Department of Planning, Housing and Infrastructure

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Design Guidelines for Koala-exclusion Fencing

For new developments in the Greater Macarthur Growth Area and Wilton Growth Area

DRAFT FOR CONSULTATION

March 2025

Acknowledgement of Country

Department of Planning, Housing and Infrastructure would like to acknowledge the Dharawal, Dharug, and Gundungurra peoples, who care for the Cumberland Plain. Others, such as Darkinjung, Wiradjuri, Guringgai, and Yuin maintain trade or other obligatory care relationships with the area. We extend that respect to the Deerubbin, Gandangara, and Tharawal Local Aboriginal Land Councils, who maintain responsibilities towards Country, community, and culture.

We acknowledge the many thousands of First Nations peoples in Western Sydney who call the Cumberland Plain home. While their lineage may also connect them to other Countries, we acknowledge their deep connection to this Country. We extend that respect to all First Nations peoples who have a relationship with the Cumberland Plain.

The development of the Cumberland Plain Conservation Plan acknowledges the continuous First Nations connection to the land that makes up NSW.

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1 Overview

In 2020, an inquiry of the NSW Legislative Council found that unless the Government takes immediate action, the koala would become extinct in NSW by 2050. The NSW koala population has since been listed as endangered at both a state and federal level. Koalas in NSW are increasingly at risk from habitat loss and fragmentation and as climate change alters their environment. Local threats, such as vehicle strike, dog attacks, and disease, also put their survival in danger.

In response, the NSW Government developed the <u>NSW Koala Strategy</u>, which proposes actions to secure habitat, support local conservation, reduce threats, and improve knowledge. In south-west Sydney, the NSW Government is investing more than \$80 million to:

- fast track a commitment under the <u>Cumberland Plain Conservation Plan</u> (CPCP) to create a koala national park along the Georges River
- provide koala-friendly crossings
- establish a koala care centre and support wildlife rehabilitators in the Macarthur region.

This is in addition to investment provided under the NSW Koala Strategy, through which the NSW Government continues to fund projects that prevent koalas from being hit by vehicles and support habitat restoration in the area.

The CPCP also includes key koala conservation measures to minimise specific threats to the south-west Sydney koala population. These are in line with the broader work of the NSW Koala Strategy and advice from the <u>Office of the NSW Chief Scientist and Engineer</u>. The CPCP protects important koala habitat and corridors. However, for these areas to truly support koalas, there need to be ways to keep them safe from urban threats, especially road traffic and dogs.

Exclusion fencing to separate koalas from urban threats is a CPCP priority. Where this is difficult – for example, on steep terrain – other options, such as additional buffer zones and koala-sensitive design, are available.

We have prepared the Design Guidelines for Koala-exclusion Fencing to guide landholders, developers, and consent authorities on best practices for the design and location of koala-exclusion fencing. We've based these guidelines on advice from the Office of the NSW Chief Scientist and Engineer on protecting koala populations from risks from urban development. They aim to:

• minimise the risk of urban threats, including vehicles, swimming pools, and domestic dogs, to the south-west Sydney koala population

- clearly outline the requirements for koala-exclusion fencing and alternative options where koala-exclusion fencing is not practical, for new developments in the Greater Macarthur Growth Area and Wilton Growth Area
- ensure a consistent approach to koala-exclusion fencing across different types of land tenure
- ensure koala-exclusion fencing or alternative options are consistent with <u>the advice</u> <u>from the Office of the NSW Chief Scientist and Engineer</u>.

1.1 When to use the guidelines

These guidelines are given effect by the <u>CPCP Mitigation Measures Guideline</u>. It outlines the requirements that developments or activities on certain land must meet to ensure consistency with the CPCP biodiversity approvals.

Development applications under Part 4 of the *Environmental Planning and Assessment Act* 1979 must follow these guidelines if the projects are in the applicable areas. If they don't meet the requirements, applicants must explain why and show how they will still protect koalas and their habitat.

These guidelines apply only to certified urban-capable land in the Greater Macarthur Growth Area and Wilton Growth Area that borders protected koala habitat. This land is mapped under Chapter 13 of the State Environmental Planning Policy (Biodiversity and Conservation) 2021 and the CPCP biodiversity certification order. More information on these maps and a link to the spatial map viewer are available on the NSW Government <u>Planning website</u>. Protected koala habitat is identified in the <u>CPCP spatial map</u> viewer as the 'Protected Koala Habitat and Restoration' map layer.

2 Overarching principles

Apply the following principles to help ensure koala-exclusion fencing effectively protects koalas and supports broader environmental and community goals.

Overarching principles for koala-exclusion fencing

- Ensures habitat connectivity: Fencing helps to keep koala habitat connected, allowing koalas to move safely throughout the corridor. It avoids creating dead ends that could isolate the koalas.
- **Contributes to habitat function**: Fencing helps to reduce edge effects and koala stressors at the urban-habitat interface, including illegal dumping and domestic animal predation.
- **Reduces risk of koala deaths**: Fencing helps keep koalas away from roads and residential areas, reducing their risk of injury or death.
- **Designed around koala behaviour and biology**: Fencing design matches the natural behaviour of koalas, including their climbing skills, agility, and movement patterns, to effectively keep them out of dangerous areas. (See section 2.1 for more information.)
- **Designed for longevity**: Fencing is built with strong, durable materials to last over time and withstand site conditions. This reduces maintenance and keeps the fencing effective.
- Fit for purpose and site-specific: Fencing solutions are tailored to each site, considering local conditions, risks, and constraints. They are fit for purpose and assess potential environmental impacts, including effects on other wildlife and ecosystems. Wherever possible, they minimise harm to the environment.
- **Consultation and compliance**: Ideally, consult relevant stakeholders, such as easement rights holders and local authorities, early in the process. This helps ensure compliance with regulations and addresses any specific requirements.
- **Consistency**: Fencing follows consistent standards and uses standard methods and materials to ensure effectiveness and lower maintenance costs.

2.1 Koala behaviour and biology to guide fencing design

When designing and installing options to protect koalas, consider that they:

- spend most of their time in trees. Although they lack energy, they are skilled climbers and can scale unexpected structures, including smooth metal posts and standard metal pool fences. When moving between trees or habitats, they often travel on the ground and prefer to push through or crawl under obstacles rather than climb over them.
- are most active from dusk to dawn, but they may also move during the day if they are disturbed, need shelter, or are dispersing during breeding season (September to February)
- typically change trees at night, preferring to walk across the ground rather than move through the canopies of nearby trees
- can travel anywhere from a few metres to several hundred metres per night, and during dispersal, they may cover many kilometres. Young koalas, before breeding, often disperse from their birthplace to a new habitat, sometimes travelling more than 10 kilometres before settling in a new home range. Their instinct to disperse is strong, and they will find ways to move through, over, or under obstacles in their path.
- move slowly on the ground and pay little attention to their surroundings; however, if they feel threatened, they can reach speeds of up to 30 kilometres per hour
- have home ranges that can overlap with others. The size of their range varies widely, from less than one hectare to more than 100 hectares, depending on the forest structure and location.

3 Fencing design requirements

This section outlines the requirements for planning, designing, and installing koala-exclusion fencing and related infrastructure, such as gates, grids, and escape structures. To clarify key features and concepts, we have included images.

In some cases, fencing is not possible or practical, such as in steep terrain, areas with cultural or heritage significance, locations with safety concerns, or places where fencing would affect the visual landscape. Section 4 of this guideline provides requirements for alternative options.

3.1 Site analysis and planning

The planning and design phase of koala-exclusion fencing should include a thorough site and risk assessment early in the process to determine the best fencing solution, alignment, and other necessary infrastructure. This assessment should include desktop analysis and site visits (ground truthing). These can uncover information on, for example:

- landscape features including topography
- flora and fauna
- barriers and opportunities to maintain or improve habitat connectivity
- waterways
- declared cultural and heritage sites
- potential risks, such as bushfires
- access requirements
- future public and recreational uses
- existing fencing and maintenance needs.

This process should involve consultation with relevant experts, including koala specialists, to identify the most appropriate solution for koalas, the site, and the broader landscape.

3.2 Fencing placement

The koala-exclusion fence, along with the required vegetation clearance buffers, development areas, and asset protection zones, must be located entirely within certified urban-capable land. This placement helps protect and preserve the koala corridor. Figure 1 shows how koalaexclusion fencing fits within the landscape. Fencing cannot be located on avoided land, which refers to areas set aside for conservation, cultural heritage, or environmental protection, where development and infrastructure are restricted.



Figure 1. Configuration of koala-exclusion fencing for development and koala habitat

In some cases, fencing may need to extend onto or connect with excluded land to maintain a continuous barrier. Excluded land is land excluded from the CPCP, where NSW strategic biodiversity certification and federal strategic assessment approval have not been sought. If this land has an easement or a different owner, we recommend consulting with the easement rights holder or landowner early in the planning and design process. They may have specific requirements for fence design, alignment, or access. They may also need to approve the fencing or be willing to fund their portion of it.

3.3 Timing

Koala-exclusion fencing should be erected before any development activities, including earthworks, begin. If possible, coordinate the fencing installation with the construction of koala crossings (if required) to minimise the time that work disrupts movement corridors.

If permanent fencing installation is delayed, koala-proof temporary fencing should be erected to ensure the safety of koalas. See section 3.5 for details on what qualifies as koala-proof temporary fencing.

3.4 Vegetation clearance buffer

To keep the fence effective and long-lasting, projects must maintain a 3-metre vegetation clearance buffer on both the development side and the koala habitat side (see Figure 2). This buffer must stay entirely within certified urban-capable land.

In some cases, such as when protecting important vegetation or retaining mature habitat trees, the buffer can be smaller but must be at least 1-metre wide. Regular trimming is necessary to prevent branches from damaging the fence, and projects should plan accordingly for maintenance access.

Projects must exclude trees and other vegetation on the habitat side of the fence, as well as any vines or other plants growing on the fence that could help koalas climb over to the development side. However, projects can retain significant mature habitat trees, including stags, by fitting them with metal sheeting at least 60 cm high. The bottom of the sheeting must start 90 cm above the ground to prevent koalas from climbing. The sheeting should be expanded as the tree grows.

Make sure projects manage trees and other vegetation on the development side of the fence to prevent them from falling on or growing over the fence.



Figure 2. A vegetation clearance buffer is essential for the koala fence to be effective.

Fencing alignment

When determining proper fencing alignment, fences should:

- run as straight as possible to allow easy inspection and maintenance and prevent bottlenecks that could trap animals fleeing from predators or bushfires
- be continuous, with no gaps or breaks larger than 5 cm
- avoid sharp corners with internal angles less than 135 degrees whenever possible, except where returns are required
- have returns where the fence ends, with multiple acute angles (less than 60 degrees) to guide animals back into habitat areas, particularly when roads are nearby (see Figure 3)
- connect securely to adjoining property fences to prevent gaps
- attach properly to structures such as bridges, culverts, or other barriers such as rock cuttings to block koala access to the development side of the fence. Place metal

sheeting vertically where fencing meets the structures to stop koalas from climbing over (see Figure 4).



Figure 3. Examples of suitable returns to guide koalas back into habitat, where the fencing has ended.



Figure 4. The fencing connects securely to the bridge, directing animals to the underpass beneath it. Vertical sheeting at the connection point prevents koalas from climbing up to the railing and onto the road.

3.5 Fencing design

Although we have based this guidance on the best available information at the time of publication, fencing projects should use the most-up-to date design specifications when developing site-specific plans.

In some cases, changes or innovative solutions may provide equal or better conservation outcomes. Any changes or exceptions to these guidelines must still meet the koala-exclusion principles that section 2 outlines.

Fencing design requirements

All fencing must:

- be at least 1.5 m high
- prevent koalas from climbing over from the habitat side to the development side (see section 3.5.1 on current koala-exclusion fencing concepts). Other fencing types, such as Colorbond, may be suitable if they meet all design requirements
- have no gaps, with no holes under the fence and no openings wider than 5 cm within the fencing material or along its alignment
- be flush with the ground
- be one of the following:
 - attached to concrete footings along the entire fence line, with 4 mm tensioned helicoil wire running 5 cm above the ground to prevent koalas from pushing underneath (see Figure 5)
 - equipped with a chain-link 'skirt' that extends at least 30 cm from the base of the fence, either installed below ground level or pinned to the ground using 2 x 30 cm fastening pins (or longer in soft soils) at 1m intervals (see Figure 6)
- be safe for other animals, with no barbs or sharp protrusions on top
- have chain-link mesh (if used) that:
 - meets Australian Standard AS:1725 Chain-link fabric security fences and gates
 - is made of steel core and coated with zinc, zinc/aluminium, or galvanized material
 - has a maximum diamond size of 5 cm
- have fencing supports and posts that:
 - meet relevant Australian Standards, including AS:1163 Cold-formed structural steel hollow sections, AS 1214 Hot-dip galvanized coatings on threaded fasteners, and AS 4680 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles

- are placed at suitable intervals to ensure the fence remains structurally sound and meets safety and engineering specifications
- sit on the development side of the fence whenever possible. If they sit on the habitat side, projects must use additional measures, such as metal shields, to prevent koalas from climbing the posts.



Figure 5. Cement footing prevents erosion and animals from digging under the fencing. This works best on flat ground.



Figure 6. The mesh 'skirt' at the bottom of the fence is pinned into the ground to stop koalas from crawling underneath. This design works well on uneven ground.

Design requirements for koala-proof temporary fencing

To ensure temporary fencing is koala-proof, it must meet the design requirements above and include solid bars (often called 'dog bars') secured along the bottom. These bars ensure the gap between the fence and the ground stays under 5 cm. Whenever possible, these should be welded to the fence instead of using clamps (see Figure 7). Clamps can shift over time, creating gaps larger than 5 cm, that koalas could squeeze through (see Figure 8).



Figure 7. Effective temporary fencing needs slippery sheeting and 'dog bars' to make it koala-proof. In this example, the dog bars are securely welded to the fence to prevent movement and stop gaps from forming that koalas could squeeze through.



Figure 8. This example uses clamps to attach the dog bars to the temporary fencing. Clamps can shift, creating gaps big enough for koalas to get through. Welding dog bars to the fence is a stronger and more effective way to make the fencing koala-proof.

3.5.1 Current koala-exclusion fence concepts

There are 2 main types of koala-exclusion fencing: slippery top and floppy top. The best option depends on site conditions and maintenance needs. Any modifications must still meet the koala-exclusion principles in section 2.

Whichever fencing type a project uses, it should meet the design requirements in section 3.5 and the specific guidelines for each fence type below.

Slippery-top fencing

Slippery-top fencing is currently the most common type of koala-exclusion fencing, especially along road corridors. It stops koalas from climbing over but still allows some animals that live on the ground to pass through the chain-link mesh and lets surface water flow. This design generally requires less cleared area and maintenance than floppy-top fencing.

Slippery-top fencing consists of chain-link mesh with smooth sheeting that is at least 60 cm high, attached to the habitat side of the fence. The sheeting starts 90 cm above the ground and can be made from galvanized steel, powder-coated steel, high-density polyethylene, clear Perspex, or a similar material. The sheeting must securely fasten to the fence and be flush against each other or slightly overlapping. This ensures there are no gaps for animals to grip the chain-link mesh or nearby fence posts. It should also meet wind loading ratings and specifications, as well as other construction standards to make sure it lasts (see Figure 9, Figure 10 and Figure 11).



Figure 9. Slippery-top fencing uses 60 cm wide metal sheeting on the habitat side to stop koalas from climbing over. Here a metal bar along the top adds strength and secures the sheeting in place.



Figure 10. Metal sheeting attached to the top of a 1.5m slippery-top fence prevents koalas from entering the road corridor. An escape pole next to the fence gives koalas a way to climb up and safely return to their habitat by sliding down or jumping over.



Figure 11. Metal sheeting attached below the top of a 2.1m fence helps koalas use the escape pole to climb over and reach the other side with a shorter drop to the ground. Here, animal fencing includes a solid skirt to prevent small ground-dwelling animals from passing through the chain wire onto the road.

Floppy-top fencing

Floppy-top fencing was once common in New South Wales, but its use has declined due to higher costs, a larger footprint, and increased maintenance. It has a flexible, floppy extension at least 60 cm wide at the top of the fence. The extension angles outward on the habitat side, making it difficult for koalas to climb (see Figure 12 and Figure 13).

Floppy-top fencing is generally not as strong as slippery-top fencing and more prone to damage. As a result, it requires more frequent maintenance to keep it effective at keeping koalas out.



Figure 12. Floppy-top fencing works by making the top section too unstable to support the weight of a koala. The flexible design prevents koalas from gripping the fence firmly enough to climb over.



Figure 13. In this example, black floppy-top fencing at the entrance to a visitor attraction creates a more visually appealing design compared with the often stark look of slippery-top fencing. Installing fencing without panels also helps prevent graffiti in urban areas.

3.6 Additional infrastructure

Fencing alignments may need additional infrastructure to allow for maintenance access, essential infrastructure, or emergency management. They may also provide access to private land, national parks, and fire trails, while ensuring the free flow of traffic and safe pedestrian access. In some cases, fencing may require features that help koalas return to the habitat side if they end up on the development side.

3.6.1 Vehicle and pedestrian access gates

Gates may be necessary along fencing alignments, but these access points must be welldesigned and well-maintained to keep the fence effective. Limit access points to only those that are essential. Authorised users must immediately close and lock access points (where applicable) after use. Gates must remain locked at all times, except during emergencies, such as bushfires or flood, when they may need to stay open for safety.

Requirements for vehicle and pedestrian access gates

Vehicle and pedestrian access gates must:

- follow fence design requirements, including the slippery-top fence requirements in section 3.5.1. If using floppy-top fencing, switch to slippery top fencing in the area next to the gate.
- include vertical slippery sheeting on the side of the gate and main fence to prevent koalas from climbing the gate or fence posts.
- maintain a maximum gap of 5 cm between the gate and the fence, as well as between the slippery-top sheeting on both.
- use either a double-gate system (also known as airlock gates) or spring-loaded gates for pedestrian access to reduce the chances of people leaving them open (see Figure 14).
- include a concrete base slab or footing under gates to prevent animals from digging underneath and to keep gates as flush with the ground as possible (see Figure 15). If concreting is impractical due to uneven ground, attach sturdy but flexible rubber skirting to the base of the gate instead (see Figure 16).
- be placed at designated vehicle and pedestrian access points, considering maintenance needs and recreational use. Consult the Rural Fire Service and other interested parties, such as easement rights holders and local authorities, to find out specific requirements for gate placement, frequency, and access.
- if locked, use a multiple padlock system, allowing access for relevant agencies. Alternatively, consider a remote-controlled or automated system.

• include signage at entry points on both the development and habitat sides of fence (see box, 'Example wording for koala-exclusion fencing signs').



Figure 14. Pedestrian airlock or double-gate systems with spring-loaded latches ensure gates close. Signs at the entrance and exit remind users to follow the rules and keep gates secure.



Figure 15. Vehicle access gates with a concrete base stop animals from digging underneath and help keep the gate flush with the ground.



Figure 16. Plastic sheeting is secured to the base of the gate and surrounding area to eliminate gaps and prevent animals from leaving the reserve.

Example wording for koala-exclusion fencing signs

Protected koala habitat area

This fencing keeps koalas out of urban areas where they face dangers such as cars and dogs.

Gates must stay closed at all times, except in emergencies.

Dogs or other domestic animals are prohibited within this area (alternatively: Dogs must stay on a lead at all times).

Please report any damage or breaches to the fencing or gates to XX.

Please report any sick or injured koalas to XX.

3.6.2 Koala escape structures

Escape structures help koalas return to the habitat side of the fence if they get past it. Projects must include these structures every 50m along the fence and in high-risk areas, such as at the end of the fence, where koalas are more likely to enter urban zones.

Escape poles are the most commonly used structure. However, escape hatches have been developed based on koala behaviour, as they often try to push along the bottom of a fence to find a way out, rather than climb the fence. These structures come as complete units.

Escape poles

The following are requirements for escape poles.

- Posts must consist of treated pine or salvaged timber, with a minimum diameter of 12.5 cm. They must be sturdy enough to support a koala.
- There must be a vertical post installed on the development side of the fence within 30 cm of the fence and extending at least 60 cm above its height.
- There must be a vertical post installed on the habitat side of the fence, opposite the post on the development side, within 30 cm of the fence and extending at least 30 cm above its height.
- The post on the habitat side must be fitted with a smooth metal collar extending from the ground to at least 1.5m high or positioned as a 'floating' collar from 1.2m to 1.5m off the ground.
- Metal sheeting, such as slippery-top fencing uses, must be installed on the habitat side of the fence, running vertically from top to bottom, with at least 60 cm extending on either side of the pole.
- A horizontal post must connect both vertical posts, aligned with the height of the post on the habitat side (see Figure 17, Figure 18 and Figure 19).



Figure 17. The position of the escape pole allows koalas to easily climb up and over the fence before sliding down the metal sheeting into their habitat. The metal sheeting sits slightly below the top of the chain wire to help guide their movement.



Figure 18. In this view from the habitat next to the fence, this escape pole with a horizontal cross-piece allows koalas to climb up, move across, and slide down into their habitat. Galvanized sheeting encloses the pole, and the adjoining fence is retrofitted with metal sheeting from the ground to the top to ensure the pole functions as a one-way structure. On the urban side, the pole extends outward, giving koalas a way to climb up and reach the horizontal beam before crossing back to their habitat.



Figure 19. A hanging escape pole allows koalas to leave the road corridor and drop down into their habitat.

Escape hatches

The following are requirements for the escape hatches.

- The hatch must securely attach to the base of the koala-proof fencing, ensuring no gaps larger than 5 cm.
- There must be a concrete base slab or footing to stop animals from digging underneath and to keep it flush with the ground (see Figure 20 and Figure 21).
- The area around the hatch must be kept free of vegetation.



Figure 20. A push-through one-way escape hatch can help quickly move koalas away from the road corridor (Photo credit: Endeavour Veterinary Ecology)



Figure 21. This push-through one-way escape hatch sits within the fencing alignment near an escape pole, providing multiple options for koalas to quickly leave the road corridor (Photo credit: Endeavour Veterinary Ecology).

3.6.3 Koala grids

Koala grids prevent koalas from crossing roads and getting hit by vehicles (see Figure 22). These grids are similar to traditional cattle grids but specifically aim to stop koalas from walking across roads while still allowing vehicles to pass. They sit at vehicle access points along the fence line, in places that require no gates or gates are impractical.

Koala grids must:

• sit on the development side of the fence, no higher than ground level

- use smooth, unclimbable sheeting (like that used for slippery-top fencing) that covers the fence at the sides of grid and extends at least 1.5m high.
- have a vertical piece of 5 mm metal welded to the support beam between the rails, staying below the rail height.
- use cylindrical rails
- have proper drainage
- have open sides to ensure that animals do not become trapped; built-in escape structures provide a way out for small animals that may enter the grid.



Figure 22. Designed like a cattle grid, a koala grid makes it difficult for koalas to cross the road by creating an unstable surface with rounded bars raised above the supports. Koala grids help keep koalas off side roads and prevent them from entering major road corridors. However, safety concerns for drivers can limit their use. (Photo credit: Brendan Taylor)

3.6.4 Preventing koala access through drainage points

To stop koalas from bypassing the fence through drainage points larger than 5 cm, projects should install spring flaps on the downstream side, escape hatches, or metal grids.

These measures allow water to flow freely and require regular maintenance to stay clear of debris and other blockages.

4 Alternative measures

In some situations, installing koala-exclusion fencing may be impractical, or meeting the design requirements may be impossible. These situations may include:

- challenging landscape or access issues (including topography) that make fence installation and maintenance difficult or unsafe. In some cases, natural barriers can protect koalas from urban threats. Examples include rock faces steeper than 1.5:1 and higher than 5m, which koalas are unlikely to climb, or bodies of water wider than 15m without rocks or stepping stones
- declared cultural or heritage sites
- areas where fencing could harm koalas, such as locations where koalas and other wildlife may be unable to escape from threats such as bushfires
- safety concerns, especially in areas where fencing could reduce visibility near roads or intersections
- visual impact considerations, where fencing may negatively affect the surrounds.

When it is impractical to install koala-exclusion fencing, alternatives are available.

4.1 Applying alternative measures

Alternative measures usually involve adding a 30m buffer within the certified urban-capable land, combined with koala-sensitive urban design. Figure 23 illustrates how these measures, including the additional 30m buffer, fit within the landscape alongside development and koala habitat. Any changes to these measures must still meet the koala-exclusion principles in section 2.



Figure 23. Alternative measures, including the additional 30m buffer, create separation between development and koala habitat.

4.2 Site analysis and planning

Project planners must conduct a thorough site and risk assessment early in the planning and design phase to determine the best solution and layout for alternative measures.

Development in the growth areas will offer little to attract koalas into residential areas. However, during breeding season, koalas often cross cleared non-habitat areas and can travel more than a kilometre in one night searching for new habitat. So, in areas without fencing, project planners must think about how koalas might move through urban areas. To ensure the best approach for both koalas and the broader landscape, project planners should consult relevant experts, including koala specialists.

4.3 Additional buffer

In areas where koala-exclusion fencing is impractical, project planners must include a minimum 30m buffer within the certified urban-capable land next to protected koala habitat. This additional buffer helps protect koalas where urban development meets their habitat.

Development and asset protection zones cannot sit within this buffer. Also, dogs must remain on a lead at all times to prevent potential threats or disturbances to koalas.

4.3.1 Avoid tree species that koalas use

In the additional buffer, if there is no koala-exclusion fencing, no tree species that koalas use – listed in Appendix A – should be planted. This makes the additional buffer area less attractive to koalas and reduces the risk of them crossing into urban areas. Other native vegetation is allowed and encouraged within the buffer. This helps minimise human impacts, such as light and noise, and provides habitat for other animals.

4.3.2 Using the buffer area

The 30m buffer is part of the protected koala habitat and generally sits on avoided land. When used, the additional 30m buffer typically sits on certified urban-capable land. Koala-exclusion fencing and alternative measures do not change the CPCP land category.

The buffers help limit interactions between koalas and urban areas, reducing human impacts, such as light and noise. Reducing these stressors benefits the health of koalas, improves survival rates, and supports breeding. Koalas can still use the buffer areas as part of their movement corridors but can retreat further into habitat areas, where edge effects are less apparent.

Buffers should contain no roads, playgrounds, or picnic areas, but they may support lowintensity community or recreational activities. The Office of the NSW Chief Scientist and Engineer emphasises that community involvement is essential for maintaining the effectiveness of these areas. Residents play a key role in checking fence integrity, reporting injured koalas, keeping dogs enclosed, maintaining bush regeneration, and helping with wildlife counting and monitoring. When koala habitat buffers also enhance residential spaces and provide benefits to the community, they are more likely to gain community support and encourage a shared sense of responsibility for their upkeep.

Any community use of the buffer areas should prioritise protecting koalas and their habitat.

4.4 Koala-sensitive urban design

The <u>CPCP Mitigation Measures Guideline</u> sets requirements for strategic planning and development proposals to reduce the impact of development on koala habitat and threatened species. These guidelines ensure projects align with CPCP biodiversity approvals and include koala-sensitive urban design measures related to precinct layout, road safety, and dog containment.

As the CPCP Mitigation Measures Guideline applies to the same development applications as this guideline, we have not repeated koala-sensitive urban design measures here to avoid duplication. For more details, refer to Part 2 of the CPCP Mitigation Measures Guideline.

5 Maintenance

5.1 Quality control

Quality control measures are essential to ensure the correct installation of koala-exclusion fencing. Proper installation helps maintain the effectiveness of the fence and reduces the need for maintenance.

Whenever possible, a suitably qualified engineer, asset manager, or other expert should certify the fencing. Any defects should be fixed promptly to meet or exceed standards.

5.2 Inspections and maintenance

Koala-exclusion fencing must have permanent maintenance to ensure its effectiveness (see Figure 24 and Figure 25).

The land manager should develop a maintenance plan that includes regular inspections (ideally at least every 3 months), maintenance schedules, and prompt repairs. Maintenance should address:

- replacing damaged sections caused by vandalism, storms, floods, fire, fallen trees, or other impacts, following the specifications
- clearing vegetation on both sides of the fence by removing regrowth, broken branches, climbing plants, or any obstructions that could help koalas climb over
- checking for gaps under the fence and ensuring chain-link mesh is securely pinned to the ground to prevent animals from pushing or digging through. Erosion and washouts are common causes of these gaps
- ensuring the slippery-top sheeting stays securely fastened to the fence to maintain its effectiveness
- assessing overall fence performance and identifying potential improvement, such as adding pedestrian gates in areas where repeated vandalism occurs to provide access to bushland.

Any damage that compromises the integrity of the fence should be repaired as soon as possible, ideally within 7 days.



Figure 24. Graffiti on slippery panels is common and needs regular removal.



Figure 25. Unauthorised access paths into the habitat from people cutting holes in the chain wire weaken the fence and require urgent repair.

6 Next steps

These guidelines outline the design of effective koala-exclusion fencing to prevent koala deaths and reduce urban threats to koala populations under the CPCP. We have based them on scientific advice from the Office of the NSW Chief Scientist and Engineer, along with input from experts and key stakeholders.

To ensure that koala-exclusion fencing and alternative measures work effectively, we are now seeking feedback from the community, industry, and experts. This input will help refine the guidelines to better protect koalas while minimising negative impacts on the environment, urban areas, and local communities.

Have your say

The Department welcomes feedback on these draft guidelines. It will help shape the final version.

To share your feedback, please complete the online form on the <u>NSW Planning Portal</u>, which includes a set of guiding questions. These include:

- Do the fencing design requirements make sense and seem appropriate?
- Should the guidelines include any additional fencing design considerations?
- Are there other proven or potential ways to protect koalas from urban threats such as vehicles, dog attacks, and drowning in swimming pools? What challenges or impacts might come with using these measures?

These questions are just a starting point. We welcome feedback on any aspect of koala fencing and related measures to protect koalas from urban threats. Please feel free to share any relevant examples, data, research, ideas, or concerns about fencing that you think we should consider.

7 Developer checklist

Table 1. Checklist for koala-exclusion fencing

Checklist item	Yes
Does the site include certified urban-capable land next to protected koala habitat? (Refer to the 'certified-urban capable land' and 'Protected Koala Habitat and Restoration' layers on the CPCP spatial map on the <u>Planning website</u> .)	
Does the fencing follow the principles in section 2 of the guidelines?	
Has a site and risk assessment taken place to determine the best solution, fence alignment, and any necessary additional infrastructure?	
Does the fencing meet all the requirements in section 3 of the guidelines, including:	
• Do the koala-exclusion fence, vegetation clearance buffers, development areas, and asset protection zones all sit entirely within the certified-urban capable land?	
• Has the timing of fence construction been planned in relation to development activities, and is it appropriate?	
• Is there a 1 to 3m vegetation clearance buffer on both sides of the fence?	
• Is the fence alignment appropriate to the site, and does it meet the requirements in section 3.2?	
• Does the fencing design meet all the requirements in section 3.5?	
• Does the additional infrastructure, including gates, escape structures, grids, and measures to mitigate access through drainage points, sit in the correct locations and meet the requirements in section 3.6?	
• Have you consulted the relevant stakeholders and agencies to help determine the fencing alignment, design, and additional infrastructure needs?	
• Have you determined who is responsible for monitoring and maintenance, including inspection timeframes and maintenance schedules?	

Table 2. Checklist for alternative measures

Checklist item	Yes
Does the site include certified urban-capable land next to protected koala habitat? (Refer to the 'certified-urban capable land' and 'Protected Koala Habitat and Restoration' layers on the CPCP spatial map on the <u>Planning website</u> .)	
Have you conducted a site and risk assessment to determine the best solution and layout of alternative measures?	
Have you provided an additional 30m buffer on certified-urban capable land adjoining protected koala habitat?	
Have you excluded tree species that koalas use from the additional 30m buffer? (See Appendix A – Koala-use tree species.)	
Does the proposal include appropriate koala-sensitive urban design measures? (See Part 2 of the CPCP Mitigation Measures Guideline.)	

8 Definitions

Asset protection zone (APZ): a fuel-reduced area (with minimal vegetation) that creates a buffer between built assets or structures and bushland to help protect people and property from bushfires.

Avoided land: land with high biodiversity values that is protected under the CPCP and not certified for urban development. Development controls apply to these areas to minimise impacts on federal- and state-listed threatened species and ecological communities.

Certified-urban capable land: land identified in the CPCP as suitable for urban development. Development in these areas requires no additional biodiversity assessment under the *Biodiversity Conservation Act 2016* or *Environment Protection and Biodiversity Conservation Act* 1999 as long as it complies with the CPCP and its approvals.

Cumberland Plain Conservation Plan (CPCP) – A conservation plan for Western Sydney that identifies key biodiversity areas within the Cumberland subregion to offset the environmental impact of future urban development while supporting a vibrant, green, and liveable city.

Excluded land: land excluded from the CPCP, where NSW strategic biodiversity certification and federal strategic assessment approval have not been sought.

Greater Macarthur Growth Area: a planned development zone that includes the Glenfield to Macarthur urban renewal precincts and the land release precincts of Gilead, North Appin, and Appin.

Land managers: entities that control and manage land.

Protected koala habitat: a designated layer in the CPCP spatial viewer that identifies koala habitat protected under the CPCP. It includes both protected koala habitat and areas for potential restoration for protected koala habitat. It is identified in the CPCP spatial viewer as the 'Protected Koala Habitat and Restoration' map layer.

Wilton Growth Area: a planned development zone where the Hume Motorway and Picton Road meet in the Wollondilly Shire local government area.

Appendix A – Koala-use tree species

For the purposes of these guidelines, the following are considered tree species that koalas use. This list comes from Schedule 3 of the State Environmental Planning Policy (Biodiversity and Conservation) 2021. The list includes all koala-use tree species identified in NSW, to ensure they are not planted within the additional buffer, where they could attract koalas.

Scientific name	Common name/s
Allocasuarina littoralis	Black She-oak
Allocasuarina torulosa	Forest Oak
Angophora bakeri	Narrow-leaved Apple
Angophora costata	Smooth-barked Apple
Angophora floribunda	Rough-barked Apple
Callitris glaucophylla	White Cypress Pine
Casuarina cristata	Belah
Casuarina glauca	Swamp Oak
Corymbia eximia	Yellow Bloodwood
Corymbia gummifera	Red Bloodwood
Corymbia henryi	Large-leaved Spotted Gum
Corymbia intermedia	Pink Bloodwood
Corymbia maculata	Spotted Gum
Eucalyptus acaciiformis	Wattle-leaved Peppermint
Eucalyptus acmenoides	White Mahogany
Eucalyptus agglomerata	Blue-leaved Stringybark
Eucalyptus albens	White Box
Eucalyptus amplifolia	Cabbage Gum
Eucalyptus bancroftii	Orange Gum
Eucalyptus baueriana	Blue Box

Scientific name	Common name/s
Eucalyptus beyeriana	Beyer's Ironbark
Eucalyptus biturbinata	Grey Gum
Eucalyptus blakelyi	Blakely's Red Gum
Eucalyptus bosistoana	Coast Grey Box
Eucalyptus botryoides	Bangalay
Eucalyptus bridgesiana	Apple Box
Eucalyptus brunnea	Mountain Blue Gum
Eucalyptus caleyi	Drooping Ironbark
Eucalyptus caliginosa	Broad-leaved Stringybark
Eucalyptus camaldulensis	River Red Gum
Eucalyptus camfieldii	Camfield's Stringybark
Eucalyptus campanulata	New England Blackbutt
Eucalyptus canaliculata	Large-fruited Grey Gum
Eucalyptus capitellata	Brown Stringybark
Eucalyptus carnea	Thick-leaved Mahogany
Eucalyptus chloroclada	Dirty Gum
Eucalyptus conica	Fuzzy Box
Eucalyptus consideniana	Yertchuk
Eucalyptus coolabah	Coolibah
Eucalyptus crebra	Narrow-leaved Ironbark
Eucalyptus cypellocarpa	Monkey Gum
Eucalyptus dalrympleana	Mountain Gum
Eucalyptus dealbata	Tumbledown Red Gum
Eucalyptus deanei	Mountain Blue Gum
Eucalyptus dives	Broad-leaved Peppermint
Eucalyptus dwyeri	Dwyer's Red Gum

Scientific name	Common name/s
Eucalyptus elata	River Peppermint
Eucalyptus eugenioides	Thin-leaved Stringybark
Eucalyptus exserta	Peppermint; Queensland Peppermint or Yellow Messmate
Eucalyptus fastigata	Brown Barrel
Eucalyptus fibrosa	Broad-leaved Red Ironbark
Eucalyptus glaucina	Slaty Red Gum
Eucalyptus globoidea	White Stringybark
Eucalyptus goniocalyx	Bundy
Eucalyptus grandis	Flooded Gum
Eucalyptus haemastoma	Broad-leaved Scribbly Gum
Eucalyptus imitans	Illawarra stringybark
Eucalyptus intertexta	Gum Coolibah
Eucalyptus laevopinea	Silver-top Stringybark
Eucalyptus largeana	Craven Grey Box
Eucalyptus largiflorens	Black Box
Eucalyptus longifolia	Woollybutt
Eucalyptus macrorhyncha	Red Stringybark
Eucalyptus maidenii	Maiden's Blue Gum
Eucalyptus mannifera	Brittle Gum
Eucalyptus melanophloia	Silver-leaved Ironbark
Eucalyptus melliodora	Yellow Box
Eucalyptus michaeliana	Brittle Gum
Eucalyptus microcarpa	Western Grey Box
Eucalyptus microcorys	Tallowwood
Eucalyptus moluccana	Grey Box
Eucalyptus muelleriana	Yellow Stringybark

Scientific name	Common name/s
Eucalyptus nicholii	Narrow-leaved Black Peppermint
Eucalyptus nobilis	Forest Ribbon Gum
Eucalyptus nortonii	Large-flowered Bundy
Eucalyptus nova-anglica	New England Peppermint
Eucalyptus obliqua	Messmate
Eucalyptus oblonga	Stringybark
Eucalyptus paniculata	Grey Ironbark
Eucalyptus parramattensis	Parramatta Red Gum
Eucalyptus pauciflora	White Sally, Snow Gum
Eucalyptus pilligaensis	Narrow-leaved Grey Box
Eucalyptus pilularis	Blackbutt
Eucalyptus piperita	Sydney Peppermint
Eucalyptus placita	Grey Ironbark
Eucalyptus planchoniana	Bastard Tallowwood
Eucalyptus polyanthemos	Red Box
Eucalyptus populnea	Bimble Box, Poplar Box
Eucalyptus prava	Orange Gum
Eucalyptus propinqua	Small-fruited Grey Gum
Eucalyptus psammitica	Bastard White Mahogany
Eucalyptus punctata	Grey Gum
Eucalyptus quadrangulata	White-topped Box
Eucalyptus racemosa	Narrow-leaved Scribbly Gum
Eucalyptus radiata	Narrow leaved Peppermint
Eucalyptus resinifera	Red Mahogany
Eucalyptus robusta	Swamp Mahogany
Eucalyptus rossii	Inland Scribbly Gum

Scientific name	Common name/s
Eucalyptus rubida	Candlebark
Eucalyptus rummeryi	Steel Box
Eucalyptus saligna	Sydney Blue Gum
Eucalyptus scias	Large-fruited Red Mahogany
Eucalyptus sclerophylla	Hard-leaved Scribbly Gum
Eucalyptus seeana	Narrow-leaved Red Gum
Eucalyptus siderophloia	Grey Ironbark
Eucalyptus sideroxylon	Mugga Ironbark
Eucalyptus sieberi	Silvertop Ash
Eucalyptus signata	Scribbly Gum
Eucalyptus sparsifolia	Narrow-leaved Stringybark
Eucalyptus squamosa	Scaly Bark
Eucalyptus stellulata	Black Sally
Eucalyptus subvelutina; Angophora subvelutina	Broad-leaved Apple
Eucalyptus tereticornis	Forest Red Gum
Eucalyptus tindaliae	Stringybark or Tindale's (or Tindal's) Stringybark
Eucalyptus tricarpa	Mugga (Red) Ironbark
Eucalyptus umbra	Broad-leaved White Mahogany
Eucalyptus viminalis	Ribbon Gum
Eucalyptus williamsiana	Williams's stringybark
Eucalyptus youmanii	Youman's Stringybark
Geijera parviflora	Wilga
Melaleuca quinquenervia	Broad-leaved Paperbark
Syncarpia glomulifera	Turpentine