detailed in Appendix 1, it is this distance that both optimises the probability of success in terms of actually finding faecal pellets, while at the same defining a workable search area. Any lesser search area and the probability of success will be significantly reduced (Figure 2 in Appendix 1 refers) such that the mean activity levels and associated activity level thresholds applicable to the approach cannot be justifiably applied.

In terms of search effort, an average of approximately two person minutes per tree should be dedicated to the faecal pellet search. In practice, more time will be spent searching beneath larger trees than smaller trees. For assessment purposes, the search should be concluded once a single faecal pellet has been detected or when the maximum search time has expired, whichever happens first. This process should be repeated until each of the 30 trees in the site has been assessed. Where the location of faecal pellets falls within overlapping search areas

due to two or more trees growing in close proximity to each other, both should be scored for pellet(s). For more detailed reporting purposes, information relating to the site's location (UTM co-ordinates or Lat/Long), selection criteria, tree species assessed (and dbh), and the radial area searched (as measured by distance from the centre tree) should also be recorded. Faecal pellets should not be removed from the site unless some verification (i.e. that they are in fact *P. cinereus* faecal pellets) is necessary.

Calculation and interpretation of Koala activity levels

The activity level for a SAT site is simply expressed as the percentage equivalent of the proportion of surveyed trees within the site that had a *P. cinereus* faecal pellet recorded within the prescribed search area. For example, given a sample of 30 trees, 12 of which had one or more faecal pellets recorded – the resulting activity level would be determined as $12/30 = 0.4 = 40$ per cent.

From the data sets presented in Table 1, we opted for a precautionary approach by proposing use of mean activity levels ± 99 per cent confidence intervals to define the limits of "normal" *P. cinereus* activity. Based on the threshold values that result, three categories of activity – "low", "medium(normal)" and "high" can thus be determined for each of the three area/population density categories detailed in Table 2. Subject to qualifications regarding the need for a cautious approach to low activity levels in some instances (see below), where the results of a SAT site returns an activity level within the low use range, the level of use by *P. cinereus* is likely to be transitory. Conversely, where a given SAT site returns an activity level within the prescribed range for medium (normal) to high use – the level of use is indicative of more sedentary ranging patterns and is thus within an area of major activity.

Table 2. Categorisation of Koala activity into Low, Medium (normal) and High use categories based on use of mean activity level \pm 99 per cent confidence intervals (nearest percentage equivalents) from each of the three area/population density categories indicated in Table 1.

Activity category	Low use	Medium (normal) use	High use
Area (density)			
East Coast (low)	-	$\geq 3.33\%$ but $\leq 12.59\%$	$> 12.59\%$
East Coast (med – high)	$< 22.52\%$	$\geq 22.52\%$ but $\leq 32.84\%$	$> 32.84\%$
Western Plains (med – high)	$< 35.84\%$	$\geq 35.84\%$ but $\leq 46.72\%$	$> 46.72\%$

A precautionary approach to activity levels in low use areas.

Ideally, SAT site activity levels should only be interpreted in the context of location-specific habitat utilisation data (e.g. Lunney *et al.* 1998; Phillips *et al.* 2000; Phillips and Callaghan 2000; Phillips and Hopkins 2009). Low activity levels recorded in what might otherwise be med-high carrying capacity *P. cinereus* habitat may be a result of contemporary population dynamics, landscape configuration and/or historical disturbances including logging, mining, fire, agricultural activities and/or urban development. Such considerations should not necessarily detract from the potential importance of such habitat for longer-term conservation, particularly if preferred koala food trees are present and populations of *P. cinereus* are known to occur in the general area. Ideally, any determination of the importance of activity levels in such instances should be informed by a broader, soil-based understanding of tree preferences (e.g. Phillips and Hopkins 2009), and in conjunction with an understanding of ecological history (e.g. Knott *et al.* 1998; Seabrook *et al.* 2003).

Low activity levels are also associated with low-density *P. cinereus* populations. Stable, low-density *P. cinereus* populations occur naturally in some areas (Melzer and Lamb 1994; Jurskis and Potter 1997; Phillips and Callaghan 2000; Ellis *et al.* 2002; Sullivan *et al.* 2006). The density of *P. cinereus* in such areas generally reflects the absence of "primary" food tree species and reliance by the population on "secondary" food tree species only (Phillips and Callaghan 2000; Phillips 2000). While secondary food tree species will return significantly higher levels of utilisation when compared to other *Eucalyptus* spp. in the area, their level of use (as determined by field survey) will

invariably be both size-class and/or density dependent when compared to a primary food tree species (Phillips and Callaghan 2000; Phillips 2000; Moore and Foley 2005). Because the autecology of *P. cinereus* occupying habitat areas that do not naturally support one or more "primary" food tree species remains poorly understood at this point in time, again we advocate a precautionary approach whereby the presence of any activity in areas occupied by naturally occurring, low density populations should be regarded as ecologically meaningful for conservation and management purposes until proven otherwise.

Concluding comment

The SAT is intended for application in conjunction with land-use planning activities that require *P. cinereus* habitat to be assessed, especially where identification of important areas for protection and management is required. The technique is suitable for use in conjunction with stratified/random or systematic survey techniques but has proved especially powerful when applied at the landscape-scale using a regularised grid-based sampling design and appropriate spatial modelling techniques (see Phillips *et al.* 2007; Phillips and Hopkins 2007; Phillips and Hopkins 2009; Allen *et al.* 2010; Phillips *et al.* submitted); it is also suitable for long-term monitoring purposes. Further information and advice regarding application and use of the technique and its application to the tasks of koala management can be supplied if required.

In refining the SAT approach over the intervening time period since its initial inception and development, we have deliberately opted for efficiency (in terms of time) and reproducibility in the field, all the while mindful that it must remain a robust sampling tool capable of answering the critical questions associated with koala conservation biology.

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APPENDIX Some probabilistic aspects of the SAT approach

Over the years many individuals have contributed to development and refinement of the Koala Habitat Atlas methodology and its derivative progeny the Spot Assessment Technique.

In 1994, Southern Cross University student Maria Jones was set the task of examining the distribution of *P. cinereus* faecal pellets beneath trees used by the species. Thirty spatially independent Forest Red Gums *Eucalyptus tereticornis* were selected for assessment, each of which was confirmed to have been used by *P. cinereus* on the basis of one or more faecal pellets being observed beneath their respective canopies. Forest Red Gum was selected because it was known to be a preferred food tree throughout the range of *P. cinereus* in eastern Australia. Beneath each of these trees both the number and distribution of faecal pellets were recorded at 200 mm radial increments from the base, along with other data such as tree dbh and canopy configuration.

Collectively, Maria recorded 8,565 faecal pellets beneath (and sometimes beyond) the canopies of the 30 trees (mean dbh of sampled trees: $40.51\text{cm} \pm 24.67(\text{SD})$, range 95–895; mean no. faecal pellets tree⁻¹: $285.6 \pm 341.8(\text{SD})$, range 1–1433). From these data it was able to be demonstrated that (i) *P. cinereus* faecal pellets were not uniformly distributed beneath the tree canopy, but (ii) they occurred most commonly near the base of trees (Figure 1).

Given the problems of accumulated faecal pellet counts, one of us (SP) then asked of Maria's

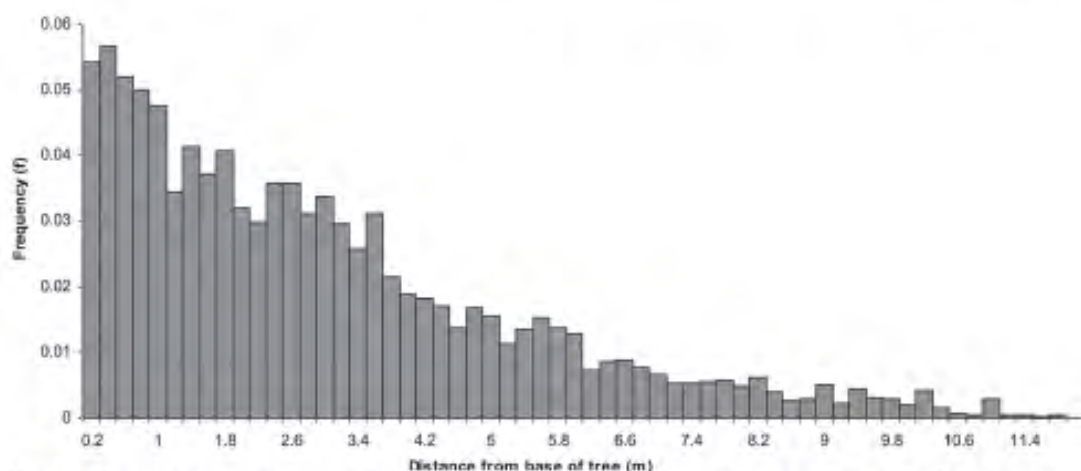


Figure 1. Pooled frequency histogram illustrating the distribution of *P. cinereus* faecal pellets as a function of increasing distance from the base of 30 sampled food trees (Source: Jones 1994).

data: "Given that each tree is a spatially independent replicate, what - on average - is the relationship between proportion (p) of the total faecal pellet count beneath each of the sampled trees as a function of distance from the base?" Figure 2 illustrates the answer to this question, demonstrating how the probability of success in terms of actually finding pellets can be related to the size of a radial search area. With this knowledge it then became a matter of looking for a search parameter that combined a meaningful probability of encountering one or more faecal pellets, yet also restricting the

search to an area that could be efficiently worked. Further interrogation of the data established that, on average, the equivalent of $47\% \pm 12\%$ (95% CI) of all *P. cinereus* faecal pellets will be located within a distance of 1m from the base of trees that have been utilized by the species. We figured the odds at that distance (i.e. ~50:50) were good. While a smaller search area (i.e. 0.6m) would clearly have increased search efficiency, the probability of finding pellets was almost halved! Conversely, increasing the search area beyond 1m resulted in not just minor increases in the probability of success but also substantively increased the search area in each instance.

The results of the preceding analysis are generally in accord with the observations of other workers, Ellis et al (1998) also recording a disproportionately high density of pellets adjacent to the trunks of some trees utilized by *P. cinereus*, with approximately 18% of daily collection falling within a 1m x 1m area around the tree base. Sullivan et al (2002) used a 30cm search area around the base of trees, reporting a variable tendency (1.9 - 13.5%) for misclassification (i.e. recording absence when in fact pellets were actually present elsewhere beneath the canopy). Interestingly, the potential for such misclassification is strongly supported by Figure 2 which otherwise infers that the proportional representation of faecal pellets using a 30cm basal search area is very low (~10-15%).

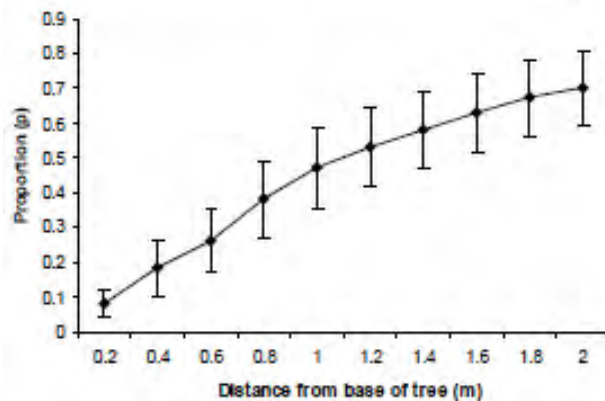


Figure 2. Mean proportional representation (\pm 95% Confidence Interval) of the total faecal pellet counts from beneath a sample of 30 trees known to have been utilised by *P. cinereus* (raw data sourced and re-analysed from Jones (1994)).

Appendix 5 – Habitat Compensation Policy

Background

This policy is designed to provide a system for determining appropriate compensation for activity associated with *large impact development* that has the potential to adversely impact *koala habitat* and/or impede safe koala movement. The standardised approach presented here is transparent, can be applied in a consistent manner and is less resource-intensive for Council and proponents than the current largely case-by-case method.

The policy aims to provide for ecologically sustainable development, to protect and enhance areas of existing *koala habitat* and to create *koala habitat* where there is a sound ecological reason to do so.

Guiding principles

The principles that underpin this policy are:

1. The primary objective of habitat compensation must be to protect, enhance or create ecologically viable *koala habitat*;
2. Compensation must only be considered once all options to avoid, minimise and mitigate any adverse impacts have been exhausted;
3. Clearing must not be approved where the impact of clearing cannot be satisfactorily compensated;
4. Habitat compensation works should lead to a net gain in the area of *koala habitat*, and an improvement in the condition of *koala habitat*;
5. The *land* receiving compensation works (*'receiving land'*) must be ecologically suitable and appropriate for protection, enhancement or creation of *koala habitat*;
6. An activity that leads to the loss of *koala habitat* (especially clearing) should only proceed once the management arrangements on the *receiving land* are legally secure;
7. Compensation works must not lead to permanent adverse environmental impacts and must not be used as a justification for granting approval to a DA where the adverse environmental impacts of a development are greater than the benefit to be obtained from the compensation works;

8. Compensation works undertaken on rural land should be conducted in a way which achieves best practice farm management;
9. Management and monitoring of habitat compensation activities should be undertaken over an ecologically meaningful timeframe (i.e. a minimum of five years).

Components of the Habitat Compensation Policy

If Council gives approval to clear an area of *koala habitat*, this policy requires the proponent to undertake compensation works to compensate for the loss of *koala habitat*. The compensation works must benefit another area of *koala habitat* or a *koala movement corridor* to that being impacted by development. The policy is based on two main components:

1. the nature of and level of legal protection afforded an area of *receiving land*;
2. a loss:gain multiplier that takes into account:
 - a. the relative conservation value of the area of *koala habitat* adversely impacted by development activity;
 - b. a time/risk factor that takes into account the time lag before ecological benefits are realised and the risk of the compensation works failing².

Habitat compensation works

Based on the nature of habitat compensation works to be conducted and the level of legal protection afforded an area of *receiving land*, this compensation policy recognises three classes of compensation works that can be applied to *koala habitat*, namely: Protection, Enhancement and Creation. This classification is based on measures used by Council to compensate for the adverse impact of development activity prior to the development of this Plan.

Each class of compensation works must be applied in accordance with the guiding principles outlined above and the Development Assessment Framework detailed in Section 4 of the Plan. It should be noted that for all three classes of habitat compensation works:

² This policy is based on the Habitat Offsets Policy Framework detailed in Ecol Logical Australia (2003).

- no class of habitat compensation works is mandatory;
- the proponent has the option of choosing which class of habitat compensation works to implement;
- each class of works may be operated singly or in some combination with another class of works;
- habitat compensation works may be undertaken concurrently with other activities that protect, enhance or create habitat (i.e. on the same *receiving land*). For example, this may include the creation of biological buffers, revegetation of riparian corridors or areas reserved for stormwater management.

This policy recognises five classes of *koala habitat*: Endangered Ecological Communities (TSC Act) which have been verified as *preferred* or *core koala habitat*, *core koala habitat*, *preferred koala habitat* (i.e. primary koala habitat and secondary koala habitat), and *koala movement corridors* (Table 5).

Protection

Should Council give development consent to clear and/or adversely impact an area of *koala habitat* then the proponent may compensate for the adverse impacts of development activity by providing a high level of conservation security to an area of *receiving land* (i.e. 'Protection'). All classes of koala habitat can receive Protection under this policy (Table 5). There are four acceptable primary protection mechanisms for this category of habitat compensation works (Table 6):

1. transfer of *land* ownership to the Crown for dedication as a conservation reserve (NPW Act);
2. dedication of *land* under a Voluntary Conservation Agreement (NPW Act);
3. dedication of *land* under an in perpetuity trust agreement (*Nature Conservation Trust Act 2001*);
4. transfer of *land* to Council for dedication as a reserve either as a donation and/or in lieu of Section 94 contributions (EP&A Act).

It is acknowledged that whilst the mechanisms identified in 1-3 above are all legally viable, the acquisition guidelines of the agencies involved in negotiating these agreements may preclude their use in practice. Consequently, it is anticipated that the majority of *receiving land* will be afforded Protection under mechanism 4 above.

Table 5. Habitat compensation works that can be applied for each class of koala habitat impacted by development activity

		Habitat Compensation Works		
		Protection	Enhancement	Creation
Class of koala habitat impacted by development activity	Endangered ecological communities verified as preferred or core koala habitat	Yes	Yes	Yes
	Core koala habitat	Yes	Yes	Yes
	Primary koala habitat	Yes	Yes	Yes
	Secondary koala habitat	Yes	Yes	Yes
	Koala movement corridor	Yes	Yes	Yes

Table 6. Acceptable protection mechanisms for each class of habitat compensation works

	Habitat Compensation Works		
	Protection	Enhancement	Creation
Primary protection mechanisms			
Donation of land to the Crown for dedication as a conservation reserve (NPW Act)	Yes	No	No
Voluntary conservation agreement (NPW Act)	Yes	No	No
In perpetuity trust agreement under the <i>Nature Conservation Trust Act 2001</i>	Yes	No	No
Transfer of land to council for dedication as a reserve either as a donation and/or in lieu of Section 94 contributions (EP&A Act)	Yes	No	No
Voluntary planning agreement (EP&A Act)	No	Yes	Yes
Incentive property vegetation plan (NV Act)	No	Yes	Yes
Land use protection mechanism			
Positive covenants or equivalent instrument (Section 88E, <i>Conveyancing Act 1919</i>)	Yes	Yes	Yes
Rezoning within the <i>Lismore LEP</i> to zone E2 Environmental Conservation, E3 Environmental Management, RE1 Public Recreation or SP2 Infrastructure (EP&A Act)	Yes	Yes	Yes
Management and funding mechanisms			
VMP/PoM fully funded with a minimum five-year management period as a condition of development consent (EP&A Act)	Yes	Yes	Yes
Environmental levy (<i>Local Government Act 1993</i>)	Yes	Yes	Yes

An area of *receiving land* subject to Protection may also be afforded additional protection with a land use protection mechanism. There are two acceptable land use protection mechanisms for this category of habitat compensation works (Table 6):

1. Positive covenants (Section 88E, Conveyancing Act 1919) or equivalent instrument; and/or
2. Rezoning within the *Lismore LEP* to zone E2 Environmental Conservation, E3 Environmental Management, RE1 Public Recreation or SP2 Infrastructure (EP&A Act).

Furthermore, *receiving land* afforded Protection is to be appropriately managed with enhancement works to improve the integrity and viability of koala habitat and/or prevent/minimise threats to *koala habitat*. All enhancement works must be outlined in a VMP/PoM approved by Council and fully funded by the proponent with a minimum five-year management period following the completion of the initial phase of enhancement works (Table 6). Compliance with the VMP/PoM must be enforceable and secured by legal agreement (Table 6).

Long term funding for management of enhancement works beyond the minimum five-year management period detailed above, may also be secured by application of an environmental levy, subject to the approval of the NSW Department of Local Government (Table 6).

Enhancement

Should Council give development consent to clear and/or adversely impact an area of *koala habitat* then the proponent may compensate for the adverse impacts of development activity by appropriately managing an area of *receiving land* to improve the integrity and viability of *koala habitat* and/or prevent/minimise threats to *koala habitat*. (i.e. 'Enhancement'). Management activities may include works to restore/regenerate degraded habitat and/or prevent/minimise threats to koala habitat (e.g. exclusion fencing). Under this policy all classes of *koala habitat* can be afforded Enhancement (Table 5).

Given that Enhancement works may require significant investment, it is important to ensure that the benefits of Enhancement works are durable over time. The loss of *koala habitat* and/or adverse impacts for which the Enhancement works is compensating are intended to be long-lasting. Furthermore, there will be a lag between the time that the

Enhancement works is undertaken and the time that the ecological benefit is obtained. There are two acceptable protection mechanisms to increase the level of conservation security for this category of habitat compensation works (Table 6):

1. Voluntary planning agreement (EP&A Act);
2. Incentive property vegetation plan (NV Act).

An area of *receiving land* subject to Enhancement must also be afforded additional protection by a land use protection mechanism. There are two acceptable land use protection mechanisms for this category of habitat compensation works (Table 6):

1. Positive covenants (Section 88E, Conveyancing Act 1919) or equivalent instrument; and/or
2. Rezoning within the *Lismore LEP* to zone E2 Environmental Conservation, E3 Environmental Management, RE1 Public Recreation or SP2 Infrastructure (EP&A Act).

For *receiving land* afforded Enhancement all enhancement works must be outlined in a VMP/PoM approved by Council and fully funded by the proponent with a minimum five-year management period following the completion of the initial phase of habitat protection works (Table 6). Compliance with the VMP/PoM must be enforceable and secured by legal agreement (Table 6).

Long term funding for management of enhancement works beyond the minimum five-year management period detailed above, may also be secured by application of an environmental levy, subject to the approval of the NSW Department of Local Government (Table 6).

Creation

Should Council give development consent to clear and/or adversely impact an area of *koala habitat* then the proponent may compensate for the adverse impacts of development activity by creating *koala habitat* on an area of *receiving land* (i.e. 'Creation'). Habitat may be created in an area of receiving land where there is a sound ecological reason to do so (e.g. within gaps of contiguous *koala habitat*, areas adjacent to *koala habitat*, within a *koala movement corridor* or unvegetated riparian corridor). Appropriate works for an area of *receiving land* afforded Creation will depend on the individual features of the land and the type of ecological community to be created. Revegetation

works, landscape plantings, bush regeneration, threat prevention and minimisation activities (e.g. exclusion fencing) all contribute to the Creation of *koala habitat*. All classes of koala habitat can be afforded Creation under this policy (Table 5).

Given that Creation works may require significant investment, it is important to ensure that the benefits of Creation works are durable over time. The loss of *koala habitat* and/or adverse impacts for which Creation works are compensating are intended to be long-lasting. Furthermore, there will be a significant lag between the time that the Creation works is undertaken and the time that the ecological benefit is obtained. There are two acceptable protection mechanisms to increase the level of conservation security for this category of habitat compensation works (Table 6):

1. Voluntary planning agreement (EP&A Act);
2. Incentive property vegetation plan (NV Act).

Other than Creation works within areas of *receiving land* which are afforded a high level of conservation security by virtue of their location (e.g. landscape plantings located within a Council road reserve), an area of *receiving land* subject to Creation must also be afforded additional protection by a land use protection mechanism. There are two acceptable land use protection mechanisms for this category of habitat compensation works (Table 6):

1. Positive covenants (Section 88E, Conveyancing Act 1919) or equivalent instrument; and/or
2. Rezoning within the *Lismore LEP* to zone E2 Environmental Conservation, E3 Environmental Management, RE1 Public Recreation or SP2 Infrastructure (EP&A Act).

For *receiving land* afforded Creation all enhancement works must be outlined in a VMP/PoM approved by Council and fully funded by the proponent with a minimum five-year management period following the completion of the initial phase of habitat protection works (Table 6). Compliance with the VMP/PoM must be enforceable and secured by legal agreement (Table 6).

Long term funding for management of enhancement works beyond the minimum five-year management period detailed above, may also be secured by application of an environmental levy, subject to the approval of the NSW Department of Local Government (Table 6).

Compensation loss:gain multiplier

To ensure that the loss of *koala habitat* caused by development activity does not lead to a net loss of habitat, the area to be secured by compensation works needs to be larger than the area of habitat that is impacted by development activity. The compensation loss:gain multiplier presented in this habitat compensation policy takes into account all of the following ecological factors:

- the relative conservation value of the area of *koala habitat* adversely impacted by development activity and consequently the net gain required for environmental improvement;
- risk of all or some of the compensation works failing;
- time lag before the positive ecological benefits of compensation works are realised;
- area of clearing and the negative ecological impacts of the clearing;
- area of the compensation works and the positive ecological impact of the compensation works.

The compensation multiplier can only be represented as a relative value as it is not possible to quantify the true value of *koala habitat* impacted by development activity. The relative values identified above and detailed in Table 7 were chosen to ensure that this policy is workable and does not place an unreasonable or prohibitive cost burden on proponents. At the same time, the values need to be high enough to accommodate the inherent risks associated with compensation works.

Conservation value

The conservation value represents the relative ecological value of the area of *koala habitat* adversely impacted by development activity. A relative value has been assigned to each of the five classes of *koala habitat* identified in this policy ranging from 1 (low) to 5 (high) (Table 7).

Table 7. Compensation Multiplier values based on the formula:
 Compensation Multiplier = Conservation Value x Time/Risk Factor

		Compensation Multiplier			Conservation Value
		Protection	Enhancement	Creation	
Class of koala habitat impacted by development activity	Endangered ecological communities verified as preferred or core koala habitat	5	10	15	5
	Core koala habitat	4	8	12	4
	Primary koala habitat	4	8	12	4
	Secondary koala habitat	3	6	9	3
	Koala movement corridor	2	4	6	2
Time/Risk Factor		1 (low)	2 (medium)	3 (high)	

Time/risk factor

The time/risk factor recognises that for any area of *receiving land* there is an inherent risk in the habitat compensation works failing and/or a time lag before the positive ecological benefits of the activity are realised. Each of the three classes of habitat compensation works (i.e. Protection, Enhancement and Creation) was ranked as having either low, medium or high time lag and/or risk of failure (i.e. time/risk factor). The three types of compensation works were then assigned a numerical value to represent time lag and/or risk of failure (Table 7).

How do I calculate the area required for habitat compensation works?

The compensation multiplier used for each class of koala habitat and each type of compensation works identified in this policy is detailed in (Table 7) and is calculated by the following formula:

$$\text{Compensation Multiplier} = \text{Conservation Value} \times \text{Time/Risk Factor}$$

Table 8. Worked example of the Area of Habitat Compensation Works required based on an area of 0.46 ha of primary koala habitat proposed to be impacted by development activity. The area of Habitat Compensation Works required is based on the formula:

$$\text{Area of Habitat Compensation Works} = \text{Area Impacted} \times \text{Conservation Multiplier}$$

Class of Habitat Compensation Works chosen by proponent	Area of Habitat Compensation Works (ha)	Area Impacted (ha)	Compensation Multiplier (from Table 7)
Protection	1.88	0.46	4
Enhancement	3.76	0.46	8
Creation	5.64	0.46	12

The calculation of the area of habitat that is to undergo compensation works is based on the area of habitat that is impacted by development activity and the compensation multiplier, and is calculated by the following formula:

$$\text{Area of Habitat Compensation Works} = \text{Area Impacted} \times \text{Compensation Multiplier}$$

Worked example

Within a 50 hectare proposed subdivision, there are 20 hectares of degraded *primary koala habitat* located on undevelopable *land* on the *subject site*. After all efforts to avoid, minimise and mitigate the adverse impacts of the proposed subdivision on *koala habitat* have been exhausted, clearing of 0.46 hectares of *primary koala habitat* is proposed to upgrade an existing road servicing the proposed development.

Should the proponent choose Protection as the measure to compensate for clearing of 0.46 hectares of primary koala habitat, the area of *receiving land* required is calculated as follows (Table 8):

$$\begin{aligned} \text{Area of Habitat Compensation Works} &= \text{Area impacted} \times \text{Compensation Multiplier} \\ &= 0.46 \text{ ha} \times 4 \\ &= 1.88 \text{ hectares} \end{aligned}$$

Similarly, should the proponent choose Enhancement or Creation as the measure to compensate for proposed clearing then the area of receiving land required is 3.76 hectares and 5.64 hectares respectively (Table 8).