Habitat Management Plan

Hickey Street
Iluka
Clarence Valley LGA

For: Stevens Group

REF: CVC 14-695

14th August 2018

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Habitat Management Plan

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PLAN RESOURCES AND AMENDMENTS

IMPORTANT NOTE. The development proposal relies on a number of plans and documents that are live. Therefore, these plans are referred to in this HMP in a generic sense and it is assumed that the detail and environmental controls relied upon at any one time are those within the latest revision of each plan and / or document and available to the contractors on site.

Version	Date	Details
1	6th June 2018	First draft for issue as part of development application package.
1.1	14th August 2018	Incorporated comments from Dept of Env and Energy. Minor typographical edits.

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Cover photograph: Centre of the site with weed infestations proposed for development.

Photo: E. Ashby, 16th October 2014.

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PART A – BACKGROUND

1 INTRODUCTION

Keystone Ecological has been contracted by Stevens Holdings Pty Ltd to prepare a Habitat Management Plan (HMP) for a proposed development at Lot 99 DP 823635, Hickey Street, Iluka in the Clarence Valley Local Government Area (LGA).

The development site occupies 19.41 hectares, with the approximate centre of the site at grid reference 534549 E 6747858 N MGA on the Woodburn 1:100,000 topographic map sheet. The northern boundary adjoins Hickey Street and the local golf course whilst the eastern, western and (partially) southern boundaries adjoin bushland. The south western part of the site adjoins residential dwellings. The site is divided from Bundjalung National Park and Iluka Nature Reserve to the east by Iluka Road.

The locations of the development site are shown in Figure 1 and the layout of the proposal is shown in Figure 2.

The development proposal will result in the construction of a residential community, including 140 residential lots, access streets, pathways, street landscaping, Asset Protection Zones (APZs) and retained bushland. The subdivision is proposed to be conducted over eight development stages, including land dedicated for conservation in a series of bushland parks.

The subdivision is proposed to be developed and titled under a community scheme format. The bushland parks will be incorporated into the community land. This community land will be administered and maintained by the Community Association.

This HMP has been prepared to provide a working document to deliver conservation management objectives for the retained bushland parks, including known and potential habitats for species of conservation significance, and species identified by the Commonwealth as providing Outstanding Universal Values (OUVs) that help define Iluka Nature Reserve's World Heritage status.

This conservation objective will be delivered in the long term by:

- Ecological supervision of works;
- Weed control;
- Bushland rehabilitation;
- Natural regeneration;
- Strategic planting;
- Habitat enrichment; and
- Control of recognised threatening processes.

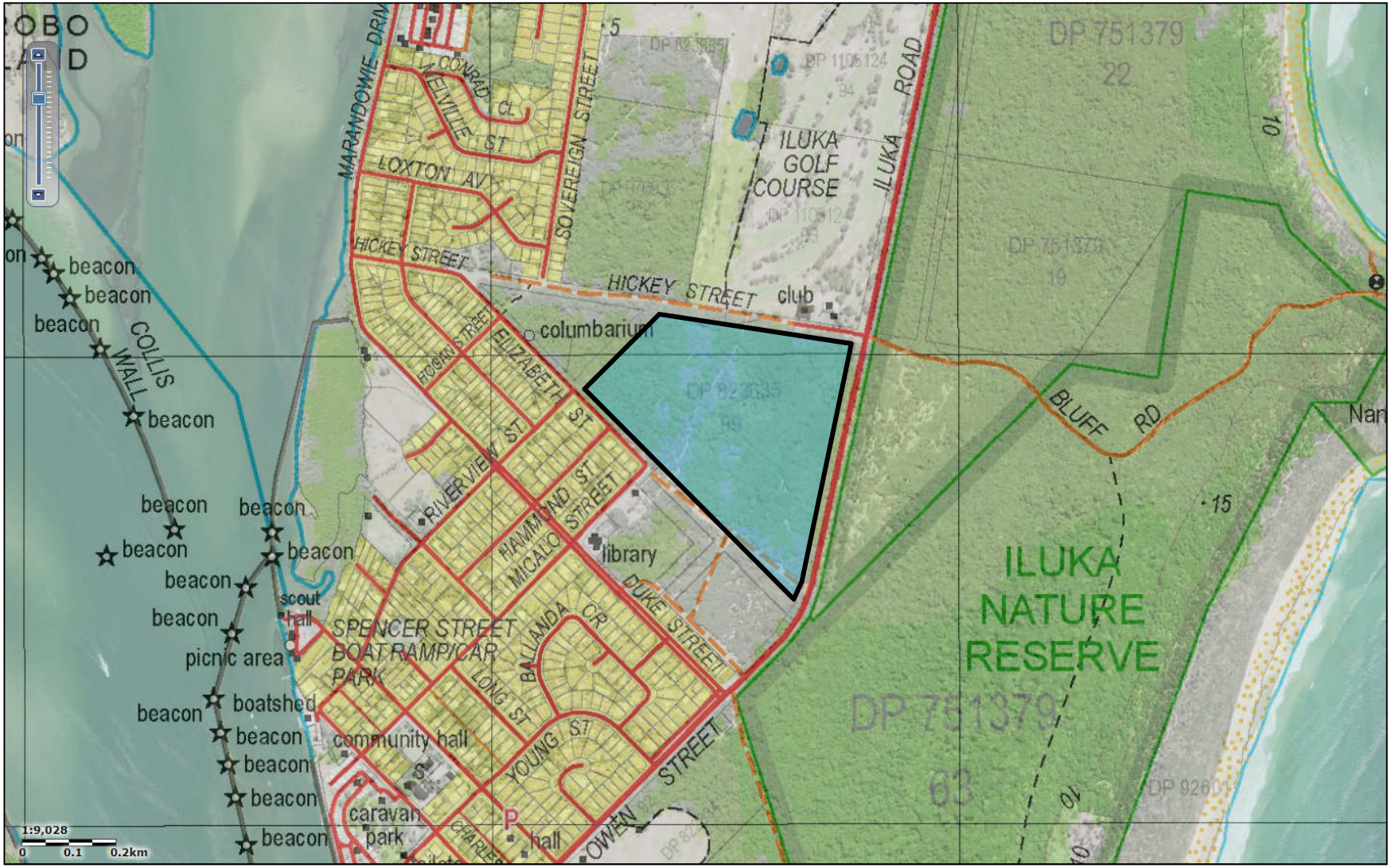


Figure 1: *Topographic map showing the location of the subject site.*

Figure 2: *The proposed development with retained bushland parks and Asset Protection Zones.*

2 LEGISLATIVE CONTEXT

The management protocols detailed herein address the relevant requirements of the following legislation:

- Commonwealth *Environmental Protection Biodiversity Conservation Act 1999* – the relevant requirements of this Act relate specifically to threatened entities and the World/National Heritage listings, including Outstanding Universal Values and are embodied in the development application. The implementation of requirements is the responsibility of the Project Manager and the relevant sub-consultant, with the Council / private certifier being the ultimate authority;
- NSW *Environmental Planning and Assessment Act 1979* – the requirements of this Act will be embodied in the Development Consent Conditions. Their implementation is the responsibility of the Project Manager and the relevant sub-consultant, with the Council / Private Certifier being the ultimate authority; and
- NSW *National Parks and Wildlife Act 1974* – the relevant requirements of this Act are principally related to protected fauna, particularly:
    - *A person shall not harm any protected fauna* (Part 7 Section 98 Subsection 2a); and
    - *A person shall not liberate … any animal … unless under and in accordance with a licence under section 127* (Part 7 Section 109 Subsection 1 and 2).

  The responsibility for the observation of these conditions lies with the Project Manager and the Project Ecologist; and
- NSW *Biosecurity Act 2015* – this replaced the *Noxious Weeds Act 1993* and its primary objective is to provide a framework for the prevention, elimination and minimisation of biosecurity risks, including weeds. The responsibility for recognition of weed threats and management actions remains with the Local Council, but also extends that responsibility to landholders.

The HMP also relies on recovery plans, management plans and weed control strategies prepared by various authorities arising from that legislation, particularly:

Department of Environment, Climate Change and Water NSW (2010) Border Ranges Rainforest Biodiversity Management Plan NSW and Queensland, March 2010. Department of Environment, Climate Change and Water NSW, Sydney.

This Plan of Management has considered the conservation requirements of rainforests and closely associated flora and fauna in the Border Ranges region of New South Wales and Queensland. The aims of this Plan of Management are to:

1. Achieve a net gain in the extent of rainforest and related vegetation.

2. Promote the survival and adaptive capacity of species, populations and ecological communities of plants, animals and micro-organisms native to the rainforest and related vegetation of the Planning Area.
3. Promote a consistent cross-regional, landscape approach seeking biodiversity conservation improvement across all land tenures.
4. Recognise and incorporate cultural values into biodiversity management of the Planning Area through ongoing Indigenous engagement.
5. Promote the importance of native biodiversity protection and restoration through strengthening existing initiatives and developing new partnerships in consultation with the community, industry and relevant government agencies.
6. Improve management through an increasing scientific, social and cultural knowledge base.
7. Undertake long-term, prioritised commitment to cost-effective recovery processes.

The aims of this Plan of Management have been considered within a number of management objectives for the Border Ranges region that will provide a long-term viability of biodiversity assets, including threatened flora and fauna, ecological communities and movement corridors. Plan objectives aim to:

1. Reduce organisational-related impediments to biodiversity conservation;
2. Minimise the impacts of climate change on biodiversity;
3. Protect rainforest, related vegetation and species from clearing;
4. Protect rainforest and related vegetation from fragmentation, modification and degradation;
5. Protect rainforest and related vegetation from the impact of weeds;
6. Protect rainforest from fire and to promote the implementation of appropriate fire regimes in related vegetation;
7. Protect rainforest and related vegetation from the impact of pest animals;
8. Minimise the effects of Bell Miner associated dieback on rainforest and associated wet sclerophyll forest;
9. Protect rainforest and related vegetation from grazing and trampling by livestock;
10. Minimise the impacts of human interference;
11. Control and minimise impacts of introduced pathogens and diseases;
12. Maintain the viability and evolutionary potential of rainforest and related populations, species and communities;
13. Recognise the cultural value of rainforest and related vegetation to the Indigenous community and engage the Indigenous community in the protection and enhancement of rainforest and associated biodiversity and cultural values;
14. Engage the community and private land-holders in biodiversity conservation; and
15. Establish effective monitoring of biodiversity related projects.

Department of Environment, Climate Change and Water NSW (2010) Northern Rivers Regional Biodiversity Management Plan, National Recovery Plan for the Northern Rivers Region. Department of Environment, Climate Change and Water NSW, Sydney.

This Plan of Management identifies the threats to biodiversity at both a regional level and for each of the four broad landscapes delineated within the region: Coastal Plains, Midland Hills, Escarpments Ranges and Tablelands. This Management Plan also constitutes a national recovery plan for federally listed communities and threatened species that occur in the region.

The vision for the regional management of the Northern Rivers is to *"provide coordinated and strategic outcomes for biodiversity management, underpinned by community involvement and partnerships that guide the protection and recovery of threatened species, populations, ecological communities and ecological processes across all land tenures in the region"*.

In order to achieve this vision, a number of strategic objectives have been identified that aim to:

1. Improve the resilience of ecosystems and landscapes to the effects of climate change;
2. Reduce organisational-related impediments to biodiversity conservation;
3. Protect species and their habitats from the effects of clearing and fragmentation;
4. Protect vegetation communities, ecosystems and habitats from inappropriate fire regimes;
5. Protect the region from the impact of weeds;
6. Protect the region from the impact of pests;
7. Reduce the impacts of native forestry and timber plantations;
8. Strategic management of dieback (including Bell Miner dieback);
9. Maintain and improve water quality;
10. Protect and improve aquatic habitats;
11. Protect the region from the impact of disease and pathogens;
12. Minimise human-induced disturbance and mortality of species;
13. Reduce the impacts of domestic livestock on the natural environment;
14. Protect ecosystems from chemical pollution;
15. Protect non-targeted species from pest control;
16. Minimise the impact of waste disposal on biodiversity;
17. Maintain the viability and evolutionary potential of species and populations;
18. Recognise the cultural value of biodiversity to the Indigenous community and engage the Indigenous community in the protection and enhancement of biodiversity and associated cultural values;
19. Engage the community and private landholders in biodiversity conservation; and
20. Establish effective monitoring of biodiversity-related projects.

National Parks and Wildlife Service (1997) Broadwater National Park, Bundjalung National Park, and Iluka Nature Reserve Plan of Management. NSW National Parks and Wildlife Services, August 1997. NSW, Sydney.

The Broadwater, Bundjalung and Iluka reserves protect most of the coastline between Iluka and Ballina, and together with Yuraygir National Park, comprise a large conservation system which ranks in importance with only a handful of other conservation areas on the east coast of Australia. National Parks and reserves in NSW are managed in a way that protect and preserves natural features, wildlife, natural processes and Indigenous and historic features.

Management of the Broadwater National Park, Bundjalung National Park and Iluka Nature Reserve is undertaken by specific objectives that lead to:

1. The protection of important systems, natural features and values, remote natural 'primitive' areas, indigenous and heritage sites, and maintain biodiversity;
2. The maintenance of biodiversity and values; and
3. Appropriate use of the region for outdoor recreation.

The overall strategy for the region is to achieve the following:

1. Protection of the existing native plant and animal communities by reducing, and where possible eliminating, threats to those communities.
2. Establishment of a fire regime consistent with maintaining native plant and animal diversity in a regional context and in particular excluding fire from the Iluka Nature Reserve.
3. The provision of additional environmental education and interpretation programs.
4. Promotion of appropriate land use planning and management amongst neighbours and other land management authorities which will protect to the highest levels practicable the natural and cultural values of the planning area.
5. Emphasis within the local community, particularly neighbours of the planning area, of the importance and purpose of management programs relating to the protection of the natural and cultural heritage, and the control of fire, weeds and feral animals.
6. The development of additional nature based tourist and recreation facilities by the private sector will be encouraged on lands adjacent to, or in close proximity to, the planning area rather than within it.

Department of the Environment and Heritage (2000) World Heritage Central Eastern Rainforest Reserves of Australia: Strategic Overview for Management, World Heritage, November 2000. Commonwealth of Australia, Canberra.

This strategic overview was prepared to ensure appropriate consideration is given to the extent of Central Eastern Rainforest Reserves of Australia (CERRA) and their World

Heritage values. Management of these areas is to be influenced by the management obligations listed under the World Heritage Committee, specifically:

> *To ensure that effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage situated on its territory, each State Party to this Convention should endeavour insofar as possible and as appropriate for each country:*
>
> 1. *to adopt a general policy which aims to give the cultural and natural heritage a function in the life of the community and to integrate the protection of the heritage into comprehensive planning programs;*
> 2. *to set up within its territories, where such services do not exist, one or more services for the protection, conservation and presentation of the cultural and natural heritage with an appropriate staff and possessing the means to discharge their functions;*
> 3. *to develop scientific and technical studies and research and to work out such operating methods as will make the State capable of counteracting the dangers that threaten its cultural or natural heritage;*
> 4. *to take appropriate legal, scientific, technical, administrative and financial measures to ensure the identification, protection, conservation, presentation and rehabilitation of this heritage; and*
> 5. *to foster the establishment or development of national and regional centres for training in the protection, conservation and presentation of the cultural and natural heritage and to encourage scientific research in this field.*

To match these values, management principles have been established to manage World Heritage values of the property, integrate protection into a planning program, give the property a function in the community, strengthen the respect and appreciation of World Heritage values, take appropriate measures to implement management, provide continuous community engagement in management and manage the values (both World Heritage and non-World Heritage) to achieve long-term conservation.

These obligations provide the basis of the strategic management objectives if CERRA:

1. To ensure that the World Heritage values of the property are clearly identified.
2. To ensure that the World Heritage values of CERRA are protected through appropriate long-term legislative, regulatory and institutional arrangements.
3. To ensure that the World Heritage values of CERRA are conserved through both pro-active management and the control of threatening processes.

4. To ensure that degraded areas of CERRA are rehabilitated to a natural condition.
5. To ensure that the World Heritage values of CERRA are presented in the most appropriate and sustainable way to the community.
6. Through achievement of the above objectives, to transmit the outstanding universal values of CERRA to future generations.

Clarence Valley Council (2010) Biodiversity Management Strategy. Clarence Valley Council, Grafton.

This management plan aims to identify the responsibilities of the Clarence Valley Council and the management strategies to preserve biodiversity of the Clarence Valley region. The strategy proposes a number of management actions however, the following are considered priority actions where Council aim to:

1. appoint a dedicated Biodiversity Officer;
2. develop and maintain relevant biodiversity layers within a geographic information system;
3. finalise for exhibition, with a local environment plan amendment, biodiversity corridors and areas of high conservation significance;
4. control clearing of native vegetation;
5. amend the Clarence Valley Local Environment Plan and adopt a development control plan to enact appropriate controls to protect biodiversity;
6. ensure that Council planning and compliance staff are trained and supported to implement the Biodiversity Management Strategy;
7. encourage community participation in the protection, restoration and conservation of habitat areas and corridor links;
8. educate and support the community to identify and control weeds; and
9. remove barriers to fish movement.

Objectives of this Plan of Management are categorised into nine management categories established by Clarence Valley Council and are summarised below.

1. **Habitat protection / habitat corridors**
    a. Protect the habitats of native flora and fauna and existing habitat/wildlife corridors.
    b. Retain habitat areas in land parcels that will enable the long-term survival of existing plant and animal communities.
    c. Establish a network of habitat corridors linking areas of native vegetation.
    d. Protect the recreational and educational value of areas of native vegetation.
    e. Encourage and promote community involvement and cooperation in the management of biodiversity.

2. **Clearing controls / vegetation management**
    a. Protect areas of native vegetation.
    b. Reduce the loss of native vegetation to facilitate a net gain in vegetation in the LGA area.
    c. Revegetate riparian zones.
    d. Encourage the protection and management of regrowth in identified corridors.
    e. Educate the community on the benefits of biodiversity, and enforce legislation aimed at protecting native flora and fauna values.
3. **Pest Management**
    a. Protect the Clarence Valley LGA from the impact of pests.
    b. Encourage community participation in reducing the impacts of introduced species on biodiversity.
4. **Weed Management**
    a. Protect the Clarence Valley from the impact of weeds.
5. **Bushfire Management**
    a. Manage fire within Clarence Valley LGA in a way that maintains, or does not compromise, the ecological integrity of areas of native vegetation.
6. **Protect and improve aquatic habitat**
    a. Clean and healthy rivers, creeks and estuaries that enhance habitat values.
    b. Wetlands are protected and managed to maintain ecological diversity and function.
7. **Community education and extension**
    a. Raise awareness of the importance of our biodiversity and how to protect it.
    b. Provide on-ground extension services.
    c. Increase the area of land managed for conservation or managed in a sustainable manner.
    d. Monitor effectiveness of education programs (including baseline data).
8. **Climate change**
    a. Minimise potential climate change impacts on biodiversity by increasing the resilience of natural ecosystems and landscapes.
9. **Monitoring and review**
    a. Biodiversity plan implemented, and actions completed to halt the decline of biodiversity.

Department of the Environment, Water, Heritage and the Arts (2009) National Koala Conservation and Management Strategy 2009 – 2014, endorsed by the Natural Resource Management Ministerial Council. Department of the Environment, Water, Heritage and the Arts, Canberra.

This management strategy was established to clearly define the implementation of management actions as a review of the National Koala Conservation Strategy (1998) identified this as a major limitation. The aim of this strategy is to conserve Koalas by retaining viable populations in the wild throughout their natural range. A number of desired

outcomes have been identified, including short term goals (within 10 years) and long-term achievements (up to 50 years).

Desired outcomes – Long-term (0 – 50 years):

1. Koala populations in identified priority areas are stabilised or increasing.1
2. Overabundant koala populations are stabilised or reducing wherever they occur or arise.
3. Threatened status of the koala at state and regional levels is reduced.
4. Koala remains nationally abundant and widespread and is not nationally threatened.

Desired outcomes – Short term (0 – 10 years):

1. Increased consideration of koala habitat demonstrated in development planning.
2. Greater area of high-quality koala habitat conserved and effectively managed through legislation, covenants or agreements.
3. Greater activity by land and resource managers to effectively protect and manage koala populations.
4. Increased community capacity to drive koala conservation and care.
5. Productive and integrated partnerships that foster the conservation and welfare of koalas.

In order to achieve these outcomes, the strategy will facilitate in the production of the following tools:

1. Provide policy advice to ensure koala habitat is prioritised in land conservation and management initiatives;
2. Provide policy advice to guide the consideration of koala habitat in statutory planning strategies and applications;
3. Develop a better understanding of koala population requirements and management responses, and maintain an information network to guide and assist planning, natural resource management processes, and other community and stakeholder activities;
4. Facilitate high welfare standards for koalas kept in captivity or while under care and management;
5. Recognise, motivate and commemorate koala conservation efforts;
6. Develop and maintain productive, integrated partnerships to influence and achieve greater funding for outcomes.

Clarence Valley Council (2015) Comprehensive Koala Plan of Management for the Ashby, Woombah and Iluka localities in the Clarence Valley LGA. Clarence Valley Council, Grafton.

The Clarence Valley Council produced the Plan of Management to assist in the recovery of Koalas and their populations within the Clarence Valley Local Government Area (LGA). The aims of the Plan of Management are to ensure that the current extent of Koala habitat is maintained and improved in the management area, and not reduced and mitigate processes which are limiting Koala occupancy rates and / or population sizes.

It is important to provide these aims in order to:

1. Minimise threats to Koalas and their habitat that are not related to development activity;
2. Increase the amount of Koala habitat in the management area;
3. Maintain and where possible improve the quality of existing Koala habitat in the management area; and
4. Ensure effective implementation and monitoring of the Koala Plan.

Within the Iluka region, the Koala population has been in decline over several decades. Numerous surveys have been undertaken in the Iluka region since 1990 with the decline of the species documented within these surveys. Although no individuals have been identified during recent surveys (Biolink 2012), injuries to this species are often reported suggesting there may be a residual population in the Iluka area.

Management objectives for the Iluka region are to:

1. Undertake monitoring to ascertain further evidence of any resident Koala population;
2. Ensure fire management activities aim to conserve individual Koalas, and their habitats and migration corridors; and
3. Protect Koala habitat.

Tweed Shire Council (2014) Tweed Coast Comprehensive Koala Plan of Management 2014. Tweed Shire Council, Murwillumbah, NSW.

A habitat study identified the Koala population of the Tweed Coast has declined by approximately 50% within the last decade and have effectively been confined to three sub-populations around the Tweed Coast. The decline means it is likely that the population will become extinct within the next 20 years.

In order to reduce the risks of this happening, five Koala-based issues have been identified, including bushfire, incidental mortalities, habitat loss, standards for ecological assessment and land use planning controls.

The vision of this Plan of Management aims to:

1. Recover the Tweed Coast population of the Koala to at least 200 to 250 Koalas over the next three Koala generations (15 to 20 years);
2. Increase the total area of preferred Koala habitat to at least 2,600 hectares in priority areas and linkages;
3. Ensure that future development on the Tweed Coast takes place in a manner that encourages the proper conservation and management of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over the present range and reverse the current decline trend; and
4. Provide information on the status of Tweed Coast Koalas and actions required of the community in a regular and accessible format over the life of the plan.

Geolink (2010) Final Maclean Flying-fox Management Strategy. Prepared for joint venture between Clarence Valley Council and the Department of Environment, Climate Change and Water on behalf of the Maclean Flying-fox working group.

This management strategy was developed to provide a comprehensive document for the management of Flying-foxes in Maclean. It focuses on short, medium, and long term management to achieve two major objectives:

1. Address the concerns of local residents, Maclean High School / TAFE community and the broader community; whilst
2. Conserving and co-existing with the Flying-fox population.

The Maclean camp is a large, long-term camp that has been nationally recognised as important for its size and history as a maternity camp. Management has considered the statutory considerations, animal welfare aspects, scientific validity and previous experience, strengths and weaknesses, estimated costs, feasibility and other important considerations. Preferred management for the Flying-foxes at Maclean require a number of strategies to be implemented for the short, medium, and long term. The preferred actions are:

1. Trim vegetation within private lands and streets that adjoin the camp and revegetate with screening habitat;
2. Extend the reserve area and revegetate with preferred roost trees;
3. Relocate powerlines underground to reduce mortality;
4. Educate the community to increase the understanding of Flying-foxes;
5. Identify additional alternative habitats nearby;

6. Provision of alternative habitats through revegetation of cleared land;
7. Monitor public health and record any notifiable Flying-fox related illnesses;
8. Manage special events and consider Flying-foxes;
9. Prepare a Development Control Plan (DCP) to guide future development near camps;
10. Provide buffer areas for new development to prevent inappropriate development;
11. Implement systematic weed control plans to assist regeneration of reserves;
12. Modify development to create more friendly development;
13. Modify the Maclean High School / TAFE buildings to be friendly toward Flying-foxes;
14. Voluntary buy-back of properties where residents are directly affected by Flying-foxes;
15. Commission a feasibility study to assess future potential land uses within the Maclean region; and
16. Promote ecotourism vis the installation of a viewing platform, guided walks and signage.

3 SITE ASSESSMENT

The development proposal has been the subject of a number of assessment documents within which its ecological features and habitats have been described:

- Flora and Fauna Impact Assessment (Ashby and McTackett 2015) (FFIA);
- Additional Flora and Fauna Impact Assessment (Ashby and McTackett 2016) (AFFIA);
- Addendum Impact Assessment (Ashby and McTackett 2017) (AIA); and
- Updated Impact Assessment of Matters of National Environmental Significance (Ashby and McTackett 2017) (UIAMNES).

As part of these works, the biota was surveyed during all seasons over several years. These investigations were relied upon to determine the development area with least impact, as well as ascertain the site's general condition, the extent and nature of the necessary APZ, the exotic species present, and the extent of weed infestations.

The site has experienced profound disturbance comprising clearing, sand mining, severe fires, weed infestation, possibly some recontouring and some seeding and / or planting of unknown material. The site continues to be used by locals as a dumping ground for garden waste, old furniture, building materials and other rubbish. Plastic garden pots, mesh and water bottles also indicate covert cultivation of illicit plants.

The vegetation of the site reflects this pattern of abuse, with a mosaic of regenerating locally native canopy species. The understorey is dominated by exotic species across most of the site, particularly *Lantana camara* Lantana and *Megathyrsus maximus* Guinea Grass.

A narrow band of vegetation at the western end of the site has probably been spared the clearing and sand mining as it supports large trees and the landform seems to reflect a more natural pattern of dune and swale.

The three vegetation types present as follows and their distribution is shown in Figure 3:

- **Community 190 Coast Banksia woodland and open forest of coastal dunes** is the band of relatively undisturbed vegetation at the site's western end, occupying 0.41 hectares. This area has elements of regenerating Littoral Rainforest (for example, some vines and rainforest tree species), but it is not structurally or floristically well developed.
- **Community 193 Pink Bloodwood - Brush Box open forest on coastal dunes and sandplains** is the dominant community, occupying 18.16 hectares.
  This vegetation type is represented by 5 sub-types, based largely on disturbance:
  - 193a – 10.41 hectares, dominated by a dense low canopy of a single age class of *Acacia disparrima.* This may be a naturally occurring result of fire, or a result of rehabilitation efforts post-sand mining, or a combination of both.

  - 193b – 1.14 hectares, near the northern boundary of the site. This area contains a number of mature and semi-mature *Eucalyptus tereticornis* Forest Red Gum. This area has been delineated due to the high value of this tree species to Koalas as a forage tree. This tree species also occurs in small numbers along Iluka Road in the road reserve and across the road in Iluka Nature Reserve.
  - 193c – 3.15 hectares, in the site's south western quadrant. Although still *Acacia disparrima* comprises a large component of the canopy, this area has a more mixed canopy, including *Corymbia intermedia* Pink Bloodwood, *Lophostemon confertus* Brush Box, *Banksia integrifolia* Coast Banksia and occasional rainforest trees and *Callitris columellaris* Coastal Cypress Pine.
  - 193d – 2.66 hectares, in the centre of the site. This is typically very open and dominated by weed infestations, typically of Lantana.
  - 193e – 0.80 hectares, near the north eastern corner. This also has a very open canopy and is highly modified with dense infestations of weeds, but there are elements of regenerating Littoral Rainforest.
- **Community 187 Coast Cypress Pine shrubby open forest** is restricted on site to a dense patch of adult trees near the site's southern boundary, occupying 0.25 hectares.

Survey established that the site supports potential and realised habitat for many threatened species of fauna. Fauna species of conservation significance recorded on site or close enough to the subject site to be considered likely or able to use the habitats of the subject site include:

- *Dromaius novaehollandiae* Emu (Endangered Population, *BC Act 2016*)
- *Lophoictinia isura* Square-tailed Kite (Vulnerable, *BC Act 2016*)
- *Ptilinopus regina* Rose-crowned Fruit-dove (Vulnerable, *BC Act 2016*)
- *Ptilinopus superbus* Superb Fruit-dove (Vulnerable, *BC Act 2016*)
- *Calyptorhynchus lathami* Glossy Black-Cockatoo (Vulnerable, *BC Act 2016*)
- *Hirundapus caudacutus* White-throated Needletail (Migratory, *EPBC Act 1999*)
- *Merops ornatus* Rainbow Bee-eater (Migratory, *EPBC Act 1999*)
- *Coracina lineata* Barred Cuckoo-shrike (Vulnerable, *BC Act 2016*)
- *Rhipidura rufifrons* Rufous Fantail (Migratory, *EPBC Act 1999*)
- *Daphoenositta chrysoptera* Varied Sittella (Vulnerable, *BC Act 2016*)
- *Phascolarctos cinereus* Koala (Vulnerable, *BC Act 2016* and *EPBC Act 1999*)
- *Nyctophilus bifax* Eastern Long-eared Bat (Vulnerable, *BC Act 2016*)
- *Saccolaimus flaviventris* Yellow-bellied Sheathtail-bat (Vulnerable, *BC Act 2016*)
- *Mormopterus norfolkensis* Eastern Freetail-bat (Vulnerable, *BC Act 2016*)
- *Miniopterus australis* Little Bentwing-bat (Vulnerable, *BC Act 2016*)

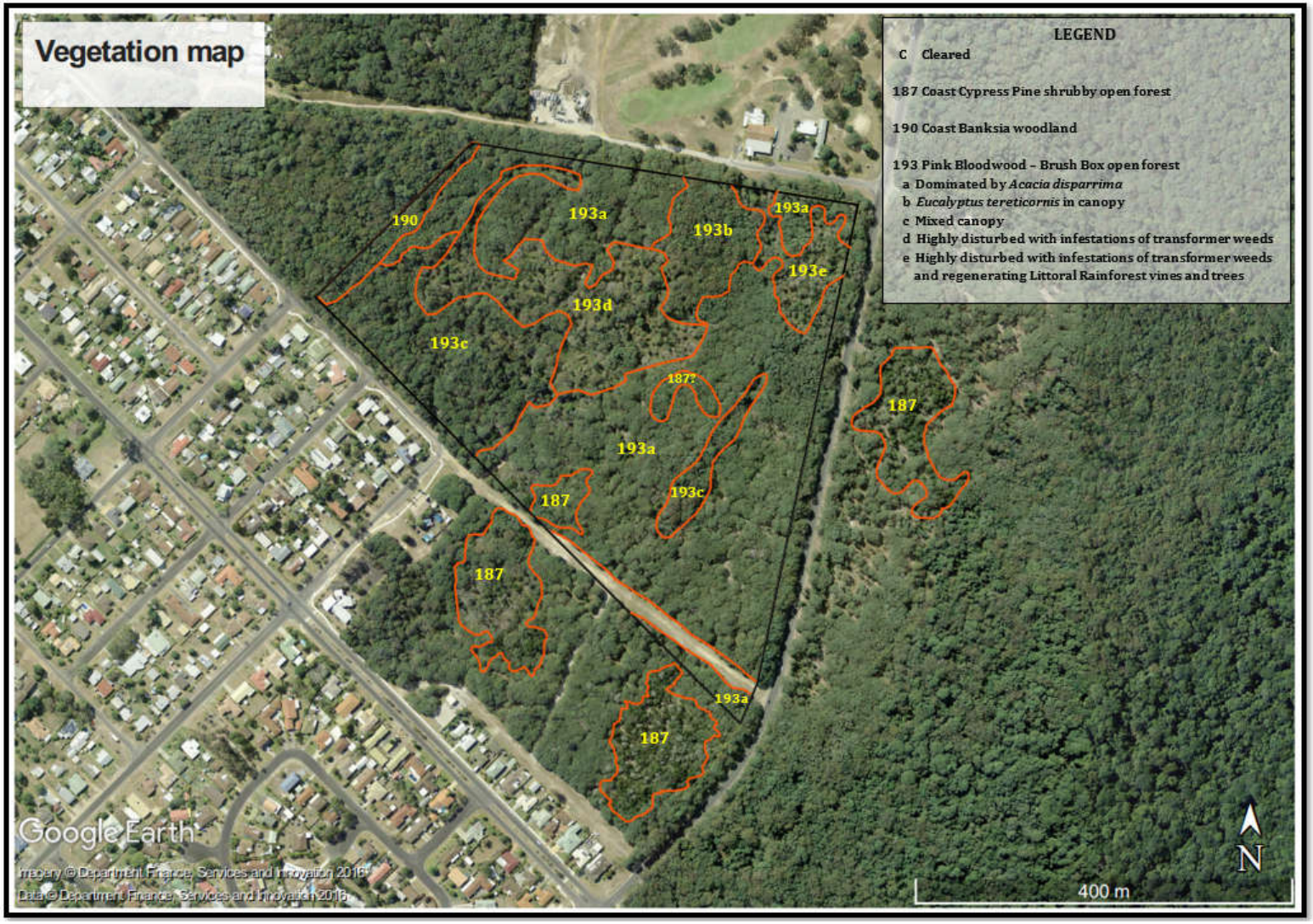


Figure 3: *Vegetation types and their distribution across the site.*

Of the 19.41 hectares occupied by the site, development is proposed for 14.11 hectares. The APZs are located within the development footprint, shared among the residential lots, the roadways, the landscaped verges, and two of the parks (E and F – see below).

The remaining 5.30 hectares is within proposed Lot 1, which is made up of 6 parks:

- **Park A** occupies approximately 0.88 hectares. This is situated at the site's western end and captures the vegetation that is in the best condition on site.
- **Park B** occupies approximately 2.33 hectares. This is situated in the north eastern corner of the site and captures most of the *Eucalyptus tereticornis* Forest Red Gum on site.
- **Park C** occupies approximately 0.48 hectares. This is situated on the site's southern boundary and captures the best developed area on site of Coastal Cypress Pine Forest Endangered Ecological Community (CCPF EEC).
- **Park D** occupies approximately 1.28 hectares. This is situated along the eastern boundary of the site and provides a buffer to Iluka Nature Reserve.
- **Park E** occupies approximately 0.18 hectares. It is situated at the site's south eastern corner and contains the existing fire trail that is to remain.
- **Park F** occupies approximately 0.15 hectares. It contains APZ and may also be required for some stormwater drainage works.

The condition of the vegetation across the site is illustrated in Photographs 1 to 3.

Photograph 1: *Looking toward the site from the existing fire trail into the proposed Stage 8.*

Photograph 2: *Vegetation along Hickey Street looking towards proposed Stage 4.*

Photograph 3: *Vegetation in Bushland Park D along Iluka Road.*

Photograph 4: *Lantana thicket at the western end of the site.*

Photograph 5: *Dense weed in the centre of the site.*

The exotic species observed on site are listed in Table 1 below.

A number of these exotic species have the potential to compromise the integrity of regeneration efforts if these weeds are not fully controlled and supressed. These include Weeds of National Significance, listed High Threat Exotic species, as well as a number of other environmental weeds.

Table 1: *Exotic / introduced flora species on site and their management priorities.* HTW = High Threat Weeds as recognised by OEH (Version 2), WONS = Weed of National Significance. Note that *Psidium cattleyanum* var. *cattleyanum* was reported by Mark Fitzgerald in a preliminary site assessment (Fitzgerald 2005), but not otherwise observed.

Family	Species	Risk Level	Management priority
Acanthaceae	*Thunbergia alata* Black-eyed Susan vine	Low	Moderate
Araliaceae	*Schefflera actinophylla* HTW Umbrella Tree	High	High
Arecaceae	*Syagrus romanzoffiana* Cocos Palm	Low	Moderate
Asparagaceae	*Asparagus aethiopicus* WONS Ground Asparagus	High	High
Asparagaceae	*Asparagus densiflorus* Foxtail Fern	Moderate	Moderate
Asteraceae	*Conyza sp.*	Low	Low
Asteraceae	*Delairea odorata* HTW	High	High
Commelinaceae	*Tradescantia fluminensis* HTW Trad	High	High
Commelinaceae	*Tradescantia zebrina* Inchplant	Moderate	Moderate
Convolvulaceae	*Ipomoea cairica* HTW Morning Glory	High	High
Crassulaceae	*Bryophyllum delagoense* HTW	High	High
Fabaceae	*Senna pendula var. glabrata* HTW	High	High
Lauraceae	*Cinnamomum camphorum* HTW Camphor laurel	High	High
Moraceae	*Ficus elastica*	Low	Low
Myrtaceae	*Psidium cattleyanum* var. *cattleyanum* HTW	High	High
Ochnaceae	*Ochna serrulata* HTW Mickey Mouse Plant	High	High
Pinaceae	*Pinus* sp. HTW	High	High
Poaceae	*Megathyrsus maximus* HTW Guinea Grass	High	High
Poaceae	*Paspalum urvillei* HTW	Moderate	Low
Solanaceae	*Solanum nigrum* Black Nightshade	Moderate	Moderate
Solanaceae	*Solanum seaforthianum* HTW	High	High
Verbenaceae	*Lantana camara* WONS Lantana	High	High

PART B – MANAGEMENT

4 PROPOSED MANAGEMENT WORKS

The proposed management works for the retained bushland parks are intended to serve the objectives of biodiversity conservation. The site's biodiversity values are detailed in the FFIA (2015), AFFIA (2016), AIA (2017) and UIAMNES (2018).

The bushland parks support Endangered Ecological Communities (EECs), threatened fauna species, and significant habitat features. Chief among the biodiversity conservation strategies to be implemented are the:

- Protection and conservation management of bushland parks;
- Retention and conservation management of Endangered Ecological Communities;
- Retention and expansion of Koala food trees and habitat;
- Retention and conservation management of *Acronychia littoralis* habitat;
- Retention and enrichment of habitat for other threatened species;
- Retention of hollow-bearing trees where possible;
- Installation of nest boxes and coarse woody debris for habitat enrichment;
- Long-term control of weeds; and
- Control of known threatening processes.

The following potential and realised environmental issues were identified within the bushland parks during previous survey. These matters are the focus of management actions in this HMP and include:

- The likely low resilience of weed-infested areas;
- The presence of weed species that have the potential to continue to dominate if left unchecked;
- The potential for the mobilisation of bare soil after weed control;
- The potential for continued incursions of weed species from uncontrolled areas in adjacent areas;
- The potential for accidental removal of native species which can resemble weed species during weed management;
- Animal welfare considerations during vegetation clearing; and
- The presence of species of conservation significance or OUV.

To satisfactorily minimise bushfire hazard to residential lots while minimising ongoing disturbance to the retained bushland, the APZs have been located within the development footprint – no APZ occurs within bushland parks.

The APZs are to be maintained to the standard of an Inner Protection Area (IPA), as prescribed in the Rural Fire Service documents *'Planning for Bushfire Protection 2006'* and the *'Standards for Asset Protection Zones'*.

The distribution of the bushland parks on site is shown in Figure 2. The site has been delineated into a series of Management Areas (or MAs), defined according to shared features, including location, intended use, vegetation types, specific habitat features, and the distribution and density of weeds. Each Management Area has been further classified into Management Units (or MUs).

Descriptions of each MA, their MUs and the appropriate management strategies are detailed in the following section.

5 MANAGEMENT AREAS AND THEIR TREATMENT

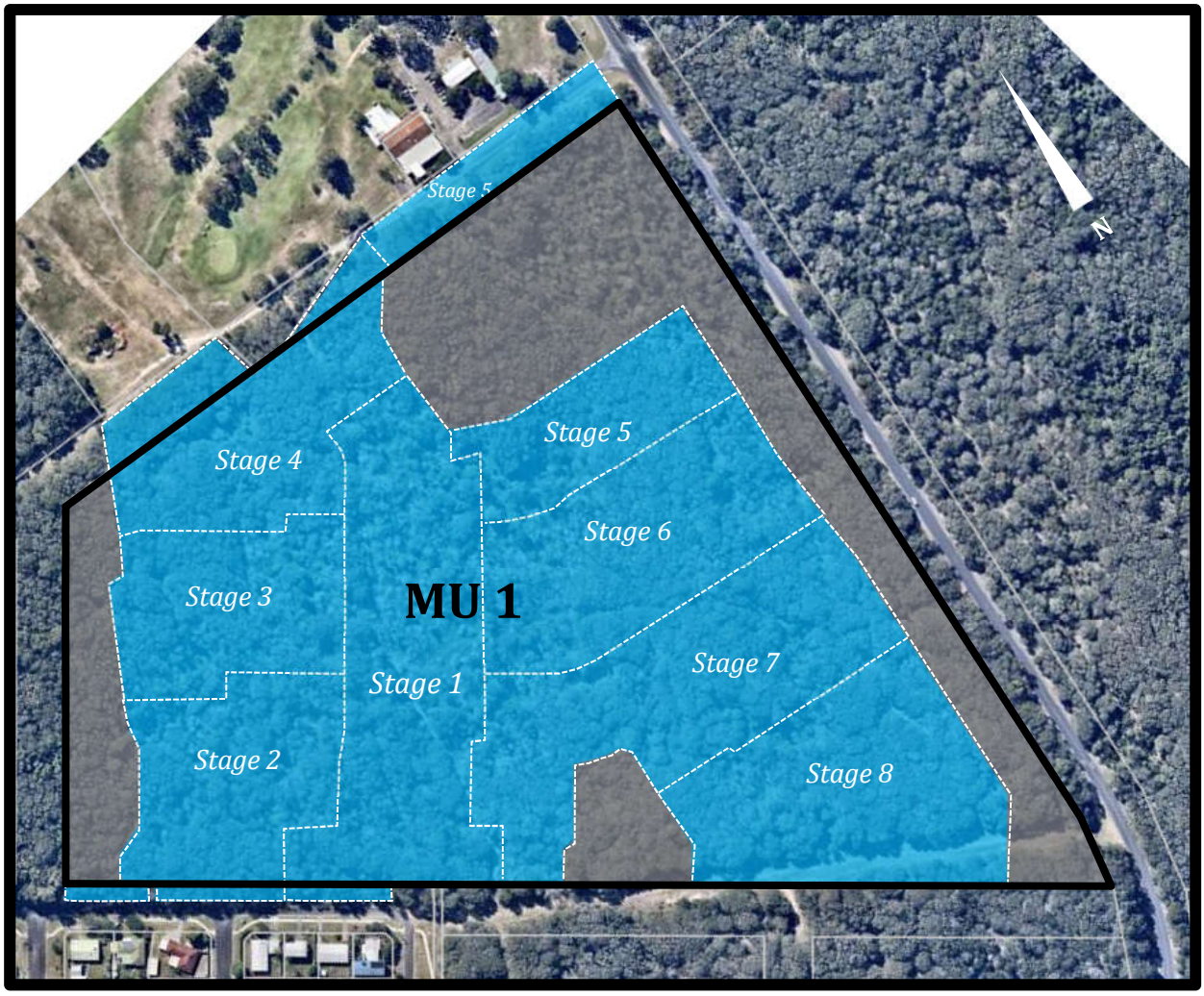
The areas that are the subject of this HMP have been divided into seven Management Units (MUs) characterised by their major management objectives and existing condition.

The Management Areas are:

- MA 1 – Development Footprint and Park F
- MA 2 – Bushland Park A
- MA 3 – Bushland Park B
- MA 4 – Bushland Park C
- MA 5 – Bushland Park D
- MA 6 – Bushland Park E

The distribution of Management Areas, their constituent Management Units and the definitions, objectives and management strategies are detailed for each in the following sections.

5.1 MANAGEMENT AREA 1 – DEVELOPMENT FOOTPRINT (including Park F)



Description: Management Area 1 is the proposed development footprint and is located across the centre of the subject site. It includes Bushland Park F.

Management Units: Management Area 1 is made up of only one Management Unit (MU 1), but it is to be developed in 8 stages. All management actions are relevant to every development stage.

Approximate area: 14.1 hectares.

Objectives: Minimise environmental impact during vegetation clearing and construction.

Weed density: High. Baseline data to be collected immediately prior to HMP implementation.

Natural resilience: Low.

Vegetation communities:

- 187 Coast Cypress Pine shrubby open forest – 0.20 hectares
- 193a Pink Bloodwood – Brush Box open forest, dominated by *Acacia disparrima* – 7.91 hectares
- 193b Pink Bloodwood – Brush Box open forest, *Eucalyptus tereticornis* in canopy– 0.19 hectares
- 193c Pink Bloodwood – Brush Box open forest, mixed canopy – 2.97 hectares
- 193d Pink Bloodwood – Brush Box open forest, highly modified with infestations of transformer weeds – 2.65 hectares
- 193e Pink Bloodwood – Brush Box open forest, highly modified with infestations of transformer weeds and regenerating Littoral Rainforest species – 0.04 hectares

Dominant weed species: *Lantana camara* Lantana and *Megathyrsus maximus* Guinea Grass. *Acacia disparrima* patches also acting as a weedy introduced species.

Management strategies:

1. The works area to be clearly marked out to prevent accidental damage to adjacent Management Areas during construction (e.g. to prevent stockpiling or parking within TPZs, unapproved root damage). As enclosed fencing has the potential to trap fauna, it is recommended that a porous barrier is used, such as high visibility plastic webbing.
2. Ensure all environmental controls are in place. These include controls for erosion, sediment, stormwater runoff, and spill management.
3. Strictly no dumping or stockpiling of materials is to occur in adjacent Management Areas that are to be retained. Compounds, parking and stockpiles may be located within the footprint only.
4. All civil contractors are to be inducted by the Project Ecologist regarding the important features of the site and the appropriate controls on works to minimise environmental damage and harm to fauna.
5. Clearing of vegetation on site is to be conducted under ecological supervision to protect resident fauna species, minimise the spread of weeds, and minimise the spread of pathogens / disease.
6. Prior to vegetation clearing, all trees to be removed are to be inspected for fauna habitat values and likely presence of fauna (e.g. hollows, nests).
7. Hollow-bearing trees and tree with nests that are to be removed are to be clearly tagged in such a way as to be seen by a machinery operator from all angles. The numbers and types of hollows are to be documented so that a nest box replacement strategy can be implemented.

8. Compensatory nest boxes are to be installed in the nearby retained vegetation in the bushland parks for as long as possible prior to clearing. This will allow animals to become accustomed to their presence.
9. Nest boxes are to be installed must be of a robust design appropriate for the target species likely to use the hollow to be removed.
10. Clearing is to be conducted according to an agreed clearing plan in two stages so that escape routes to adjacent habitat are available to fauna during works.
11. Hollow-bearing trees to be cleared in the second phase of clearing.
12. Hollow-bearing trees to be felled using techniques that minimise risk of harm to fauna. The felling protocol for each hollow-bearing tree is to be agreed on site, taking into account the safety of personnel, the individual characteristics of the tree, the likely fauna present, an escape route for resident fauna, and a safe procedure for the Project Ecologist to inspect the newly-felled tree and rescue animals as required.
13. It is preferable to allow animals to relocate voluntarily. Therefore hollow-bearing tree removal techniques may include initial gentle tapping and shaking with machinery to rouse sleeping animals, and / or gentle pushing to the ground, and / or sectional felling.
14. If unharmed, animals rescued during clearing activities are to be released into adjacent secure habitat, as appropriate to the species. For example, nocturnal species are to be kept in a cool, dark and quiet place until nightfall. Microbats may be released in adjacent habitat, and arboreal mammals may be released at the base of a hollow-bearing tree or directly relocated into a suitable nest box.
15. If injured, animals are to be passed as soon as possible to a wildlife carer and / or local veterinarian for treatment.
16. Fauna may only be handled by suitably-qualified, experienced and appropriately vaccinated professionals / wildlife carers.
17. Felled timbers (especially hollow sections) are to be relocated within remaining bushland parks under ecological supervision.
18. Sections of trees with epiphytic ferns and orchids may also be rescued and relocated into the adjacent bushland parks.
19. Connectivity of habitat between bushland parks across the site is to be enhanced by the implementation of the approved Landscape Plan and by tree plantings along road verges.
20. Trees planted in the roadside verges are to include as a minimum the Koala food tree planting offsets at 20-30 metre spacings, as proposed in the Ecological Response (Ashby and McTackett 2018):
    - 150 *Corymbia intermedia* Pink Bloodwood
    - 23 *Banksia integrifolia* Coast Banksia
    - 23 *Cupaniopsis anacardioides* Tuckeroo
    - 24 *Syzygium hemilampra* Broad-leaved Lilly Pilly

    Other verge plantings are to include those species listed in Table 3 in Section 9.

21. Any vegetation to be planted as per the Landscape Plan is to comply with bushfire protection measures, including maintaining 'a maximum shrub cover of 20% and a maximum 15% canopy foliage cover' at all times and not to include species known to be bushland weeds, e.g. *Agapanthus praecox* African Lily.
22. To minimise the spread of weeds, it is preferable to clear areas dominated by *Megathyrsus maximus* Guinea Grass when it is not in seed.
23. Management and maintenance works within the public road verges of all future internal public road verges on site and existing external public road verges surrounding the site are to be managed by the Community Association.
24. Hygiene protocols for machinery (such as wash-down procedures) and personnel (such as boot-cleaning), are to be strictly observed to minimise the spread of weeds and the movement of pathogens.
25. Weeds are not to be stockpiled on site or chipped; they are to be disposed of offsite in a timely manner. Loads are to be covered in order to reduce spread of seed.
26. All on-ground weed control works must be managed by a suitably qualified and experienced bush regenerator or restoration ecologist with at least 5 years' experience in the management of native bushland and at least a TAFE Certificate III in Bush Regeneration or Conservation and Land Management – Natural Area Restoration qualifications.
27. Traffic calming measures, including restricted speed limits, are to be observed during construction works.
28. Other traffic calming measures designed into the road network are to be implemented after occupation. These include speed limits, speed humps, short lengths of straight road, and signs regarding the likely presence of fauna (such as Koalas).
29. Street lighting is to be of a type that produces minimal spill and glare, with no lighting directed into adjacent bushland or retained hollow-bearing trees.
30. Best practice water sensitive urban design principles are to be implemented in accordance with relevant plans.
31. Residents are to strictly control their domestic pets. A domestic animal management strategy is detailed in a later section of this HMP.
32. In order to separate Koalas and Dogs, fencing around yards is to be of a type that Koalas cannot easily climb. Vegetation is to be trimmed away from the fence, and other materials must not be stacked along fences that could be exploited by Koalas for climbing over fences.
33. To further separate Koalas and Dogs, no yards will back directly onto bushland in the final layout. However, during the development phase, yards will back onto bushland until that adjacent stage is cleared. Therefore, the fence type and the provision of an APZ will serve to prevent Koalas climbing into yards.
34. Backyard pools must include an acceptable Koala escape mechanism, such as a shallow end or a thick rope.

5.2 MANAGEMENT AREA 2 – BUSHLAND PARK A

Description: Management Area 2 is the extent of Bushland Park A along the western boundary of the site, and consists of bushland in generally good condition, but with some patches of weeds. This Management Area also contains the recognised scar trees.

Management Units: Management Area 2 is made up of only one Management Unit (MU 1).

Approximate area: 0.9 hectares.

Objectives: Core conservation land and wildlife corridor comprising self-sustaining native vegetation and habitats with low weed cover.

Weed density: Patchy, low to high. Baseline data to be collected immediately prior to HMP implementation.

Natural resilience: High

Vegetation communities:

- 190 Coast Banksia woodland and open forest – 0.41 hectares
- 193a Pink Bloodwood – Brush Box open forest, dominated by *Acacia disparrima* – 0.29 hectares
- 193c Pink Bloodwood – Brush Box open forest, mixed canopy – 0.18 hectares

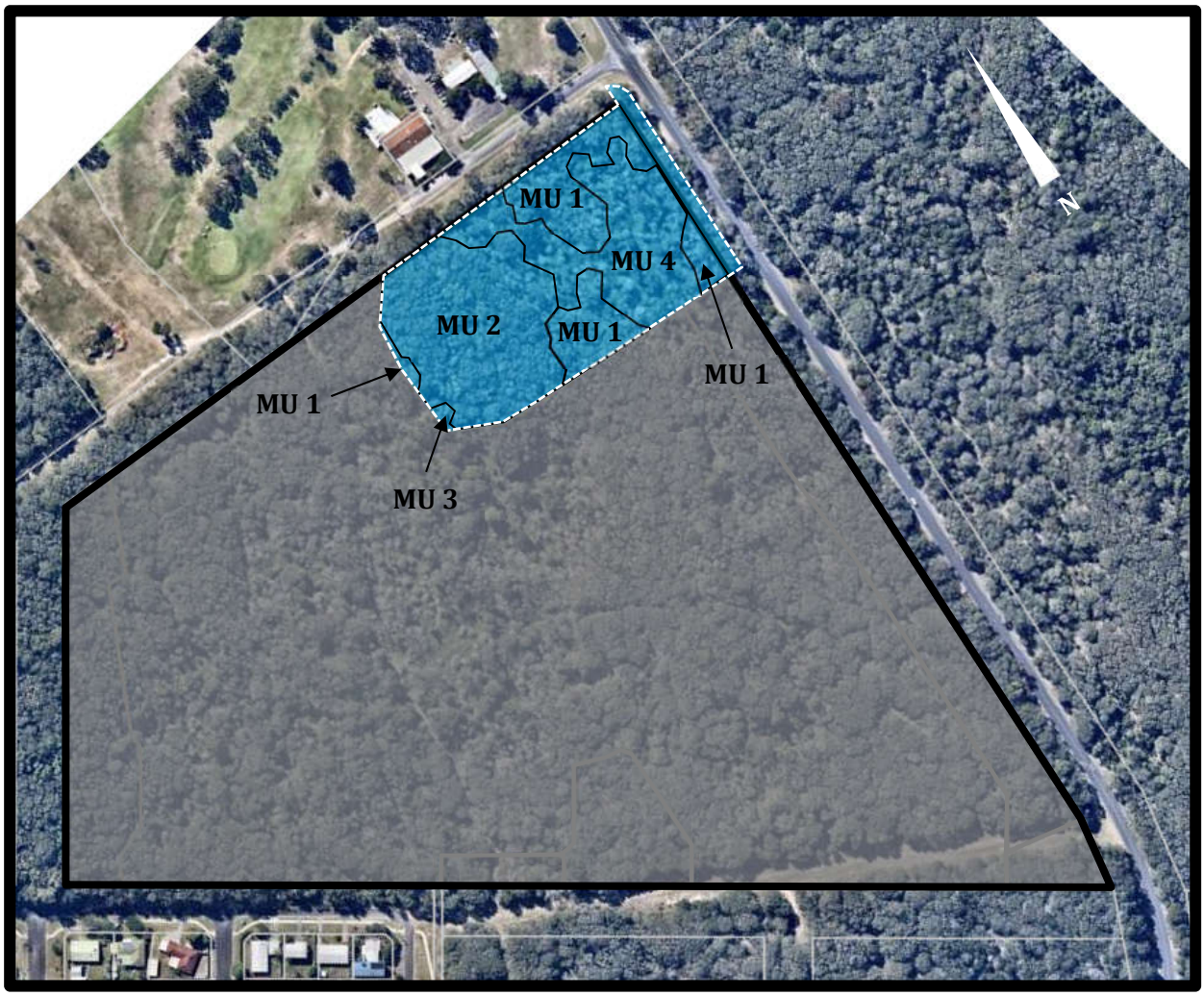
Dominant weed species: *Lantana camara* Lantana.

Management strategies:

1. Ensure erosion, sediment and stormwater runoff controls are in place to avoid impacts of runoff from adjacent works.
2. Delineate and protect the eastern edge of Management Area 2 to prevent accidental incursions during civil works and later during occupation. Temporary high visibility fencing can be ultimately replaced with a permanent design solution (such as bollards or large stone blocks) that allows free movement of fauna but prevents accidental intrusions by mowers or car parking.
3. Weed controls works are to be strictly in accordance with best practice low impact bush regeneration techniques.
4. All on-ground weed control works must be managed by a suitably qualified and experienced bush regenerator or restoration ecologist with at least 5 years' experience in the management of native bushland and at least a TAFE Certificate III in Bush Regeneration or Conservation and Land Management – Natural Area Restoration qualifications.
5. Bush regeneration activities are to focus on the removal of priority transformer weeds such as *Megathyrsus maximus* Guinea Grass and *Lantana camara* Lantana, using best practice techniques.
6. Progressive solarisation of patches of exotic grasses (including *Megathyrsus maximus* Guinea Grass) is preferable to the broadscale use of herbicide sprays.
7. Bush regeneration and plantings are to occur following primary and secondary weed removal.
8. If natural regeneration is judged to be hindered by the dominance of *Acacia disparrima* in parts of this Management Area, then selective removal of this wattle is recommended. Cleared areas are then to be rehabilitated by planting of species appropriate to the vegetation community present, but with an emphasis on preferred Koala food trees.
9. Plantings should be of local provenance, preferably sourced from the site itself.
10. Trees planted are to include as a minimum the Koala food tree planting offsets as proposed in the Ecological Response (Ashby and McTackett 2018):
    - 5 *Corymbia intermedia* Pink Bloodwood
    - 20 *Lophostemon confertus* Brush Box
11. Other plantings are to include those species listed in Table 3 in Section 9 that will particularly also benefit Grey-headed Flying-fox and Fruit-Doves.

12. No species of *Acronychia* are to be planted due to the potential for genetic introgression of *Acronychia littoralis*.
13. Nest boxes are to be installed within this Management Area in accordance with the Nest Box Management Program as detailed in a later section of this HMP. In summary, nest boxes are to be installed under ecological supervision prior to clearing of the development footprint at a minimum ratio of 1:1 for hollows to be removed. The numbers of boxes required can be adjusted according to the numbers of hollows observed as clearing works progress. Nest boxes are to cater for a range of species, including microchiropteran bats, small to medium birds, possums and gliders.
14. Felled timbers (especially hollow sections) are to be relocated under ecological supervision within this Management Area to enhance terrestrial habitats.
15. Informative signs are to be located in strategic locations. Information may include such things as the importance of the Bushland Park system, special features of a particular Bushland Park, as well as prohibited activities (such as dumping of garden refuse or off leash dog walking).
16. Street lighting adjacent to this Management Area is not to be directed into the Bushland Park.
17. Strictly no dumping or stockpiling of materials is to occur within this Management Area.
18. All scar trees are to be protected in accordance with the Aboriginal Cultural Heritage Management Plan.

5.3 MANAGEMENT AREA 3 – BUSHLAND PARK B



Description: Management Area 3 comprises the Bushland Park B in the north eastern corner of the site.

Management Units: Management Area 1 is made up of 4 Management Units (MU 1 to 4), based on the vegetation types (see details below and map above).

Approximate area: 0.87 hectares.

Objectives: Core conservation land and wildlife corridor comprising self-sustaining native vegetation and habitats with low weed cover.

Vegetation communities:

- 193a Pink Bloodwood – Brush Box open forest, dominated by *Acacia disparrima* – 0.64 hectares in MU 1

- 193b Pink Bloodwood – Brush Box open forest, *Eucalyptus tereticornis* in canopy– 0.95 hectares in MU 2
- 193d Pink Bloodwood – Brush Box open forest, highly modified with infestations of transformer weeds – 0.01 hectares in MU 3
- 193e Pink Bloodwood – Brush Box open forest, highly modified with infestations of transformer weeds and regenerating Littoral Rainforest species – 0.73 hectares in MU 4

Weed density: Patchy, low to high. Baseline data to be collected immediately prior to HMP implementation.

Natural resilience: Low to high.

Dominant weed species: *Lantana camara* Lantana and *Megathyrsus maximus* Guinea Grass. *Acacia disparrima* patches also acting as a weedy introduced species.

Management strategies:

1. Ensure erosion, sediment and stormwater runoff controls are in place to avoid impacts of runoff from adjacent works.
2. Delineate and protect the boundaries of Management Area 3 to prevent accidental incursions during civil works and later during occupation. Temporary high visibility fencing can be ultimately replaced with a permanent design solution (such as bollards or large stone blocks) that allows free movement of fauna but prevents accidental intrusions by mowers or car parking.
3. Weed controls works are to be in accordance with best practice low impact bush regeneration techniques. However, aggressive techniques will need to be employed in areas of high density weed infestations (such as 193d and 193e).
4. All on-ground weed control works must be managed by a suitably qualified and experienced bush regenerator or restoration ecologist with at least 5 years' experience in the management of native bushland and at least a TAFE Certificate III in Bush Regeneration or Conservation and Land Management – Natural Area Restoration qualifications.
5. Bush regeneration activities are to focus on the removal of priority transformer weeds such as *Megathyrsus maximus* Guinea Grass, *Lantana camara* Lantana and *Chrysanthemoides monilifera* subsp. *monilifera* Boneseed, using best practice techniques.
6. Progressive solarisation of patches of exotic grasses (including *Megathyrsus maximus* Guinea Grass) is preferable to the broadscale use of herbicide sprays.
7. Bush regeneration and plantings are to occur following primary and secondary weed removal.
8. If natural regeneration is judged to be hindered by the dominance of *Acacia disparrima* in parts of this Management Area, then selective removal of this wattle is recommended. Cleared areas are then to be rehabilitated by planting of species

appropriate to the vegetation community present, but with an emphasis on preferred Koala food trees.

9. Plantings should be of local provenance, preferably sourced from the site itself.
10. Trees planted are to include as a minimum the Koala food tree planting offsets as proposed in the Ecological Response (Ashby and McTackett 2018):
    - 30 *Eucalyptus tereticornis* Forest Red Gum
    - 15 *Eucalyptus propinqua* Small-fruited Grey Gum
    - 5 *Corymbia intermedia* Pink Bloodwood
    - 15 *Lophostemon confertus* Brush Box
11. Other plantings are to include those species listed in Table 3 in Section 9 that will particularly also benefit Grey-headed Flying-fox and Fruit-Doves.
12. No species of *Acronychia* are to be planted due to the potential for genetic introgression of *Acronychia littoralis*.
13. Plantings in MU 4 to rely heavily on species of Littoral Rainforest.
14. Management and maintenance works within the public road verges of all existing external public road verges surrounding the site are to be managed by the Community Association.
15. Nest boxes are to be installed within this Management Area in accordance with the Nest Box Management Program as detailed in a later section of this HMP. In summary, nest boxes are to be installed under ecological supervision prior to clearing of the development footprint at a minimum ratio of 1:1 for hollows to be removed. The numbers of boxes required can be adjusted according to the numbers of hollows observed as clearing works progress. Nest boxes are to cater for a range of species, including microchiropteran bats, small to medium birds, possums and gliders.
16. Felled timbers (especially hollow sections) are to be relocated under ecological supervision within this Management Area to enhance terrestrial habitats.
17. Informative signs are to be located in strategic locations. Information may include such things as the importance of the Bushland Park system, special features of a particular Bushland Park, as well as prohibited activities (such as dumping of garden refuse or off leash dog walking).
18. Street lighting adjacent to this Management Area is not to be directed into the Bushland Park.
19. Strictly no dumping or stockpiling of materials is to occur within this Management Area.

5.4 MANAGEMENT AREA 4 – BUSHLAND PARK C

Description: Management Area 4 comprises Bushland Park C at the southern boundary of the site.

Management Units: Management Area 4 is made up of a single Management Unit (MU 1).

Approximate area: 0.48 hectares.

Objectives: Core conservation land for 187 Coast Cypress Pine shrubby open forest comprising self-sustaining native vegetation and habitats with low weed cover.

Vegetation communities:

- 187 Coast Cypress Pine shrubby open forest – 0.25 hectares in MU 1
- 193a Pink Bloodwood – Brush Box open forest, dominated by *Acacia disparrima* – 0.22 hectares in MU 1
- Cleared – 0.01 hectares in MU 1

Weed density: Low. Baseline data to be collected immediately prior to HMP implementation.

Natural resilience: Moderate to high but probably suppressed by dominance of *Callitris columellaris* Coastal Cypress Pine.

Dominant weed species: *Lantana camara* Lantana and *Megathyrsus maximus* Guinea Grass.

Management strategies:

1. Ensure erosion, sediment and stormwater runoff controls are in place to avoid impacts of runoff from adjacent works.
2. Delineate and protect the boundaries of Management Area 4 to prevent accidental incursions during civil works and later during occupation. Temporary high visibility fencing can be ultimately replaced with a permanent design solution (such as bollards or large stone blocks) that allows free movement of fauna but prevents accidental intrusions by mowers or car parking.
3. Weed controls works are to be in accordance with best practice low impact bush regeneration techniques.
4. All on-ground weed control works must be managed by a suitably qualified and experienced bush regenerator or restoration ecologist with at least 5 years' experience in the management of native bushland and at least a TAFE Certificate III in Bush Regeneration or Conservation and Land Management – Natural Area Restoration qualifications.
5. Bush regeneration activities are to focus on the removal of priority transformer weeds such as *Megathyrsus maximus* Guinea Grass and *Lantana camara* Lantana, using best practice techniques.
6. Progressive solarisation of patches of exotic grasses (including *Megathyrsus maximus* Guinea Grass) is preferable to the broadscale use of herbicide sprays.
7. Bush regeneration and plantings are to occur following primary and secondary weed removal.
8. If natural regeneration is judged to be hindered by the dominance of *Acacia disparrima* in parts of this Management Area, then selective removal of this wattle is recommended. Cleared areas are then to be rehabilitated by planting of species appropriate to the vegetation community present.
9. Plantings should be of local provenance, preferably sourced from the site itself.
10. No species of *Acronychia* are to be planted due to the potential for genetic introgression of *Acronychia littoralis*.
11. Felled timbers (especially hollow sections) are to be relocated under ecological supervision within this Management Area to enhance terrestrial habitats.
12. Informative signs are to be located in strategic locations. Information may include such things as the importance of the Bushland Park system, special features of a

particular Bushland Park, as well as prohibited activities (such as dumping of garden refuse or off leash dog walking).

13. Street lighting adjacent to this Management Area is not to be directed into the Bushland Park.
14. Strictly no dumping or stockpiling of materials is to occur within this Management Area.

5.5 MANAGEMENT AREA 5 – BUSHLAND PARK D

Description: Management Area 5 comprises Bushland Park D at the eastern boundary of the site.

Management Units: Management Area 5 is made up of a single Management Unit (MU 1).

Approximate area: 1.28 hectares.

Objectives: Core conservation land and wildlife corridor comprising self-sustaining native vegetation and habitats with low weed cover.

Vegetation communities:

- 193a Pink Bloodwood – Brush Box open forest, dominated by *Acacia disparrima* – 1.25 hectares
- 193e Pink Bloodwood – Brush Box open forest, highly modified with infestations of transformer weeds and regenerating Littoral Rainforest species – 0.03 hectares

Weed density: Patchy, low to high. Baseline data to be collected immediately prior to HMP implementation.

Natural resilience: Low to moderate.

Dominant weed species: *Lantana camara* Lantana and *Megathyrsus maximus* Guinea Grass. *Acacia disparrima* patches also acting as a weedy introduced species.

Management strategies:

1. Ensure erosion, sediment and stormwater runoff controls are in place to avoid impacts of runoff from adjacent works.
2. Delineate and protect the boundaries of Management Area 5 to prevent accidental incursions during civil works and later during occupation. Temporary high visibility fencing can be ultimately replaced with a permanent design solution (such as bollards or large stone blocks) that allows free movement of fauna but prevents accidental intrusions by mowers or car parking.
3. Weed controls works are to be in accordance with best practice low impact bush regeneration techniques. However, aggressive techniques will need to be employed in areas of high density weed infestations in 193e).
4. All on-ground weed control works must be managed by a suitably qualified and experienced bush regenerator or restoration ecologist with at least 5 years' experience in the management of native bushland and at least a TAFE Certificate III in Bush Regeneration or Conservation and Land Management – Natural Area Restoration qualifications.
5. Bush regeneration activities are to focus on the removal of priority transformer weeds such as *Megathyrsus maximus* Guinea Grass, *Lantana camara* Lantana and *Chrysanthemoides monilifera* subsp. *monilifera* Boneseed, using best practice techniques.
6. Progressive solarisation of patches of exotic grasses (including *Megathyrsus maximus* Guinea Grass) is preferable to the broadscale use of herbicide sprays.
7. Bush regeneration and plantings are to occur following primary and secondary weed removal.
8. If natural regeneration is judged to be hindered by the dominance of *Acacia disparrima* in parts of this Management Area, then selective removal of this wattle is recommended. Cleared areas are then to be rehabilitated by planting of species appropriate to the vegetation community present, but with an emphasis on preferred Koala food trees.
9. Plantings should be of local provenance, preferably sourced from the site itself.
10. Trees planted are to include as a minimum the Koala food tree planting offsets as proposed in the Ecological Response (Ashby and McTackett 2018):
    - 20 *Eucalyptus tereticornis* Forest Red Gum
    - 15 *Eucalyptus propinqua* Small-fruited Grey Gum

- 5 *Corymbia intermedia* Pink Bloodwood
- 10 *Lophostemon confertus* Brush Box

11. Other plantings are to include those species listed in Table 3 in Section 9 that will particularly also benefit Grey-headed Flying-fox and Fruit-Doves.
12. No species of *Acronychia* are to be planted due to the potential for genetic introgression of *Acronychia littoralis*.
13. Management and maintenance works within the public road verges of existing external public road verges surrounding the site are to be managed by the Community Association.
14. Nest boxes are to be installed within this Management Area in accordance with the Nest Box Management Program as detailed in a later section of this HMP. In summary, nest boxes are to be installed under ecological supervision prior to clearing of the development footprint at a minimum ratio of 1:1 for hollows to be removed. The numbers of boxes required can be adjusted according to the numbers of hollows observed as clearing works progress. Nest boxes are to cater for a range of species, including microchiropteran bats, small to medium birds, possums and gliders.
15. Felled timbers (especially hollow sections) are to be relocated under ecological supervision within this Management Area to enhance terrestrial habitats.
16. Informative signs are to be located in strategic locations. Information may include such things as the importance of the Bushland Park system, special features of a particular Bushland Park, as well as prohibited activities (such as dumping of garden refuse or off leash dog walking).
17. Street lighting adjacent to this Management Area is not to be directed into the Bushland Park.
18. Strictly no dumping or stockpiling of materials is to occur within this Management Area.

5.6 MANAGEMENT AREA 6 – BUSHLAND PARK E

Description: Management Area 6 comprises Bushland Park E at the south eastern corner of the site.

Management Units: Management Area 6 is made up of a single Management Unit (MU 1).

Approximate area: 0.18 hectares.

Objectives: The area with existing native vegetation is to serve as a core conservation land and wildlife corridor comprising self-sustaining native vegetation and habitats with low weed cover. The existing cleared fire trail is to persist in that form and retain that protective function.

Vegetation communities:

- 193a Pink Bloodwood – Brush Box open forest, dominated by *Acacia disparrima* – 0.10 hectares
- Cleared – 0.08 hectares

Weed density: Moderate. Baseline data to be collected immediately prior to HMP implementation.

Natural resilience: Low to high.

Dominant weed species: *Lantana camara* Lantana and *Megathyrsus maximus* Guinea Grass.

Management strategies:

1. Ensure erosion, sediment and stormwater runoff controls are in place to avoid impacts of runoff from adjacent works.
2. Delineate and protect the boundaries of Management Area 6 to prevent accidental incursions during civil works and later during occupation, particularly along the edge of the fire trail. Temporary high visibility fencing can be ultimately replaced with a permanent design solution (such as bollards or large stone blocks) that allows free movement of fauna but prevents accidental intrusions by mowers or car parking.
3. Weed controls works are to be in accordance with best practice low impact bush regeneration techniques.
4. Fire trail to be regularly mowed.
5. All on-ground weed control works must be managed by a suitably qualified and experienced bush regenerator or restoration ecologist with at least 5 years' experience in the management of native bushland and at least a TAFE Certificate III in Bush Regeneration or Conservation and Land Management – Natural Area Restoration qualifications.
6. Bush regeneration activities are to focus on the removal of priority transformer weeds such as *Megathyrsus maximus* Guinea Grass, *Lantana camara* Lantana and *Chrysanthemoides monilifera* subsp. *monilifera* Boneseed, using best practice techniques.
7. Progressive solarisation of patches of exotic grasses (including *Megathyrsus maximus* Guinea Grass) is preferable to the broadscale use of herbicide sprays.
8. Bush regeneration and plantings are to occur following primary and secondary weed removal.
9. If natural regeneration is judged to be insufficient and / or hindered by the dominance of *Acacia disparrima* in parts of this Management Area, then selective removal of this wattle is recommended. Cleared areas are then to be rehabilitated by planting of species appropriate to the vegetation community present, but with an emphasis on preferred Koala food trees.
10. Plantings should be of local provenance, preferably sourced from the site itself.
11. No species of *Acronychia* are to be planted due to the potential for genetic introgression of *Acronychia littoralis*.
12. Informative signs are to be located in strategic locations. Information may include such things as the importance of the Bushland Park system, special features of a

particular Bushland Park, as well as prohibited activities (such as dumping of garden refuse or off leash dog walking).

13. Street lighting adjacent to this Management Area is not to be directed into the Bushland Park.
14. Strictly no dumping or stockpiling of materials is to occur within this Management Area.

PART C - ACTIONS AND PROCEDURES

6 GENERAL CONTROLS

All works are to be carried out in accordance with this plan as detailed below.

6.1 PERSONNEL

All management actions should only be carried out by qualified and experienced personnel. Vegetation management is only to be carried out by a qualified and experienced bush regeneration contractor. Vegetation works under this HMP must be implemented by one contractor across all management areas.

6.2 REFERENCE POINTS

Reference points are to be established within each Management Unit in each Management Area.

A photograph is to be taken from a standard marked location at this reference point and baseline vegetation information collected prior to works.

6.3 ACCESS

Sensitive areas and retained vegetation will be protected from unauthorised access and damaging activities by the judicious use of fences, access control and signs.

Access and egress controls for all stages are to be strictly observed and as detailed in the civil works plans prepared by the civil works contractor.

Access to the Bushland Parks are to be via the existing roads and fire trails and internal tracks within the development footprint. No access to the site is to occur through the Bushland Parks or via any new access point from Iluka Road.

The fire trail and APZs are to remain clear and will act as maintenance tracks.

6.4 LIGHTING

Lighting in public areas is to be kept at a minimum required for safety and amenity. None will be directed into adjacent bushland.

Outdoor lighting in residential lots is to be of low-wattage and of a type that reduces spills and glare. No lights are to be directed towards the retained bushland and should not be directed into the entrances of hollows.

6.5 EXTERNAL WASTE

During construction any waste bins, including skip bins are to be properly covered and sealed at all times to minimise access by wildlife and reduce risk of injury to wildlife.

6.6 TRAFFIC

During construction all traffic, including workers and deliveries, are to occur via Hickey Street or at the intersection of Elizabeth Street and Micalo Street, or within the existing bushfire access track.

Vehicles and deliveries are not to block any access along roads or the fire trail.

Traffic calming measures are to be strategically implemented within all internal streets. Traffic calming designs include the installation of speed bumps, short lengths of straight road, appropriate signage and enforced speed limits of 40km/h on all streets and 10km/h in areas when and where Koala movements are likely.

6.7 VERGE MANAGEMENT AND MAINTENANCE

Management and maintenance of all vegetation on site is to occur as an ongoing activity undertaken by the Community Association. This includes appropriate management of Bushland Parks and road verges.

The Community Association is to undertake management and maintenance works within the public road verges of all future internal public road verges on site and existing external public road verges surrounding the site.

Specific management and maintenance of these areas are further detailed throughout this HMP.

7 FENCING AND SIGNAGE

7.1 FENCING

No barbed wire is to be used for any temporary or permanent fencing on site.

In order to allow for free movement of fauna, the Bushland Parks are not to be fenced.

Temporary high visibility porous fencing may be used (such as flagging or webbing) during works.

Permanent delineation and protection from accidental incursions will be afforded by such things as bollards or large stone blocks.

Compounds may be fenced with wire mesh temporary fencing, but only after certified free of fauna.

Fencing of yards is to be of a type that can exclude Koalas, such as sheet metal. Fencing of dog runs and accessible swimming pools must use suitable Koala exclusion fencing designs and materials, including smooth materials such as glass and Perspex.

7.2 SIGNAGE

Standard signage during construction must be attached to the temporary fencing around the works area. Signs will warn all personnel and the public of dangers, work health and safety requirements and contact details for the Site Manager. This will be further detailed in the Construction Management Plan of the civil works contractor for all stages of works.

Temporary signs shall be erected clearly delineating bushland parks as "no-go" zones during construction.

Access to these no-go zones will only be permitted for non-destructive works (e.g. bush regeneration) and shall be approved by the Project Ecologist prior to access being granted.

Permanent signs shall be erected along all boundaries of the site and at each bushland park in order to inform the public of the necessary controls in the conservation areas. Suggested content includes:

- Management actions to protect biodiversity;
- Educational material on Endangered Ecological Communities known to occur within the local area, including Coastal Cypress Pine Forest and Littoral Rainforest;
- Educational material on significant flora and fauna known to occur in the local area;
- Specific information regarding the Iluka Peninsula Koala population;
- The importance of Dog control, particularly between dusk and dawn; and
- Prohibition of dumping of garden refuse in bushland areas.

8 WEEDING

The site's clearing and mining land use history, inappropriate fire regimes and dumping of materials has resulted in many extensive infestations of weeds, particularly *Lantana camara* Lantana. However, native forested areas remain relatively resilient.

Weed control is the major focus of the management plans for the retained bushland. Recommended treatments for weed species on site are detailed in Table 2. Best practice techniques include the judicious use of herbicide, as well as minimal impact manual removal techniques for particularly sensitive areas.

Mass plantings of local provenance species and ongoing maintenance weeding within all Bushland Parks will help prevent the return of infestations of serious weeds such as *Lantana camara* Lantana.

The clearing and excavation works across the remainder of the site have the potential to trigger germination of weed species. Soil stockpiles also provide a germination bed for aggressive pioneer weeds, particularly exotic grasses. All areas of open soil in the construction zones shall be regularly monitored by the civil contractor in consultation with the Project Ecologist and weeds controlled until all exposed soil is stabilised with a rapid cover of sterile turf grass.

8.1 WEED CONTROL STRATEGY

Weed control is usually undertaken in 3 stages:

1) Primary weed control: The first step targets primary weeds but does not remove all weeds. Involves getting rid of larger debris and raking up areas of invasive creepers.

2) Secondary weed control: Intensive follow up weeding straight after primary weeding and treating weed seedlings as they germinate and regrow. Progress of the weeds is monitored. Some are allowed a month or two of growth before they are treated so that they rapidly take up herbicides and / or are easily seen.

3) Maintenance weeding: Maintain and control low weed levels ensures new weeds that have moved into the area or have had the chance to germinate are eliminated.

Initial efforts should be focused on intensive primary and secondary weed control to ensure the management areas have been prepared appropriately. If weeding is not undertaken properly the quality of regeneration outcomes will be severely compromised and maintenance costs will be high.

Weeding should also begin from upslope areas first, as weed propagules inevitably spread downslope in soil and water.

The only species to be retained shall be those native species regenerating naturally on the site. Weeding activities are not to interfere with natural regeneration.

The best weeding strategy should be determined at the initiation of each vegetation management session as the species present and their abundance will change with the seasons and over time.

The basic principles of the "Bradley method" (Bradley 1988) should be followed for weeding the site:

- Work from the best areas of native plants towards weed infested areas;
- Make minimal disturbance as minimising the amount of soil disturbance will reduce the potential for a fresh weed invasion; and
- Let native plant regeneration and establishment of installed plants dictate the rate of weed removal.

Application of these three basic principles of bush regeneration has been proven more effective and efficient in terms of results, cost and labour. Weed control activities will necessarily be more intensive at the beginning of the implementation period and taper off as the weed seed bank in the soil is exhausted.

Manual removal of weeds is preferred as this usually results in minimal disturbance to the soil and existing native species. Such manual methods are considered adequate for the herbaceous and smaller woody species. Small bushes and herbaceous weeds and grasses can easily be hand-weeded by pulling out or using a hand trowel. Persistent clumps of exotic grasses may need to be dug out using a shovel.

Machinery is not recommended for use within the Bushland Parks.

Where possible, removal work is to be undertaken outside of the fruiting and seeding period of weeds that produce large quantities of seed that may be spread by weeding activities. However, if such work is undertaken within these periods, fruits and seeds must first be collected, bagged and disposed of offsite prior to other removal activities that might disturb and distribute the weed seeds.

Weed eradication may include strategic use of herbicide on climbing weeds; chemical treatment using the cut-pain method is considered appropriate for larger vines in infestations of weeds such as *Ipomoea cairica* Morning Glory. Thin vines should be pulled down or cut at chest height then laid with the lower sections on the ground to then apply herbicide spray over them.

For woody weeds, the best method of control is to cut the stem and **immediately** paint the newly exposed cut surface with full strength herbicide. For species with a taproot (such as *Lantana* camara Lantana), the best method is to scrape the surface of the stem near the base of the plant and immediately paint the exposed surface with full strength

herbicide.

Best practice guidelines at the time of writing for herbicide application are described below. **However, because of advances in knowledge, it is important to check on the currency of any proposed chemical management techniques, particularly by consulting the latest *Noxious and environmental weed control handbook – A guide to weed control in non-crop, aquatic and bushland situations* (currently 5th Edition 2011, Rod Ensbey principal author) and / or with the Department of Primary Industries.**

HERBICIDE APPLICATION – CUT AND PAINT

Step 1: clear the area around the base of the stem, then cut the stem horizontally as close to the ground as possible, using secateurs, loppers, bush saw, or chain saw (Weeds CRC 2004).

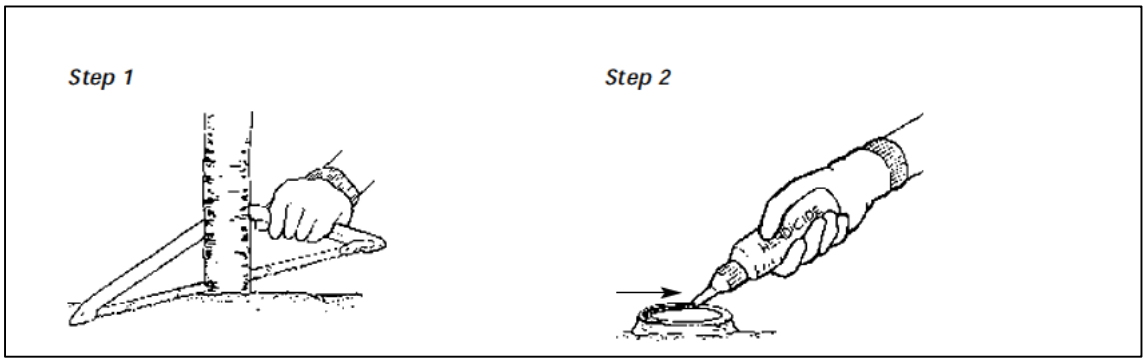
It is important that the cut is horizontal to avoid runoff of herbicide, and sharply angled cuts may present an injury risk.

Step 2: herbicide is then applied as soon as possible (preferably within 10 seconds) to the exposed surface before the plant's cells close up and inhibit the entry of the herbicide.

On larger stems, focus herbicide application on the sapwood and not the heartwood, as herbicide will not be translocated through the stump by the heartwood and will be wasted.

It is easiest to have two people for this process, one to cut and one ready to apply the herbicide as soon as possible.

This approach, though reliable, does not always provide a 100% kill rate, and ongoing follow-up and monitoring of treated plants is required.



Figures from Weeds CRC (2004)

HERBICIDE APPLICATION – SCRAPE AND PAINT

Using a knife and starting from the base, scrape 20 millimetres to 1 metre of the stem to expose the sapwood and apply herbicide to the scraped area within 10 seconds (Weeds CRC 2004).

Do not ring bark the stem. Scrape about one-third of the stem diameter. Larger stems (>10 millimetres) can be scraped on two sides.

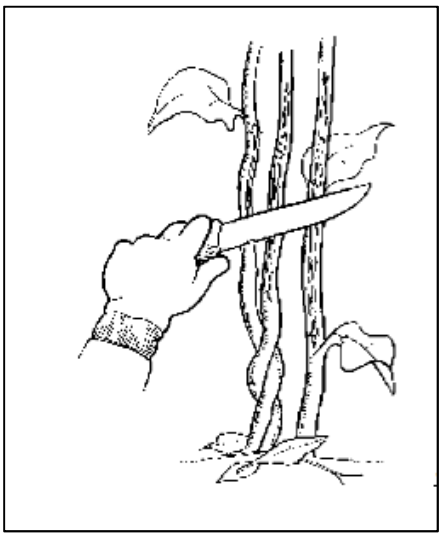


Figure from Weeds CRC (2004)

CAUTIONS AND HAZARDS

As with all herbicide applications, avoid using cut and paint or scrape and paint and similar methods if rain is expected. Herbicide labels have information on the amount of time needed after application before rain for the chemical to remain effective (Weeds CRC 2004).

Herbicides need to be handled with care. They should always be kept well away from children (preferably stored in a locked cabinet) and in the original labelled container.

Ensure that all who are going to use herbicides read and understand the label and can speak to someone qualified in herbicide use if they have any questions.

Herbicides can enter the human body through the skin, by inhalation, or swallowing. Basic safety precautions that should always be observed when using herbicides include:

- **Read the label** before opening the container and follow instructions exactly. If instructions are not understood, seek advice from appropriate authorities.
- **Store only the amount of herbicide needed**. Surplus chemicals remain a hazard.

- **Wear protective clothing**: long sleeves, long pants, sturdy shoes, gloves, and eye protection (goggles/safety glasses). Cotton, leather, canvas and other absorbent materials are not resistant to herbicides so the more layers the better. A PVC apron covering from shoulders to boots should be worn during the mixing process. Note that protective equipment should be worn during:
  – mixing of herbicides (extreme caution required at this point as herbicide is in its most concentrated form)
  – application
  – entering a treated area before the herbicide has dried or dissipated.
- **Always wear chemical-resistant gloves**.
- **Wear a respirator** when mixing or pouring liquid herbicides.
- **Do not eat, drink or smoke** while using herbicide and wash hands after handling.
- **Wash skin and equipment afterwards**. Shower and wash hair at the end of the workday. Wash contaminated clothing separately.
- **Know what the correct procedures are in the event of an accidental spill**.

KEEPING RECORDS

It is recommended and good practice to keep records of herbicide application (Weeds CRC 2004). This allows for the review of the effectiveness of the herbicide treatments and will be included in the compliance monitoring reports.

Specific management information for the most problematic weed species observed on site is provided in Table 2.

8.2 MAINTENANCE WEEDING

The competition for water from grass and weeds during the first spring and summer is possibly the most important influence on seedling survival and growth. It is vital to reduce weed and grass growth as much as possible during this time. The finely divided dense roots of many weeds (especially grasses) effectively compete with native tree and shrub roots for nutrients and, more importantly, water.

Approximately three months after planting, a follow-up herbicide application is recommended. This will maintain an area free from competition around each plant. Future herbicide application to be applied as required (two to four times a year) for up to three years.

A pre-clearing inspection that identifies areas of high threat weeds will enable clearing to be conducted in the right season with appropriate methods that will prevent their spread.

8.3 HYGIENE PROTOCOLS

Hygiene is particularly important to prevent the transfer of plant diseases. The following simple procedures can reduce the chance of transferring diseases during vegetation management activities:

- use of sharp equipment (i.e. knifes and secateurs) that are regularly cleaned with methylated spirits;
- cleaning of loose soil from boots and tools with bleach;
- keeping vehicles out of the works area as soil could be attached to the tyres; and
- ensuring all plants brought onto the site are certified free of pathogens.

The monitoring, maintenance and reporting regimes for the above works are detailed in within this HMP and in erosion and sediment controls as part of the Construction Management Plan of the civil works contractor and shall be strictly observed.

Table 2: *Recommended specific weed control actions for weed species considered to have a high management priority.*

Family	Species	Habit and Habitat	Underground structure	Reproduction	Removal	Confusing species
Araliaceae	*Schefflera actinophylla* Umbrella Tree	Widely naturalised along east coast and is shade tolerant, invading disturbed and undisturbed forest and coastal bushland.	Vigorous root system but can also grow as an epiphyte.	Reproduces by seed. Small red flower clusters occur through spring and summer. Small fruits turn dark red/purple. Seed mostly dispersed by birds and other animals.	Roots can be invasive and block pipes, as well as damage infrastructure. Fruits and flower heads to be collected and bagged. Responds to 'cut and paint' and 'drilling and injecting' with a suitable herbicide (such as Glyphosate).	Similar to other *Schefflera* species.
Asparagaceae	*Asparagus aethiopicus* **WONS** Asparagus Fern	Persistent perennial herb. Many habitats, from coastal dunes to open woodland on many soil types, but particularly where there is shade.	Short thick rhizome. Tuberous roots used as storage organ.	Flowers late winter to spring. Red berries attractive to birds. Grows from seeds that last in soil at least 5 years. Will resprout from rhizome after disturbance, incomplete removal or fire.	Hand remove rhizome by crowning with sharp knife. Autumn-winter best before berries mature. Dispose of removed material off-site.	May be confused with other *Asparagus* species, all of which are exotic and many of which are WONS.
Asteraceae	*Delairea odorata* Cape Ivy	Vigorous twining perennial. Grows in moist areas often adjacent to tall forest on edges, particularly shale batters and below drain outlets.	Stolon.	Flowers in May-August. Small achenes dispersed by wind / water in spring-summer. Grows from stem fragments dumped in bushland.	Hand remove (e.g. raking), making sure to remove all parts of the plant. Can spray with 1% solution of glyphosate-based herbicide. Does not burn and will re-grow after mechanical disturbance.	None.
Commelinaceae	*Tradescantia fluminensis* Wandering Jew	Moist, fertile sheltered soils, particularly in drainage lines, but can grow in full sun to deep shade. Can smother large areas of native vegetation.	Stolons, with shallow-growing, fine fibrous roots growing from nodes.	Reproduces by stem fragments; probably does not produce viable seed in Australia. Will reproduce from the smallest fragment and disturbance can easily spread the plant.	Small infestations can be removed manually and composted (only if thoroughly). By hand: with a knife or roll / rake. Needs repeated follow up. Herbicide: spray thoroughly in winter or early spring, with repeat treatments.	May be easily confused with *Commelina cyanea*, a native species in the same family. The native has a blue flower and fleshy roots while the weed has white flowers and fibrous roots.
Convolvulaceae	*Ipomoea cairica*	Wastelands, along roadsides and on rainforest margins.	Roots from the nodes.	Primarily from broken fragments of stems that produce new roots at the nodes. Produces seeds that are toxic to humans.	Plants can be hand pulled and the roots dug out. Plants can be cut down and stumps painted with suitable herbicide. Will respond to application of 1% glyphosate-based herbicide. Slashed stems will resprout unless follow up treatment occurs.	Easily confused with other Ipomoea species such as *Ipomoea indica*.
Crassulaceae	*Bryophyllum delagoense* Mother of Millions	Disturbed areas, often on rocky sites with very shallow soil.	Stem can be stoloniferous; extensive fibrous roots.	Will grow from plantlets that grow on leaves. Also grows from long-lived seed. Can be dispersed by water.	Hand pull all plants with follow up within weeks. May also be controlled with herbicides at any time of the year, but infestations are easiest to see in winter when the plants are in flower. Treating infestations at this time of year also has the benefit of preventing new seeds from developing.	Can be confused with other *Bryophyllum* species; all are exotic.
Fabaceae	*Senna pendula* var. *glabrata*	Near waterways, closed forest and disturbed sites such as roadsides.	Branching, woody roots generally shallow.	Reproduces by seed. Seed dispersed by water and animals. Will reshoot from any root stock left in the ground.	Hand pull or dig out juvenile plants. Herbicide application methods suitable include cut and paint, scrape and paint or foliar spray for adult plants.	Similar to Senna floribunda which has a more pointed leaf.
Lauraceae	*Cinnamomum camphora* Camphor Laurel	Roadsides, native bushland, rainforest and disturbed riparian habitats.	Shallow but dense root system that establishes within a year.	Reproduces by seed commonly spread by birds. Suckers are readily produced, particularly when older trees are poisoned, cut or damaged.	Newly established individuals or isolated seedlings can be removed by hand pulling or grubbing. Several herbicide applications are suitable for this species including Foliar spray (for trees up to 3m), Basal bark spray (for trees up to 6m), Cut stump method and stem injection (for trees smaller than 6m). Failure to remove roots of mature trees will result in regrowth.	Several closely related species may be confused such as *Cinnamomum oliveri* however, none have a string camphor smell like Camphor Laurel.
Myrtaceae	*Psidium cattleyanum* var. *cattleyanum*	Shrub or small tree of disturbed areas, often forest margins and able to tolerate shade.	Fast growing branching woody roots.	Mainly by seed but suckers are also readily produced. Large numbers of fruits produced annually.	Small plants can be hand pulled out and the roots dug out. Plants can be cut down and stumps painted with suitable herbicide. Will respond to application of 1% glyphosate-based herbicide. Slashed stems will resprout unless follow up treatment occurs.	Similar to other Psidium species but can be distinguished by its purple-red fruit.
Ochnaceae	*Ochna serrulata* Mickey Mouse Plant	Roadsides, waste areas, rainforests, riparian areas and margins of forests.	Angled taproot system that can be easily broken when pulled.	Bright coloured fruits are eaten and seeds dispersed by birds and other species.	Hand pulling is most effective for young seedlings. Larger plants can be grubbed with a mattock ensuring all of the taproot is removed. Herbicide treatments suitable include basal bark spraying and cut stump method.	This species is quite distinctive.

Family	Species	Habit and Habitat	Underground structure	Reproduction	Removal	Confusing species
Poaceae	*Megathyrsus maximus*	Perennial grass common in crops and in disturbed areas.	Short underground rhizomes forming clumps and aboveground erect stems.	Mainly by seed and dispersed mostly by animals.	Herbicide application (foliar spray) to be sprayed close to target species avoiding overspray and potentially killing other plants. Spray to cover all leaves and stems with a visible wetness and left for at least 24 hours.	None.
Poaceae	*Melinis minutiflora* Brazilian stink grass	Perennial grass growing in disturbed areas and along roadsides.	Creeping stems that can be stoloniferous.	Reproduces by creeping stems and also by seed. Seeds are easily dispersed by wind.	Small plants can be hand pulled out and roots dug out. The major root structure is to be lifted out entirely to prevent reshooting stems. Herbicide application (foliar spray) to be sprayed close to target species avoiding overspray and potentially killing other plants. Spray to cover all leaves and stems with a visible wetness and left for at least 24 hours.	Similar to *Melinis* repens.
Solanaceae	*Solanum seaforthianum* Brazilian nightshade	Perennial vine common in untended areas, roadsides, and urban bushland.	Creeping root system.	Reproduces by seed which is dispersed by birds and other animals that may eat the fleshy fruit.	Newly established individuals or isolated seedlings can be removed by hand pulling or grubbing. Several herbicide applications are suitable for this species including Foliar spray (for trees up to 3m), Cut stump method and stem injection (for trees smaller than 6m). Failure to remove roots of mature trees will result in regrowth.	Similar to other *Solanum* species.
Verbenaceae	*Lantana camara* WONS Lantana	Perennial scrambling shrub that forms thickets in disturbed and undisturbed bushland.	Tap root with numerous shallow lateral roots.	Reproduces by seed and stem layering. Fruits all year round (most heavily at end of summer) and birds spread seeds by eating succulent black fruits. Will coppice from base. Weed of National Significance.	Selective hand removal of smaller plants to minimise high disturbance to light levels and encourage the regrowth of other invasive species. Spraying the entire plant (foliar spraying) usually kills plants that are less than 2 m high. Herbicides applied to the lower bark of the stems (the basal bark technique) or immediately painted onto a freshly cut stump (the cut-stump technique) are useful for larger plants. If rafting, prevent stems from touching soil as they will form roots. Remove thickets by progressively cutting back stems until each crown is exposed. Leave stem of about 1 m length attached to crown for cut and paint treatment with glyphosate-based herbicide. Best results achieved if applied during warm, wet summers. Leave stems to die in trees as removal often damages tree.	May be confused with seedlings of *Trema tomentosa* Native Peach, a native species.

9 PLANTINGS

9.1 SPECIES

Plantings on site are to be locally native species known to occur within the vegetation communities on site and in adjoining lands. Plantings within the APZs are to be minimal and consist of low 'fire retardant' shrubs and ground covers. No plantings are to occur within the existing fire break along the southern boundary.

No plantings of any *Acronychia* species are to occur on site due to the risk of genetic introgression of *Acronychia littoralis.*

Plantings are to incorporate the favoured Koala feed trees as per recommendations in the Ecological Response (Ashby and McTackett 2018) and detailed for each Management Area herein. Within the wide verges, tree plantings are to be spaced at least 20 metres to 30 metres a part, in accordance with best practice design guidelines for the Koala (McAlpine et al. 2010). Plantings are also to provide foraging resources for *Pteropus poliocephalus* Grey-headed Flying-fox and Fruit Doves.

Where dense patches of *Acacia disparrima* occur in retained bushland on site, it is recommended that a staged incremental replacement strategy be implemented by the bush regenerator to provide diverse canopy species, including food trees for target threatened species (Koala, Grey-headed Flying-fox, Fruit-doves).

Residents are to be encouraged to plant locally native species in their gardens and particularly avoid heavy nectar-bearing plants in order to prevent dominance by the aggressive Noisy Miner.

Recommended native nurseries for local provenance plant material include:

- Clarence Peak Nursery – Yamba. (02) 6646 1555
- Sundale Palms Nursery – Rileys Hill. 0428 822 988 and 0427 822 332
- Eastern Forest Wholesale Nursery – South Gundurimba. (02) 6629 0353
- Downes Wholesale Nursery – Tuckombil. (02) 6628 6788
- Junction Hill Nursery – Junction Hill. (02) 6644 7650

A consolidated list of appropriate tree species for planting in the landscaped areas, the Bushland Parks, and in private gardens is at Table 3 overleaf. These species will provide primary, secondary and supplementary forage trees for Koalas, key foraging species and blossom throughout the year for Grey-headed Flying-fox, and fruit for Fruit-Doves in all months of the year.

Table 3: *High priority species recommended for planting.*

Large trees	Small-medium trees	Vines
Acmena hemilampra	*Claoxylon australe*	*Cayratia clematidea*
Archontophoenix cunninghamiana	*Melicope micrococca*	*Cissus hypoglauca*
Beilschmiedia obtusifolia	*Myrsine variabilis*	*Cissus sterculiifolia*
Corymbia intermedia	*Notelaea longifolia* forma *intermedia*	*Eustrephus latifolius*
Cryptocarya glaucescens	*Synoum glandulosum*	*Geitonoplesium cymosum*
Endiandra discolor	*Syzygium australe*	*Morinda jasminoides*
Eucalyptus propinqua	*Clerodendrum tomentosum*	*Stephania japonica var. discolor*
Eucalyptus tereticornis	*Glochidion ferdinandi* var. *ferdinandi*	
Gmelina leichhardtii	*Neolitsea australiensis*	
Livistona australis	*Trochocarpa laurina*	
Lophostemon confertus	*Alphitonia excelsa*	
Melaleuca quinquinervia	*Banksia integrifolia*	
Polyscias elegans	*Bridelia exaltata*	
Syzygium luehmannii	*Cupaniopsis anacardioides*	
	Elaeocarpus obovatus	
	Endiandra sieberi	

9.2 WATERING

It is important to provide adequate water at planting. Plants should be soaked for at least 30 minutes prior to planting (before being removed from their pots) and watered thoroughly at planting by applying 1-1.5 litres of water to each new plant.

After planting, plantings should be watered on a weekly basis for a period of 4 weeks (weather conditions dictating frequency). After this period, watering comprising one litre of water per plant each month will be required until the plants have established.

Watering is best carried out in the morning (watering at dusk encourages fungal attack in some species).

9.3 PLANT GUARDS

Plastic plant guards have the potential to become bushland litter and so should only be used where necessary. The use of plant guards in this instance is not recommended as the plants are not likely to be eaten by large herbivores.

10 PROTECTION OF SENSITIVE AREAS

Sensitive areas on the site include an EEC and elements of EECs in the Bushland Parks, and adjacent to the site include World Heritage and National Heritage listed bushland in Iluka Nature Reserve and Bundjalung National Park. These will be protected from the works in the following ways:

- The sensitive areas will be primarily protected by their declaration as "no-go" zones and management according to this HMP.
- Retained bushland to be protected from damage during and after construction by installing appropriate barrier fencing that will prevent accidental incursions while still allowing fauna movements.
- All sedimentation and erosion controls will be strictly observed for all works.
- Erosion and sediment control devices are to be checked daily by the civil works contractor and maintained throughout the duration of the clearing and construction phases, and particularly after periods of substantial rainfall.
- Stockpile areas are to be clearly delineated on plans and on the ground. Soil and vegetation debris must be stockpiled within defined areas that will not impinge on the drip line of adjacent retained vegetation.
- Surreptitious dumping of garden effuse into bushland parks will be prevented by the layout.
- Hygiene controls re the spread of plant disease will be minimised by:
    - Minimising soil movement in and out of the site by the use of wash-down bays and shaker pads; and
    - The installation of plant material certified free from disease.
- An education package to be provided to all new residents that highlights the sensitive nature of the site and surrounds and their environmental obligations. This will include such things as animal control, disposal of garden refuse, and weed potential of garden plants.

11 TREE REMOVAL AND TREE PROTECTION

This section provides the protocol for the removal and protection of trees, including hollow-bearing trees. This applies to all trees on site as well as any trees on Council managed land that may also be removed with approval.

11.1 GENERAL CONTROLS

- Protection and rehabilitation of habitats within Bushland Parks A, B, C, D and E are to occur.
- Detailed plans showing the areas to be cleared and the vegetation to be retained are to be available at all times on site.
- Hollow-bearing trees must only be removed after inspection by, and under the supervision of, a suitably-qualified and experienced ecologist.
- Clearing works on site are to be supervised and controlled by experienced, licenced and vaccinated personnel.
- Erosion and sediment control devices are to be checked daily and maintained throughout the duration of the clearing and construction phases, and particularly after periods of substantial rainfall.
- Stockpile areas are to be clearly delineated on plans and on the ground. Soil and vegetation debris must be stockpiled within defined areas that will not impinge on the drip line of adjacent retained vegetation.
- Newly exposed soil may be rapidly colonised by exotic weed species. Disturbed areas shall be monitored carefully and stabilised as soon as possible.

11.2 PRE-CLEARING ACTIVITIES

- Prior to any clearing, all personnel involved in the clearing and construction operations shall be inducted by the Project Ecologist into the clearing protocol and animal welfare responsibilities.
- The works area is to be clearly delineated (e.g. with high visibility para-webbing) in order to protect the retained vegetation (including Bushland Park areas) from accidental clearing and damage during clearing and construction works. Machinery will be prohibited from straying outside of these marked areas, into the "no-go" zones.
- Immediately prior to any clearing, the Project Ecologist will survey the area to be cleared, including inspection of hollow-bearing trees for resident fauna. Any fauna found are to be relocated out of harm's way in the immediate vicinity in accordance with this HMP and animal welfare controls.
- Immediately prior to any clearing, the Project Ecologist will ensure that the hollow-bearing trees to be felled within that development stage are still

appropriately and obviously tagged with a numbered metal tag and distinctive flagging tape or paint around the trunk so that it may be identified as a habitat tree from any angle by an operator in a machine.

- Targeted survey for Koala to occur immediately prior to clearing in suitable habitat across the site. Any fauna found are to be relocated out of harm's way in the immediate vicinity in accordance with this HMP and animal welfare controls.
- Immediately prior to any clearing, the Project Ecologist will, in the company of the Supervisor of the clearing operations, tag trees for temporary retention that will provide a link from the hollow-bearing trees to the adjacent retained bushland. Trees will be selected based on their distance from each other and the provision of a safe work area for the clearing contractors. These will be tagged in a clear manner but differently from the hollow-bearing trees.
- Prior to clearing works (preferably one month prior), nest boxes will be erected in the adjacent retained bushland under the supervision of the Project Ecologist in order to compensate for the anticipated losses of hollow-bearing trees.
- Best practice erosion and sediment control measures will be installed in all appropriate locations where surface runoff is likely to enter the retained bushland and environmentally-sensitive areas.
- An escape route for resident fauna into the retained bushland is to be identified by the Project Ecologist prior to clearing works. Identified escape routes are to be constantly updated in line with the clearing activities so fauna species do not become trapped by clearing works.
- Trees identified for retention and vulnerable to construction are to be identified and protected according to recommendations of an arborist. This may include measures such as trunk armouring, special root protections or temporary fencing around the Tree Protection Zone.

11.3 GENERAL TREE REMOVAL PROCEDURES

- After the preparatory works are in place and inductions have been conducted, the clearing will be carried out in two stages:
  - Phase 1 will entail the removal of all of the non-tagged vegetation, including understorey and mature trees; and
  - Phase 2 will entail the removal of hollow-bearing trees.
- The Project Ecologist is to be present during Phase 1 clearing in case of error or the need for *ad hoc* alteration to the clearing protocol.
- The Project Ecologist is to supervise the clearing during Phase 2.
- Clearing of mature trees adjacent to the no-go zone should be felled in a direction that will avoid impact on the retained bushland. Similarly, felling of trees near the hollow-bearing trees is to be done in a manner and direction that will not damage the hollow-bearing tree, such as slow pushing of trees to the ground or sectional dismantling.

- Unsalvageable material may be chipped / mulched and stockpiled for use on site in landscaping projects.
- Trees that contain no hollow sections and are considered appropriate are to be salvaged for used as escape posts along Koala exclusion fencing.

11.4 HOLLOW-BEARING TREE REMOVAL PROCEDURES

- Hollow-bearing trees must only be removed after inspection by, and under the supervision of, a suitably-qualified and experienced ecologist.
- Clearing is to be staged so that losses of hollow-bearing trees are gradual, allowing time for fauna to use the replacement nest boxes.
- At least one month prior to Phase 2, nest boxes will be erected in the adjacent retained bushland under the supervision of the Project Ecologist in order to compensate for the anticipated losses of hollow-bearing trees (see Section 4).
- Clearing is to be timed so that the felling of hollow-bearing trees can occur in a season that is least disruptive to resident breeding animals; breeding generally occurs late winter-spring-summer.
- Phase 2 clearing is to occur at least 1 week after Phase 1 so that resident fauna have had a chance to voluntarily vacate the newly-disturbed habitat via the temporary corridor.
- The order of felling of the remaining hollow-bearing trees and temporary corridor trees is to be determined by the Project Ecologist in conjunction with the Supervisor of the clearing operations so that it is done efficiently and safely.
- The hollow-bearing trees are to be removed carefully, giving resident fauna every opportunity to vacate voluntarily and without injury. This may involve initial gentle tapping of the tree with an excavator bucket or similar in order to rouse sleeping animals and then felling of the tree in sections or by gently pushing them over. The methods used is to be determined by the Project Ecologist in conjunction with the Supervisor of the clearing operations so that it is done efficiently and safely.
- Felled hollow sections of trunks and branches are to be inspected by the Project Ecologist and intact and salvageable hollows are to be used as terrestrial and arboreal habitat in the retained bushland. Relocation of the hollows is to be supervised by the Project Ecologist and undertaken without damaging the existing vegetation within this area.
- Note is to be made of the sizes and types of hollows removed so that adequate numbers and types of nest boxes may be erected in the adjacent bushland. The intended and approved ratio of hollow replacement shall be at least 1:1. Supplementary nest boxes (if required) are to be erected as soon as possible after the Phase 2 clearing.
- Unsalvageable material may be chipped / mulched and stockpiled for use on site

in landscaping projects however, not with the bushland parks and APZs due to the increased weed risk and increased fuel load likely produced.

- Any fauna disturbed during clearing operations will be permitted to escape into adjacent habitat unharmed. Where fauna appear to be injured or shocked, fauna will be captured and held in appropriate circumstances by the Project Ecologist until released. Injured native species are to be delivered to a local veterinary clinic for treatment; immature or juvenile fauna which have been displaced from their parents are to be handed to the local wildlife carers as soon as practical:

    - WIRES, phone 1300 094 737
    - Northern Rives Wildlife carers, PO Box 6439 Lismore, phone 6628 1866
    - Sandy Paws vet surgery, 42 Charles Street Iluka, phone 6646 5676

- Unharmed animals may be placed in a species-appropriate nest box during the day or released near the nest boxes in the evening.
- Logs (hollow or otherwise) are to be strategically located for enrichment of terrestrial habitat, and to facilitate movement of species that require cover:
    - Such enrichment is to be undertaken under ecological supervision;
    - Logs to be used are those judged sufficiently intact and safe for relocation;
    - Any proposed enrichment locations within the APZ are to be approved by the bushfire consultant;
    - Any proposed enrichment locations within the landscaped areas are to be approved by the landscape architect; and
    - Locations are to be chosen based on site specific conditions in order to close large gaps, connect patches of bushland, and provide such terrestrial habitat where it is otherwise scarce.

12 NEST BOXES

The numbers and types of hollow-bearing trees to be removed will be determined by the Project Ecologist prior to clearing works. The loss of these potential roosting / breeding sites for fauna is to be ameliorated by the installation of nest boxes in the retained vegetation.

It has been recommended in a number of Impact Assessments undertaken by Keystone Ecological (FFIA (2015), AFFIA (2016), AIA (2017), OUIMNES (2018)) that the hollows are replaced at a ratio of at least 1:1. Supplementary boxes may need to be installed after the felled trees are inspected and the numbers and characteristics of the hollows properly determined.

The following protocol is to be observed:

- Nest boxes are to be installed at a minimum ratio of 1:1 under the supervision of an experienced ecologist.
- Each box is to be installed at a height and aspect that is appropriate for the target species.
- The exact locations of the installed nest boxes are to be determined on site at the time of installation.
- Recipient trees are not to be harmed during the installation. Therefore, the boxes are to be installed by the use of a machine such as a cherry picker or manually, using spikeless climbing techniques.
- The nest boxes are to be erected prior to the felling of the hollow-bearing trees for each development Stage (preferably at least 1 month prior to works).
- The boxes are to be installed in retained vegetation as close as possible to the trees to be felled.
- Data are to be collected re each installation including box type, identifying number, location, height, aspect and the species and size of the host tree. These data are to be provided to Council in a brief report.
- The boxes must be sourced from reputable suppliers (see below) that are experienced in making nest boxes for these target fauna groups / species. The boxes must be sturdy and weather-proof, with thick walls of and secure lids to prevent entry by predators. Appropriate designs are illustrated overleaf.

SUGGESTED SUPPLIERS

Waratah Eco Works / Sleepy Hollow Nesting Boxes
5 Corniche Road
Church Point NSW 2105
Phone: (02) 9979 3313

Web: http://www.waratahecoworks.com.au/index.htm

Hollow Log Homes
150 Chinamans Creek Road
Cambroon QLD 4552
Phone: (07) 5472 3142
Web: http://www.hollowloghomes.com

- Nest boxes are to be monitored by an experienced ecologist on an annual basis for obvious signs of disrepair and replaced as necessary. Any boxes occupied by feral bees are to be replaced. This annual monitoring is to occur until completion of all stages and then for an additional period of 3 years. The requirement for further ongoing monitoring of nest boxes is to be reviewed upon cessation of this 3 year period.

Reporting to the Australian Government Department of Environment and Energy by the Project Ecologist shall occur in accordance with the Conditions of Consent. A sample report template is provided overleaf.

Examples of nest boxes for target fauna.

Progress Report for Nest Boxes

Date of inspection	**Stage of inspection** (e.g. initial installation, 6-month year 1, 12 months, year 1)
Name and contact details of person(s) collecting data	

GENERAL CONDITION							
Nest box number	**Management Unit**	**Condition**				**Evidence of use**	**Damage**
		Poor	**Good**	**Very good**	**Excellent**		
Nest box comments:							

13 DOMESTIC PETS

Domestic pets are known to increase the risk of injury or death to a number of native fauna, including Koalas, many birds, and reptiles. Dog attacks are one of the most significant influences on Koala mortality, whilst cats are known to prey on native birds.

To ensure impacts to the native wildlife is not negligible, a number of management activities are to be adhered to by the future owners of lots.

13.1 FENCING

Appropriate fencing for domestic pets shall be installed around residential lots and within any designate pet runs. When pets are being exercised outside the confinements of the residential lots, all pets must be properly leashed.

At no point is a pet to be off leash when in a public area.

Although lots are to be fenced using suitable exclusion fencing, escape posts and planks are to be installed to allow Koalas (if they gain access) to escape these spaces. Escape poles / planks are to be no greater than 60 degrees in angle against the fence.

Further detail on suitable fencing is given in Section 7 of this HMP.

13.2 ALL PETS

All domestic pets are prohibited from bushland parks. Signage to warn of prohibited activities will be located along the boundaries of bushland parks.

Pets are to be confined within a designated pet -friendly run or kept indoors. Specifically, between dusk to dawn (6pm to 6am):

- dogs are to be either confined indoors or within a Koala exclusion external arrangement, including being restricted to a verandah or garage area, within a small dog run provided by the owner or connected to a long lead.
- cats must be kept inside or within a cat-proof enclosure.

In order to maintain pets on site and ascertain the numbers of pets, all domestic dogs and cats are to be appropriately managed and must comply with the following:

- dogs and cats are to be desexed at an early age to prevent unwanted litters and to minimise the risk of increased feral animals to the local area.
- All domestic pets are to be microchipped and registered within the local council;
- Vaccinations for all dogs and cats are to be kept up to date at all times;

- Dogs and cats are to be wearing appropriate identification (collar and tag) at all times;
- Domestic cats are to either be fitted with a bell to their collar or a motion activated audible and visual alarm to warn nearby wildlife.

New residential lot owners and occupiers within the community subdivision are encouraged to preserve the subdivision as a small pet estate.

It is up to the new owner to provide suitable obedience training to their pets to reduce potential attacks on native fauna.

If a Koala is injured from a dog attack (even after all of these provision) the following response is to be followed:

- Immediately remove the dog from the area.
- Do not touch the Koala.
- If possible, place a suitable box / crate over the Koala with a weight on top to contain the Koala.
- Contact the local vet or wildlife care group.
  - WIRES, phone 1300 094 737
  - Northern Rives Wildlife carers, PO Box 6439 Lismore, phone 6628 1866
  - Sandy Paws vet surgery, 42 Charles Street Iluka, phone 6646 5676

14 EROSION AND SEDIMENT CONTROLS

The site is largely on porous sands and the soils are erodible, thus creating a soil erosion and mobilisation hazard therefore, sediment controls are to be strictly observed.

- Sedimentation and erosion controls are critical and will be strictly observed and maintained.
- Erosion and sediment control devices are to be checked daily and maintained throughout the duration of the clearing and construction phases, and particularly after periods of substantial rainfall. Monitoring and reporting on erosion and sedimentation controls is the responsibility of the civil contractor.
- Stockpile areas are to be clearly delineated on plans and on the ground. Soil and vegetation debris must be stockpiled within defined areas that will not impinge on the drip line of adjacent retained vegetation.
- Regular mowing / slashing will be undertaken to maintain the fire trail as a low fire hazard. Regular sweeps for weeds by the Bush Regeneration Contractor will be necessary to target species that have the potential to spread into the adjacent retained bushland.

Regular monitoring, maintenance and reporting of incidents relating to erosion and sediment controls will be referenced in the Construction Management Plan of the civil works contractor.

15 MONITORING AND COMPLIANCE REPORTING

The following benchmarks, targets and reporting templates are recommended as part of that compliance regime.

The main objective of the monitoring program should be to evaluate the effectiveness of the revegetation and weed management program, to determine if adequate weed suppression is occurring and monitor the success of plantings. If, after monitoring, it is deemed that the weed eradication techniques are ineffective, then the plan can be altered at any time to reduce the weed biomass. Likewise, if plantings fail to establish within 3 months after installation, supplementary planting will be required to meet the required densities.

It is expected that at each maintenance visit noxious weeds should have <2% cover and other weed species are to have <4% cover within each Management Unit by the end of each management visit.

It is expected that at the end of the initial 3-year maintenance period of this HMP that:

- Maintenance of planted stock including replacement plantings to achieve a minimum survival rate of 95% by the end of a 3-year maintenance period;
- Noxious Weeds to be maintained below 2% cover;
- Density of other weeds to be maintained below 4% cover; and
- Total native vegetation cover is to exceed 95%.

Continued small scale weed control and maintenance of Bushland Parks will be required for the life of the development.

Reference points for monitoring and reporting should be established before vegetation management begins. The locations of these points – one in each Bushland Park - may be marked permanently on the ground by iron stake, rock cairn or similar, or the location simply recorded by GPS.

Once the locations for the reference points are established, standard photographs should be taken before this plan is implemented and then again at each monitoring session. The aim of the reference photographs is to provide a pictorial record that will aid in the judgement of the effectiveness of the vegetation management strategies.

Monitoring of each Bushland Park should be carried out immediately before the implementation of this HMP and at regular intervals for the life of the property by the chosen bush regeneration contractor.

Maintenance visits should be conducted at two-monthly intervals by the chosen bush regeneration contractor for the first year after completion of construction of each stage and at 6-monthly intervals thereafter for consecutive years.

Progress reports are to be provided to the Australian Government Department of Environment and Energy in the following timelines:

- **First report:** To be provided at the time of presenting the plan of survey and associated documents for registration and issue of land title for the first stage of individual residential allotments in the subdivision.
- **Second report.** to be provided at a time period six (6) months after the completion of the first report.
- **Third report.** to be provided at a time twelve (12) months following the first report
- **Fourth and fifth reports.** to be undertaken each on an annual basis for the following two (2) years from the completion of the third report
- **Final report.** where the construction of the subdivision development extends for a period greater than three (3) years from the completion of the first stage of the subdivision, the report to the Australian Government Department of Environment and Energy is to be prepared twelve (12) months following the completion of the last stage of the subdivision development.

At each of these assessments, the efficiency of the program should be assessed, and any necessary changes made to the regeneration strategy. The template overleaf is provided as a guide for monitoring and reporting to be conducted across the bushland parks, and in a quadrat of 10 x 10 metres.

Koala management should occur on site annually to monitor the Iluka Koala population. It is recommended that a suitably qualified person be contracted for annual Koala assessments, or a local environmental network undertake annual surveys with a community involvement approach.

An education package to be provided to all new residents that highlights the sensitive nature of the site and surrounds and their environmental obligations. This will include such things as animal control, disposal of garden refuse, weed potential of garden plants and what to do to report a threatened species record.

Progress Report for Bushland Management Works

Management Unit (tick as applicable)	☐ 1	☐ 2	☐ 3	☐ 4	☐ Other……

Date of inspection	**Stage of inspection** (e.g. pre works, 6 month year 1, 12 months year 1)
Name and contact details of person(s) collecting data	

GENERAL CONDITION					
	Major	**Minor**	**None**	**N/A**	**Notes**
Pollution					
Litter / rubbish					
Excessive sediment					
Erosion					
Weeds adjacent to rehabilitation area					
Pests					
Diseases					
Feral animals					
Native fauna evidence (scats, sightings etc)					
Overall habitat value (logs, cover, food etc)					

REGENERATION / WEED CONTROL PERFORMANCE					
Quadrat identifier: **Photograph identifier:**					
Locational details of quadrat (e.g. GPS reading)					
Natural recruitment observed	In quadrat: Y ☐ N ☐				
WEEDS					
Exotic species identified	**% cover**			**% age composition**	
	Canopy	Mid storey	Ground	Seedling / juvenile	Mature / semi mature
Weed control comments:					

NATIVES					
		Trees	**Shrubs**	**Grasses / graminoids / herbs**	**Climbers / scramblers**
Species Diversity (number) (approx. number of species in each layer)					
Structure (m) (height of average specimen in each stratum class)					
Overall cover in quadrat	Nil ☐	<5% ☐	5-20% ☐	>20% and <50% ☐	>50% ☐
Extent of bare soil in quadrat	Nil ☐	<5% ☐	5-20% ☐	>20% and <50% ☐	>50% ☐
Extent of leaf litter in quadrat	Nil ☐	<5% ☐	5-20% ☐	>20% and <50% ☐	>50% ☐
Depth of leaf litter (mm)					
Evidence of plant damage / death by feral animals	Yes ☐	No ☐	Details		
Native plant regeneration - comments					

Corrective actions				
Were previous corrective actions implemented?	Yes ☐	No ☐	N/A ☐	**Comments**
Proposed corrective actions – detail				

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