



Bingara Gorge

Bushland Management Plan

Prepared for
Lend Lease Communities Wilton

29 May 2017



DOCUMENT TRACKING

Item	Detail
Project Name	Bingara Gorge Bushland Management Plan
Project Number	17HAR -6617
Project Manager	David Brennan 0429 322 508
Prepared by	David Brennan
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Approved by	Brendan Dowd
Status	Final
Version Number	1
Last saved on	May 2017
Cover photo	View over the gorge, photo taken David Brennan 28.02.2017

This report should be cited as 'Eco Logical Australia 2017. *Bingara Gorge Bushland Management Plan*. Prepared for Lend Lease Communities Wilton Pty Ltd.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Lend Lease Communities Wilton

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Template 29/9/2015

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Abbreviations

Abbreviation	Description
ACL	Additional Conservation Lands
APZ	Asset Protection Zone
BMP	Bushland Management Plan
BNHW	Burraborang Nepean Hinterland Woodland
BPA	Bushfire Protection Assessment
CEEC	Critically Endangered Ecological Community
CPW	Cumberland Plain Woodland
DotE	Department of the Environment
ELA	Eco Logical Australia
EMP	Environmental Management Plan
EP&R	Environmental Protection and Recreation Lands
EPBC Act	Environment Protection and Biodiversity Conservation
ESL	Ecologically Sensitive Lands
KMP	Koala Management Plan
LEC	Land and Environment Court
LEP	Local Environment Plan
LGA	Local Government Area
LLS	Local Land Services
OEH	Office of Environment and Heritage
SMP	Stormwater Management Plan
SSTF	Shale Sandstone Transition Forest
TEC	Threatened Ecological Community
TSC Act	NSW Threatened Species Conservation Act
VMP	Vegetation Management Plan
WEMP	Weed Eradication and Management Plan
WoNS	Weeds of National Significance
WSC	Wollondilly shire Council

1 Introduction

Lend Lease Communities Wilton (Lend Lease) engaged Eco Logical Australia (ELA) to prepare this Bushland Management Plan (BMP) for the areas of bushland to be conserved at Bingara Gorge near Wilton, NSW. As shown in **Figure 1**, this management plan applies to the Conservation areas, which includes the Environmental Protection and Recreation (EP&R), Ecologically Sensitive Lands (ESL) and Additional Conservation Lands (ACL).

Bingara Gorge is located within the Wollondilly Shire Local Government Area (LGA), 1 km east of the intersection of the Hume Highway and Picton Road, and approximately 80 km south west of the Sydney CBD.

1.1 Purpose

This BMP has been prepared to update and supersede the BMP prepared by HWR in 2006, in accordance with the *Terms of Order* as laid out by the Land and Environment Court (LEC) (Case No. 158921 of 2016), Condition 1(5)(c)(iv) page 5.

i. *An updated Bushland Management Plan (BMP) to include the following:*

- *Purpose of the BMP within the overall context of the Bingara Gorge Development and management objectives and the consistency of these purposes or objectives with respect to the measures adopted for the proposed development.*
- *Description of the statutory framework and consistency of the BMP with this framework as well as other plans and Strategies of relevance to the development application.*
- *Concise overview of the conservation values of the site of the proposed development including bushland, instream and riparian environments as well as potential impacts to these values from all components of the proposed development, including the construction of fire trails;*
- *Management actions consistent with the Weed Eradication and Management Plan, Stormwater Management Plan, Koala Management Plan as well as applicable conditions of the proposed consent to mitigate direct and indirect potential impacts associated with the development application.*
- *Implementation Action Plan outlining performance indicators for each action, broad timeframes for the implementation of each action as well as responsibility (of both the proponent and other parties) for the implementation of each action. The Action Plan should form the basis of an ongoing management Operation Plan for the management of all EP&R Lands and ACL and Development Precincts.*

The objective of this plan has not changed from the previous objectives supplied by HWR in 2006, which is that given the existing high quality of the vegetation to be conserved, the overarching approach of bush land management is to minimise impacts on bushland areas and undertake bush regeneration, in order to assist native regeneration, where the natural processes that lead to the re-establishment of native plant species and habitat improvements are 'triggered' by management, with the long term goal being self-perpetuation high quality woodland. Further descriptions of bush regeneration principles are discussed below.

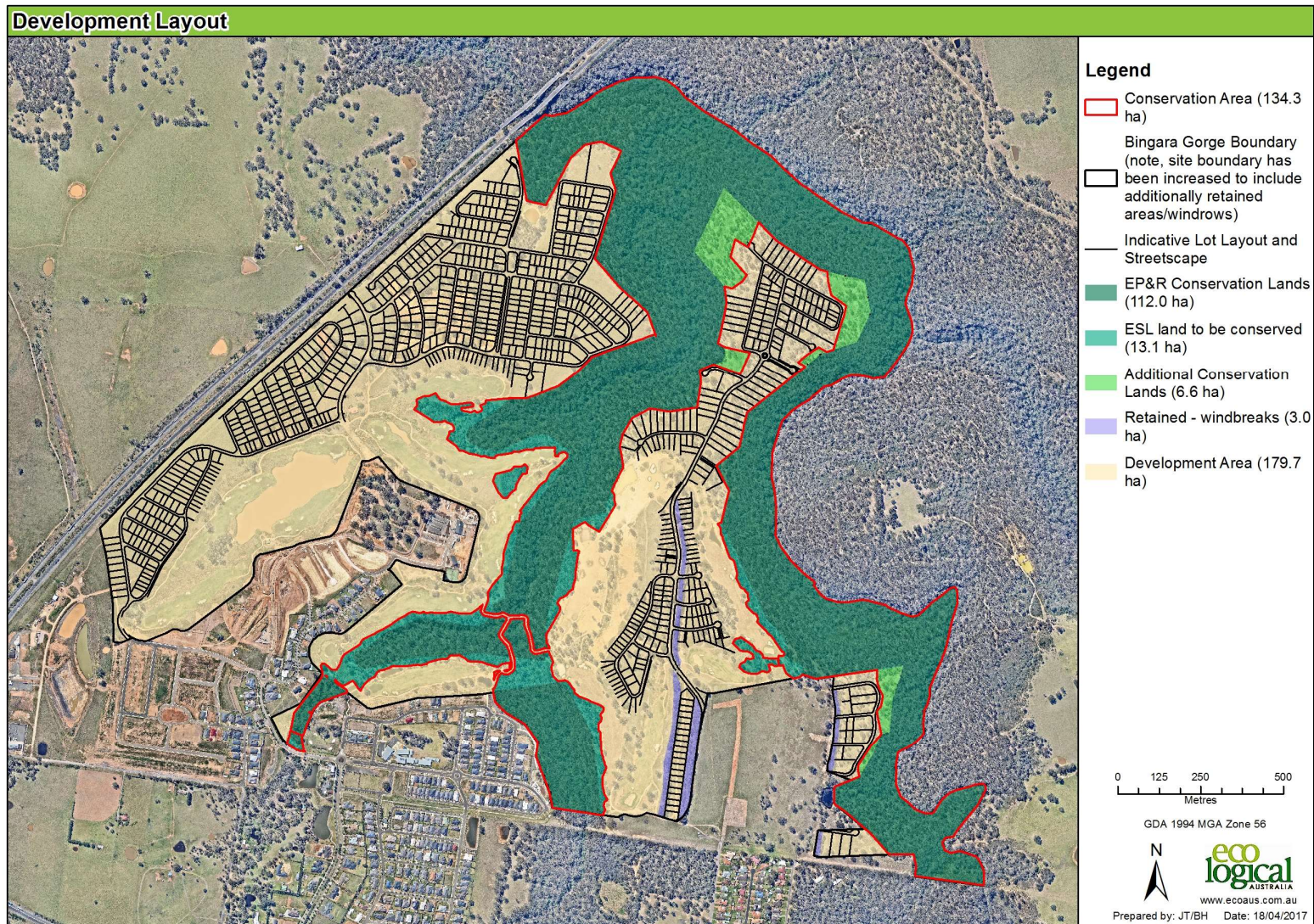


Figure 1: Final lot layout

2 BMP Framework

2.1 Legislative requirements

This BMP has been prepared to meet regulatory requirements requested by the NSW Land and Environment Court. Other legislation includes:

2.1.1 Commonwealth

In 2015, the Australian Government Department of the Environment (DotE), determined that the development site previously referred to as Bingara Gorge, would be a controlled action requiring further assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC 2014/7400).

Whilst the bushland is not currently protected under the EPBC Act, the EPBC acts to protect EPBC listed species and communities present onsite.

2.1.2 State

Voluntary Planning Agreement

In 2012, Bradcorp Wilton Park Pty Limited entered into a Voluntary Planning Agreement (VPA) with the NSW State Government for the protection and preservation of the EP&R lands, including ESL and ACL lands. The VPA sets out the requirements for the establishment of, and contribution to, an Environmental Management Fund and in perpetuity management of bushland areas at Bingara Gorge, to accompany development within the site. Under the VPA, the Community Association is also required to provide annual funding, generated from community levies, towards the environmental trust.

NSW Threatened Species Conservation Act 1995 (TSC Act) protects the TSC listed threatened species and communities onsite.

The bushland will be managed under an array of plans and strategies, see **Section 2.2**. These plans and strategies guide management actions under an array of legislation, which is spelled out in greater detail within relevant plans, however, an overview of the array of relevant legislation that applies to the management of the site includes:

- Agricultural and Veterinary Chemicals Code Act 1994
- Bushfire Environment Assessment Code 2003
- Catchment Management Act 1989
- Contaminated Land Management Act 1997
- Environmental Planning and Assessment Act 1979 (EP&A Act)
- Fisheries Management Act 1994 (FM Act)
- Heritage Act 1977
- Local Government Act 1993 (LG Act)
- Local Government Amendment (Ecologically Sustainable Development) Act 1997
- Local Land Services Act 2013
- Native Vegetation Conservation Act 1998
- National Parks and Wildlife Act 1974 (NPW Act)
- National Weeds Strategy 2007
- National Parks and Wildlife Act 1974
- Noxious Weeds Act 1993
- NSW Games and Feral Animal Control Act 2002

- Pesticide Act 1999
- Protection of the Environment Operations Act 1997 (POEO Act)
- Rural Fires Act 1997 (RF Act)
- Water Management Act 2000 (WM Act)

2.1.3 Local

The *Wollondilly Local Environment Plan* (LEP 2011) identifies areas of Ecologically Sensitive Land (ESL) onsite (as shown in **Figure 1**), with the objective of identifying areas to aid in;

- protecting native flora and fauna
- protecting the ecological processes necessary for their continued existence
- encouraging the recovery of native flora and fauna and their habitats
- protecting water quality within drinking water catchments

Whilst the ESL identification acts only as a planning mechanism and decision making tool, in order to achieve the objectives identified above, the ESL areas are included within the EP&R lands to be preserved under the VPA.

The EP&R Lands are currently zoned R2 for low density development.

2.2 Relevant plans and strategies

This plan replaces the BMP prepared by HWR in 2006. This plan is also designed to fit in with the Environmental Management Plan (EMP) provided with the EPBC assessment for the management of EP&R Lands (ELA 2015a).

This plan should be read with the following plans:

- Vegetation Management Plan (VMP) prepared in conjunction with this plan (ELA 2017)
- Koala Management Plan, prepared by ELA 2015c, updated 2017
- Bushfire management plan, in preparation ELA 2017a
- Weed Eradication and Management Plan (WEMP), prepared for the Bushland, Golf Town & Green Bridge East development precincts, ELA 2015b, and applicable WEMP for other development precincts
- Stormwater Management Plan (SMP), prepared by J. Wyndham Prince 2013
- EPBC Assessment Report, ELA 2015

3 Conservation values and potential impacts

3.1 Vegetation communities

The majority of the flatter, more arable lands at the site consists of former grazing paddocks and agricultural land which are to be developed. With the gorges, of Allens and Stringybark Creek, the bushland hasn't been subjected to significant previous disturbance and these are in good condition, with good structure and diversity being retained.

Vegetation communities present within the bushland areas are shown in **Figure 2**, and include:

- Shale Sandstone Transition Woodland
- Burraborang-Nepean Hinterland Woodland
- Hinterland Sandstone Gully Forest
- Sydney Hinterland Transition Woodland
- Riparian Forest

3.1.1 Threatened flora species

Threatened flora species known to occur within the bushland areas are shown in **Figure 3**, and include the following species:

- *Acacia bynoeana* (Bynoe's Wattle)
- *Grevillea parviflora subsp. parviflora* (Small-flower Grevillea)
- *Melaleuca deanei* (Deane's Melaleuca)
- *Persoonia bargoensis* (Bargo Geebung).

3.1.2 Threatened fauna species

Threatened fauna species with the potential to occur within the bushland areas include the following species:

- *Chalinobolus dwyeri* (Large-eared Pied Bat)
- *Heleioporus australiacus* (Giant Burrowing Frog)
- *Lathamus discolor* (Swift Parrot)
- *Ninox connivens* (Barking Owl)
- *Ninox strenua* (Powerful Owl)
- *Pteropus poliocephalus* (Grey-headed Flying Fox)
- *Phascolarctos cinereus* (Koala).

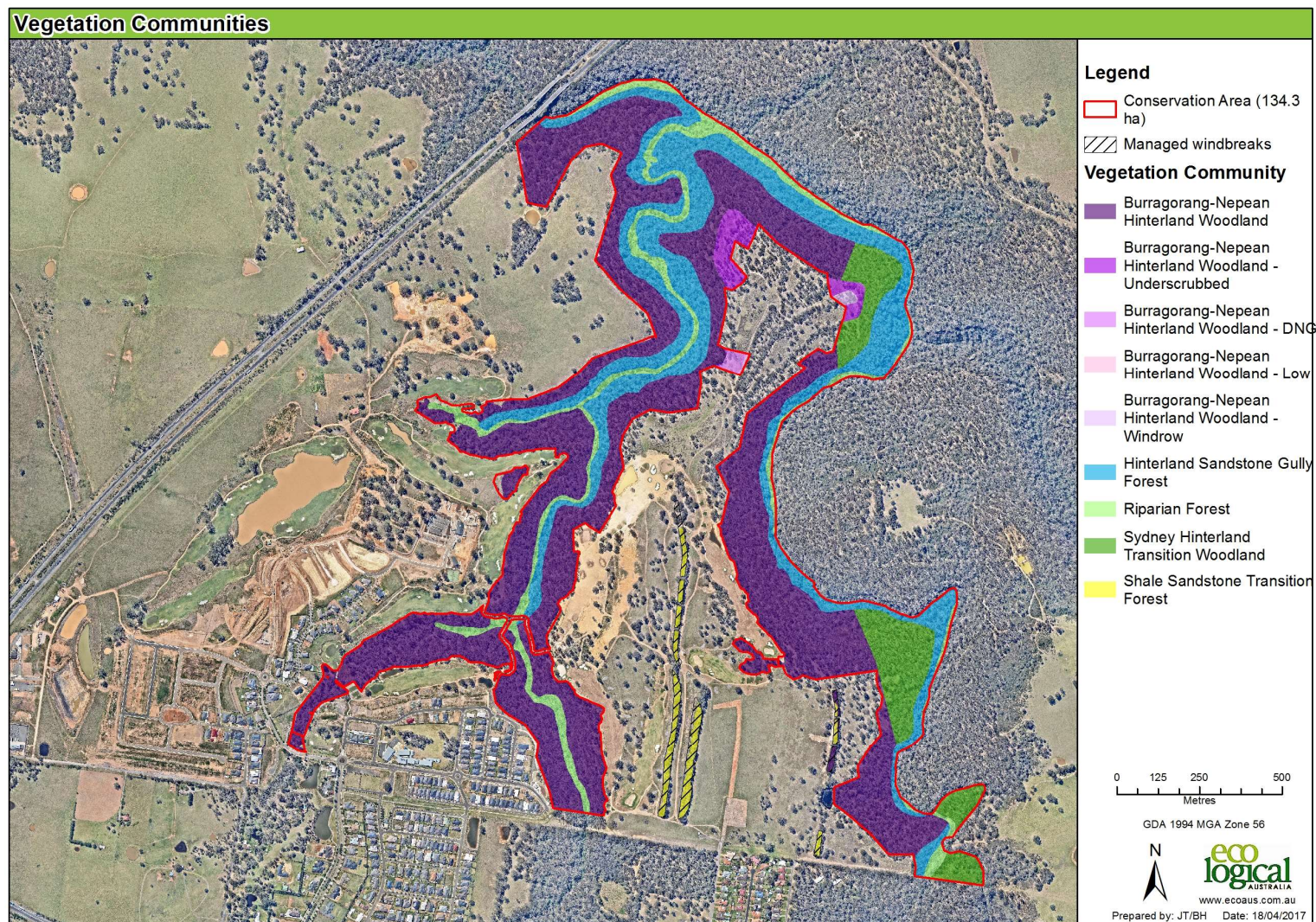


Figure 2: Vegetation communities

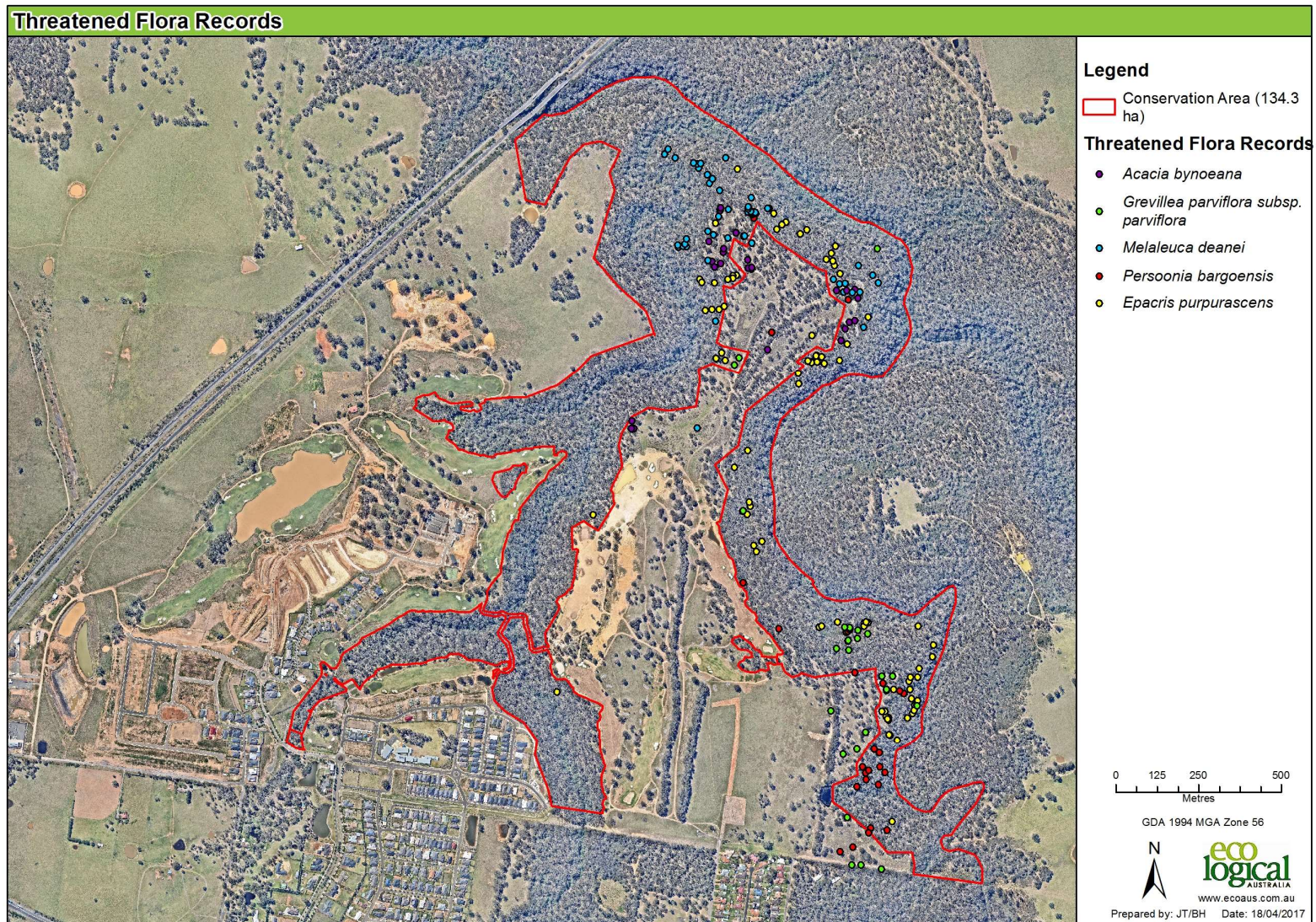


Figure 3: Threatened flora records

3.2 Potential impacts

Potential impacts to conservation of the site from the proposed development, including bushland, instream and riparian environments have been identified in **Table 1** below:

Table 1: Conservation values and potential impacts

Conservation Values	Proposed actions	Potential impacts on conservation values
Bushland / native vegetation communities	Clearing and bulk earthworks	<ul style="list-style-type: none"> • Loss of vegetation cover • Fragmentation of habitat • Introduction of weeds • Introduction of soil / water borne diseases i.e. phytophthora • Spread of litter / rubbish
	Changes in hydrology, water quality and water run-off	<ul style="list-style-type: none"> • Excess run-off • Introduction of weeds • Spread of litter and rubbish
	Construction and maintenance of fire / walking trails	<ul style="list-style-type: none"> • Loss of vegetation cover • Introduction of weeds, i.e. brought in on clothing on walkers i.e. edge effects • Spread of litter and rubbish
	Interactions with humans	<p><u>Residential</u></p> <ul style="list-style-type: none"> • Introduction of weeds, including garden escape plants and through dumping of green waste • Spread of litter and rubbish <p><u>Golf course</u></p> <ul style="list-style-type: none"> • Increased nutrient rich run-off • Pesticide / herbicide overspray • Introduction of weeds, including garden escape plants • Spread of litter and rubbish • Trampling of plants (to find balls)
Native fauna	Clearing and bulk earthworks	<ul style="list-style-type: none"> • Death and injury as a result of works • Loss of hollows / hollow bearing trees • Loss of breeding and foraging habitat • Fragmentation of habitat
	Changes in hydrology, water quality and water run-off	<ul style="list-style-type: none"> • Decrease in water quality for native aquatic fauna
	Interactions with humans	<ul style="list-style-type: none"> • Attack from companion animals & pest species • Light pollution • Noise pollution
Native threatened flora	Clearing and bulk earthworks	<ul style="list-style-type: none"> • Loss of threatened flora (as identified)
	Interactions with humans	<ul style="list-style-type: none"> • Trampling and vandalism • Increased nutrient rich run-off • Pesticide / herbicide overspray

Further details of the potential impacts and key threatening processes have been included in the VMP (ELA 2017). These include:

- Land Clearing leading to loss, fragmentation of vegetation cover, habitat / hollow bearing tree loss
- Changes to hydrology
- Pest species
- Weed impacts
- Fire regimes
- Introduction of pathogens and disease

4 Bushland management

4.1 Objectives

The previous BMP objectives (HWR 2006) included:

- *To use minimum intervention to help assist the natural recovery process:*
- *Ensure that any reconstruction / revegetation programs encourage the self-perpetuation of the plant community and the dominance of local occurring species, and*
- *Promote improved opportunities for regeneration by working outwards from good areas of bush to weed; and*
- *Promote improved opportunities for natural regeneration through managing and eliminating disturbance and weed in adjacent areas.*

The management of these objectives is further detailed in the Vegetation Management Plan (VMP) (ELA 2017a), prepared in conjunction with this document. The VMP aims to preserve and management the bushland through the mitigation of construction impacts on conservation values, identifies management strategies for pest species management, bush regeneration and weed control activities, Bushfire risk reduction and establishes requirements for revegetation.

4.2 Management actions

4.2.1 Mitigation of construction impacts

The impacts of constructions will be mitigated through:

- Fauna management, including the felling of trees as per the Fauna Management Plan in the VMP (ELA 2017a),
- Fencing & signage around the conservation areas to exclude access
- Sediment and erosion control
- Pest management
- Contractor education and hygiene controls

4.2.2 Threatened flora

A Translocation Plan has been included in the VMP (ELA 2017a) to guide the translocation of threatened native flora individuals that would otherwise be subject to loss. The VMP included specifications for exclusion fencing around the ACL / native flora translocation areas to exclude rabbits, deer and the general public.

4.2.3 Threatened fauna

The VMP includes details on the management of pest species which compete for resources and predate upon native fauna, including baiting, trapping and den destruction of foxes and feral cats. An education program will be required to promote responsible pet ownership to protect native fauna, included in the Koala Management Actions outlined in further detail in **Section 7** below.

When tree felling occurs as part of the development works, the Fauna Management Plan, contained within the VMP (ELA 2017), is to be adhered to. This is to include undertaking a preclearance survey to identify hollow bearing or potential habitat trees, any identified hollow bearing trees are then to be felled using soft felling techniques, under the supervision of an ecologist with experience in native fauna relocation / handling.

4.2.4 Bush regeneration

Bush regeneration will be required throughout the conservation areas, to manage or mitigate any impacts from the development. Best practice bush regeneration practices are described by Buchanan (2000) as summarised below:

- Where available, refer to best practice guidelines for control actions of individual weed species and apply these to the site bearing in mind that a) these guidelines are usually written from an agricultural perspective and so may need to be adapted to the actual setting b) the potential for off-target damage may be high because some areas contains EECs and CEECs intermingled with exotic species
- The practice of working from good to bad condition bushland may be applicable in certain situations, however the focus of bush regeneration works onsite will mainly to target edges / buffer areas and identify and treat weed hot spots such as along creeks to stop them encroaching into better bushland areas
- Ensure correct plant identification – many weed species are difficult to identify because they resemble native species or typically occur in a vegetative (i.e. non-flowering) form
- Limit the creation of bare patches of soil and soil disturbance in general, since this will encourage weeds to establish and grow – do not create unnecessary tracks with vehicles or other machinery
- As a first option for weed control, consider methods that don't use herbicide (e.g. hand pulling and crowning) and which create very little soil disturbance
- When using herbicides, use the least toxic chemical whenever possible and always follow the instructions
- When working on or near drainage lines, use an approved herbicide for this environment (e.g. Roundup Biactive®)
- Refer to Australian Pesticides and Veterinary Medicines Authority (APVMA) website (www.apvma.gov.au) for information on off-label permits
- Apply herbicides when the plants are actively growing and prior to seed set to achieve the best results
- Regularly monitor for new infestations and report on the outcomes of the Vegetation Management Plan
- Where woody weeds are providing habitat for native birds and animals, use the drill and fill technique to enable the structure to remain in situ while the tree or shrub dies – this will enable the plant to provide shelter for a period of time, while giving the birds and animals a chance to move on of their own accord

A flexible approach to bush regeneration is essential since techniques may need to be changed or modified to suit site conditions. This approach is consistent with adaptive management (Australian Government 2012) and allows the contractor to develop and build on site knowledge whilst implementing the VMP. Regular monitoring and reporting will take place and this will support an adaptive management approach. This is because periodic assessments will be made to see what's working and what's not. For areas needing improvement, new methods or approaches may be used to see if a better outcome can be achieved. It is in this way, that adaptive management uses site knowledge to inform future works.

Weed control actions in the development area will be determined by the WEMP, detailed below in Section 5.

4.2.5 APZ areas and fire trails

The construction of APZ areas and fire trails are detailed in the VMP (ELA 2017a), the Bushfire Protection Assessment (BPA) (ELA 2016) and the BPA reports for the Fairways North and Golf Town stages (ELA

2017b & ELA 2017c). The management of weeds in APZ areas, along fire trails will both reduce fire risk and lessen the impacts on native vegetation retained within the bushland areas.

The creation of fire trails will require the clearance of native vegetation, as per the Fauna Management Plan included in the VMP (ELA 2017a). In order to minimise the ecological impact, fire trails should be 'micro-sited' in consultation with a Bushfire consultant and Ecologist or Bush Regenerator to retain key ecological features, i.e. old, hollow bearing or habitat providing trees, rock outcrops or logs.

4.3 Monitoring and reporting

Monitoring and reporting will be required to be undertaken against the assessment criteria and at the timeframes included within the VMP (ELA 2017a). These actions have been extrapolated and are included in **Appendix A**.

5 Weed eradication and management

Weed control, in the 'Bushland', 'Greenbridge east' and 'Golftown' development areas, including within the retained windbreaks is to be undertaken as per the Weed Eradication and Management Plan (WEMP) (ELA 2015b). An over-arching WEMP for the entire development is yet to be prepared.

5.1 Objectives

The WEMP guides the management and maintenance of weeds listed as noxious in Wollondilly LGA under the NSW *Noxious Weed Act 1993* and other environmental weeds in order to reduce their negative impacts on the economy, community and environment. The WEMP identifies:

- Noxious and environmental weeds onsite
- documenting the area and degree of weed infestations within the site
- identifying control methods for each weed type
- identifying ongoing management and monitoring processes to reduce the potential for weeds to be introduced or re-introduced to the site or transported from the site
- identifying ongoing management processes to control weeds if introduction or re-introduction occurs

5.2 Noxious weeds

The WEMP identified five noxious weeds within the three development area surveyed in 2015, including:

- *Asparagus asparagoides* (Bridal creeper)
- *Lycium ferocissimum* (African Boxthorn)
- *Rubus fruticosus* agg. Species (Blackberry)
- *Senecio madagascariensis* (Fireweed)
- *Nassella trichotoma* (Serrated tussock grass)

5.3 Management actions

Required management actions are provided in the **Table 2** from the WEMP (ELA 2015b) as below:

Table 2: Noxious and environmental weed management actions required (ELA 2015b)

Stage	Management Action
Prior to civil works	Given the seasonal nature of weed germination and growth, and the potential delay between approval and implementation of this plan, it is recommended that a qualified ecologist or bush regenerator be onsite immediately prior to any vegetation clearance or weed eradication to identify any additional significant weeds on site and provide recommendations for management.
	Control of woody weeds should be undertaken via the 'cut and paint' method.
	Control of pasture grasses should be undertaken through repeated slashing with machinery.
	Control of woody weed regrowth, noxious or significant environmental weeds (e.g. WoNS) should be undertaken by herbicide spraying.

Stage	Management Action
	Weed control must be started well before civil works to allow for repeated treatments to exhaust the seed bank.
	Vegetative material generated and weed propagules, including from woody weeds, should be disposed of appropriately offsite.
	Woody weed material can be mulched and remain on-site, stockpiled separately from native mulch.
During civil works	Machinery is to be washed down before entering and leaving the site. Wash down areas are to be inspected periodically to control any potential weeds prior to flower or seed production.
	Mitigation measures, including erosion control, should be put in place to prevent the movement of weed seeds.
	Topsoil should be removed as part of earthworks only where there is minimal weed invasion. If significant weeds are present then management of weeds as per above must be undertaken. Topsoil may be stockpiled on-site.
	All stockpiles must be located > 50 m from riparian land and areas of native vegetation.
	Any fill used on-site must be 'clean' fill free of weed propagules. The site supplying the fill (either onsite or off site) is to be inspected prior to the transportation of any fill material. This includes the inspection of any topsoil on site that is to be stockpiled. If invasive weeds are present within the fill material, the weeds are to be treated prior to fill transportation. Treatment must take into consideration the likelihood of seed being present in the soil and include measures to reduce the potential for transported seed to germinate (e.g. through stockpiling time or through the use of pre-emergent herbicides). The inspection is to be undertaken by a qualified and experienced person holding a minimum qualification of TAFE Cert III in CLM. Written certification that the fill is 'clean' from weeds is required prior to transportation.
	The area receiving fill, including stockpiles, must have sediment fences installed around the perimeter of the fill placement areas.
	Monitoring of fill, including stockpiles will be required fortnightly for a period of three months after fill has been transported. The frequency of the monitoring is designed to reduce the potential for weeds to reproduce and re-establish. A brief report is to be submitted following each site visit outlining the date of the inspection, weeds observed and treatment action required. Monitoring is to be undertaken by a suitably qualified and experienced person holding a minimum qualification of TAFE Cert III in CLM.
After civil works	Engage a qualified ecologist or bush regenerator holding a minimum qualification of TAFE Cert III in CLM to undertake regular maintenance inspections to ensure weeds do not re-establish and set seed. If weeds are recorded on site they must be treated within five days.
	Undertake ongoing management of the site, as specified in WEMP (ELA 2015b), until lot ownership is transferred.

5.3.1 Additional requirements

Additional requirements are included for Serrated Tussock and St Johns Wort as identified in **Table 3** and an annual weed management plan, detailed below.

Table 3: Additional management items for Serrated Tussock and St Johns Wort (ELA 2015b)

Item	Activities	Task	Frequency	By whom
Monitoring and early intervention	Site inspection and survey	Map all known populations and key areas	Monthly	Field Ecologist / Bush Regeneration contractor
	Establish 'no go' zones or flagged areas to limited on-site seed distribution	Exclusion fencing in place	ongoing	Field Ecologist / Bush Regeneration contractor
	Educational program	Identification literature provided to staff	ongoing	Field Ecologist
	Inspection of plant and wash down bays	Pre and post use inspections of plant for seeds and soil	Daily	Grounds staff/ Civil contractor
Integrated weed management program	Non-chemical weed control	Manual removal of small and isolated specimens	ongoing	Bush Regeneration contractor
		Grass cutting and slashing equipment excluded from 'no go' zones	ongoing	Grounds staff/ Civil contractor
	Chemical control	A variety of registered herbicides used in coordination with other methods to reduce incidence of herbicide resistance	ongoing	Bush Regeneration contractor
	Biological control	Establishment of biological controls within the subject site		Make contact LCA noxious weeds officer of NSW DPI

An annual weed management program will be required during all stages of the civil works, especially in the peak growing seasons. The frequency of maintenance required will depend on the persistence of exotic species and seasonal changes (e.g. less frequent in the cooler months). It is expected that maintenance works following will be required at least bi-monthly during the peak growing seasons and quarterly in the cooler periods.

Ongoing management that are required include:

- Treatment of any regrowth from primary treated weed species
- Control of subsequent growth of other weed species
- Reduction of the potential for the spread of weeds to and from the site.

These will need to be implemented through all stages of the civil works. These processes include but are not limited to the following:

- Any weeds recorded on site are to be treated in an appropriate manner within five days of their presence been reported. It is recommended that Lend Lease Communities Pty Ltd establish an agreement with a suitable service provider to provide responses within these timeframes.
- Sediment basins, dams or water features (Golf Course) within the site are monitored for weed occurrence monthly (including aquatic weeds). Any weeds are to be eradicated in an appropriate manner within five days of their presence been reported.
- Any herbicide spraying in proximity to waterways is to only use herbicides formulated for this purpose (e.g. Roundup® Bioactive™) and is to be conducted with care to avoid unnecessary damage to native species.
- Where noxious weed material and soil contaminated with weed material is found onsite, it will be removed from the site in sealed plastic bags and disposed of offsite and taken to an appropriately licensed waste disposal facility.
- Regular (at minimum monthly) surveys and treatment of disturbed edges (pathways and access roads) and urban interfaces.

5.4 Monitoring and reporting

Monitoring and reporting will be required to be undertaken against the assessment criteria and at the timeframes included within the WEMP (ELA 2015b). These actions have been extrapolated and are included in **Appendix A**.

6 Stormwater management, Water Quality and Flooding

The management and mitigation of stormwater, water quality and flooding actions, have been identified in the Flooding, Stormwater and Water Quality Management Strategy Report (FSWQMSR) prepared by J. Wyndham Prince in 2013.

6.1 Objectives

Current water quality and the health of aquatic ecosystems need to be maintained during construction and monitored for a period of five years post completion of construction activities, as required by Council. Specific objectives of the FSWQMSR (J. Wyndham Prince 2013) include:

- *To prevent flood damage to the built and natural environment, inundation of dwellings and stormwater damage to properties*
- *To ensure stability within the watercourse, manage salinity, bank erosion and sedimentation and control pollutants to minimise adverse impacts on aquatic ecosystems*
- *To provide a safe, efficient, maintainable urban water management system*
- *To utilise stormwater as treated wastewater as resources to create an aesthetic and economic base that enhances property values and contributes to the amenity, appearance and urban structure of the suburb*
- *To ensure that after development is complete, peak stormwater runoff in the Allen's Creek system is within sustainable levels*
- *To ensure that the quality of the stormwater discharging to the Allens Creek system meets the statutory targets*
- *To conserve and enhance biological diversity and ecological health to the bushland corridors within the site*
- *To integrate with the sewage system to achieve significant reductions in potable water demand*

6.2 Management actions

6.2.1 Water quality

Surface water runoff potentially containing pesticides, fertilisers or increased flow of water due to irrigation of landscaped areas, residential gardens, and golf course areas will need to be managed so as to not adversely impact on regenerating or revegetating areas.

Water quality data, will need to be assessed throughout the duration of construction works and for five years, to ensure the development and future residential housing is not adversely affecting water quality in either Stringybark Creek or Allens Creek. Baseline data has been collected for water quality by previous reports by HWR in 2006 & 2007.

If issues with water quality are identified by water quality monitoring, appropriately qualified hydrologist should be consulted, in coordination with Bush Regeneration contractors to remediate the issue.

6.2.2 Emergency spill management

Emergency spill kits are required to be accessible in areas where chemicals are in use and personnel are required to be trained in their use. This applies to all personnel: including golf course maintenance personnel, rangers and bushcare groups.

6.2.3 Stormwater management

Stormwater management actions as per the SMP (J. Wyndham Price 2013) is to be implemented.

Note that it is recommended that straw bales, as recommended in the Landcom 'Blue Book' should be replaced with a more ecologically sensitive product such as coir logs, as straw bales often contain weedy grass seed, which is liable to spread into bushland areas.

6.3 Monitoring and reporting

Council requires water quality to be monitored for five years. This should be done at the same locations and for the same parameters as for the baseline assessment.

HWR (2007) recommended that future monitoring be conducted annually in early spring and be reported to Council. Results of monitoring need to be interpreted in the context of environmental changes such as droughts.

7 Koala Management

The Koala Management Plan (KMP), prepared by ELA in 2015, updated in 2017, provides guidance for the proper conservation and management of areas of potential koala habitat. Field studies within the KMP and other studies did not identify any Koalas onsite, however the area may provide potential movement corridors through the site.

7.1 Objectives

The KMP identifies the following three impacts as having the greatest potential impact of proposed development:

- loss, modification and fragmentation of habitat
- predation by feral and domestic dogs
- road-kills

7.2 Management actions

The KMP provides a precautionary approach to safeguard the potential Koala habitat onsite

7.2.1 Removed and retained native vegetation

The EP&R and ACL lands include 137 ha of potential foraging habitat to be retained with 33.6 ha to be removed. Prior to the felling of any trees, a fauna survey will be undertaken by a qualified ecologist not more than 24 hours prior to clearance to identify any evidence of Koalas onsite, if found tree clearance is not to occur until Koalas have been captured and relocated.

Within the areas to be retained, actions include:

- no native vegetation (includes trees, shrubs and grasses) will be cleared for any purpose other than the maintenance of necessary management tracks
- no new structures, roads or paths will be built apart from those approved
- dogs will not be permitted to roam freely

The retained native vegetation will be managed to maintain and improve on its current high condition as directed by the VMP, including the removal of weeds from, and restoration of, disturbed areas and removal of any rubbish from disturbed areas.

7.2.2 Landscaping within residential area

Landscape plantings will need to ensure they do not attract Koala into residential areas, a list of potential Koala foraging trees to be avoided has been included in the KMP as **Table 1**.

7.2.3 Conservation fencing

A combination of fencing and discouragement planting is proposed for the border of the Conservation area, with further details provided in the VMP (ELA 2017a).

Koala friendly fencing is to be used so that Koalas are discouraged but not excluded unnecessarily, for example:

- Use of minimal building materials such as post and rail with a minimum gap of 300 mm between rails.

- Other fencing material that has holes or gaps of a minimum of 300 mm in diameter, and the first gap is flush with the ground and no more than 400mm from the ground.
- If solid fencing material that cannot be climbed by a Koala is used, then a minimum gap of 300 mm between the ground and the bottom of the fence would be constructed to allow Koala to crawl under the fence (QLD Department of Environment and Heritage Protection (DEHP) 2012).

7.2.4 Threats from domestic dogs

The most effective measure to prevent dog attacks on Koalas will be community education programs promoting responsible dog-ownership. If dogs are to reside within lots adjacent to the Conservation areas, dedicated areas must be created as dog enclosures, where dogs are confined between 6 pm and 6 am, and would need to:

- Use Koala exclusion fencing around the dog's enclosure (but not the property boundary) to prohibit Koala access to the dog's area, and
- Manage vegetation adjacent to fencing to ensure Koala exclusion effectiveness (i.e. no vegetation within 3 m of fencing, and maintain fence free of vegetation and materials that could be used by Koala to climb) (QLD DEHP 2012).

7.2.5 Minimising impact during construction

Construction sites pose a threat to Koala's if they enter, including presence of pits or trenches. Temporary fencing will be required around construction areas that exclude Koala's including:

- Fencing material that is climbable, but incorporates a floppy top design that falls to outside the construction area, or smooth metal or perspex sheets of at least 600 mm in width at the top of the fence (including posts and supports). Fence and supports should be on the construction activity side of the fence (QLD DEHP 2012)

Other measures include:

- Construction activities should be limited to normal construction hours
- No lighting of the construction area should occur at night, when the Koala is active.

7.2.6 Education

Education has a key role to play towards ensuring the long-term survival of the Koala in Australia and at Bingara Gorge. A media campaign /public awareness campaign will be required to raise awareness and inform the community about the potential Koala habitat within the Conservation areas. Through such measures as school education, raising the profile of koala conservation issues in the media and by making relevant information more accessible through information brochures and publications.

Campaigns should concentrate during the koala breeding season (August to February) and the public is to be informed on who to contact if they spot a Koala as well as the relevance of the Conservation areas to the species. Owners of dogs will be encouraged to, if becoming aware of a Koala in their property, restrain or confine their dog and notify WIRES. Educational material will also include information on the most suitable breeds of dogs to keep in relation to Koalas and a discussion on the need to drive with caution throughout the community.

Permanent signage will be installed adjacent to pathways and entry roads to the site highlighting the potential presence of koala on the site.

7.2.7 Traffic management

The additional impact of traffic within the development area is not considered to be high, as there is limited evidence of site usage by Koalas and better habitat areas exist close by. It is considered that the existing Hume Highway already presents a higher risk.

Management strategies presented below aim to increase the application of a precautionary approach to reducing the potential for Koala road strike and to increase driver and community awareness:

- ‘Koala Warning Signs’ dispersed throughout the Bingara Gorge road network consisting of
 - primary warning sign situated on the Bingara Gorge entry road (being sympathetic to the look/feel of the residential community)
 - a minimum of four (4) secondary signs will be erected at key locations throughout Bingara Gorge
- all Bingara Gorge roads will have a maximum speed of 50km/hrs
- roadside vegetation will be maintained to minimise the height of ground cover and therefore increase the visibility of any roadside fauna

7.3 Monitoring and reporting

Monitoring and reporting will be required to be undertaken against the assessment criteria and at the timeframes included in **Section 4** of the KMP (ELA 2015c). These actions have been extrapolated and are included in **Appendix A**.

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Appendix A Action Plan

The following table identifies actions to be undertaken during each step in the development process (planning, pre-construction, construction, post-construction, maintenance). It is based on information in the BMP (HWR 2006), including updates from the EMP (ELA 2015) supplemented with actions included within this plan.

THEME	ISSUE	GOAL	PERFORMANCE CRITERIA	RESPONSIBILITY
Planning and design				
Stormwater, water quality and flooding	Run-off from the Golf Course	Ensure that run-off from golf course areas is controlled or treated before reaching the Conservation areas	Create a design for the treatment of run-off to ameliorate impacts on surrounding bushland areas	Developer
Recreational facilities	Diversity of recreation users	Ensure Conservation areas provides for a range of recreational users without impacting heavily on the environment	Design recreation facilities of the Conservation areas Design interpretive signage to encourage responsible use of the area	Developer and Environmental Trust Community
Education	Design educational information	Ensure that future residents are aware of environmental issues onsite	Design education material	Developer and Environmental Trust Community
Bushland Management	Threatened flora translocation	Relocate threatened flora specimens that would otherwise have been subject to loss	Prepare specimens to be translocated, and prepare area to receive them	Developer
Pre-construction				
Bushland Management	Threatened flora translocation	Relocate threatened flora specimens that would otherwise have been subject to loss	Translocate threatened flora specimens as per the VMP specifications.	Developer Contractors Environmental Trust

THEME	ISSUE	GOAL	PERFORMANCE CRITERIA	RESPONSIBILITY
Bushland Management and Koala Management	Protective / exclusion fencing	Install protective fencing around bushland buffers to encourage natural regeneration and control access points to Conservation areas	<p>Install exclusion fencing from around ACL / translocation areas</p> <p>Buffer areas surrounding the Conservation areas should be established with protective fencing to reduce accidental incursion into these areas, and provide controlled access points to the Conservation areas.</p> <p>These areas should also allow for entry for maintenance of bushland or the APZ.</p> <p>Construction fencing should exclude Koalas to prevent them entering into construction areas</p>	Developer
Bushland Management & Koala Management	Vegetation clearance	Prevent damage to native fauna and fauna habitat trees	<p>No vegetation is cleared within the Conservation areas except for the necessary maintenance of management/passive use tracks</p> <p>Vegetation to be monitored for any impacts on the current condition – i.e. introduction of any weeds will be rectified and vegetation restored where deemed necessary, dumped rubbish removed etc.</p> <p>All trees to be removed to be inspected by Ecologist, at least 24hrs prior to removal, if Koala's present these are to be captured and relocated.</p>	Developer Contractors
Weed Management & Bushland Management	Weed introduction from retained topsoil and introduced landscaping material	Avoid transporting weeds and establishing new infestations from retained topsoil and introduced landscaping material	<p>Commencement of all tasks outlined in the WEMP or evidence of planning for their implementation</p> <p>No Noxious weeds present</p> <p>No woody weeds present onsite</p> <p>Evidence of suppression of grasses through multiple treatments</p> <p>Exotic materials appropriately disposed off-site</p> <p>Baseline vegetation monitoring complete</p>	Developer

THEME	ISSUE	GOAL	PERFORMANCE CRITERIA	RESPONSIBILITY
Pest Management	Rabbits, Hares and Foxes	Ensure pest animals do not become established within the Conservation areas	Monitor pest numbers to ensure the population is not increasing If warranted, implement controls: bait stations, shooting or biological control	Developer
Pest Management	Feral Cats and Dogs	Ensure pest animals do not become established within the Conservation areas	Monitor pest numbers to ensure the population is not increasing Encourage responsible pet ownership	Developer
Stormwater, water quality and flooding	Soils and water	Prevent erosion and water pollution	Install soil erosion and sedimentation controls	Developer Contractors
During construction				
Bushland Management <i>Goal: Ensure Conservation areas support a range of locally occurring flora and fauna</i>	Weed Removal	Removal and control all noxious and environmental weeds contained within the Conservation areas	Implement bush regeneration/restoration activities to ensure that the Conservation areas remain relatively free of weed infestation, proportion of exotic groundcovers no greater than 10% with no Noxious weeds, no woody weeds. All fill used onsite is 'clean' and weed free Undertake weed control in accordance with WEMP and local control authority weed management plans. All machinery washed down before entering site	Developer Contractors Environmental Trust
Weed eradication and management	Weed Infestation	Control and suppress any new infestations of noxious and environmental weeds.	Any new weed infestations within the Development area including stockpiles and sediment basins an Conservation areas should be controlled or suppressed immediately (within 5 days) to prevent degradation of the naturally occurring flora and fauna in the local area	Developer Contractors Environmental Trust

THEME	ISSUE	GOAL	PERFORMANCE CRITERIA	RESPONSIBILITY
Threatened flora protection and Koala Management	Protective / exclusion fencing	Install protective fencing around bushland buffers to encourage natural regeneration and control access points to Conservation areas	<p>Buffer areas surrounding the Conservation areas should be established with protective fencing to reduce accidental incursion into these areas, and provide controlled access points to the Conservation areas.</p> <p>These areas should also allow for entry for maintenance of bushland or the APZ.</p> <p>Trails for recreational users can be constructed within the APZ/vegetation buffer.</p> <p>Construction fencing should exclude Koalas to prevent them entering into construction areas</p>	Developer
Weed eradication and management	Weed introduction from retained topsoil and introduced landscaping material	Avoid transporting weeds and establishing new infestations from retained topsoil and introduced landscaping material	<p>Stockpiles of topsoil and materials should be inspected periodically to detect any establishment of noxious and environmental weeds</p> <p>Weed-infested stockpiles should be covered with a heavy-duty impermeable plastic enclosed by erosion control fencing. Plastic will promote composting and over time the heat will destroy most of the living material present (e.g. seeds, roots/rhizomes, spores) including weeds</p>	Developer Contractors
Pest Management	Rabbits, Hares and Foxes	Ensure pest animals do not become established within the Conservation areas	<p>Monitor pest numbers to ensure the population is not increasing</p> <p>Ask contractors to report all sightings of pest animals within the Conservation areas</p> <p>If warranted, implement controls: bait stations, shooting or biological control</p>	Developer Contractors

THEME	ISSUE	GOAL	PERFORMANCE CRITERIA	RESPONSIBILITY
Pest Management	Feral Cats and Dogs	Ensure pest animals do not become established within the Conservation areas	Monitor pest numbers to ensure the population is not increasing Ask contractors to report all sightings of pets and feral animals within the Conservation areas	Developer Contractors
Stormwater, water quality and flooding	Soils and water	Prevent erosion and water pollution	Monitor and maintain integrity of soil erosion and sedimentation controls	Developer Contractors
Post-construction / establishment				
Bushland Management <i>Goal: Ensure Conservation areas support a range of locally occurring flora and fauna</i>	Weed Removal	Removal and control all noxious and environmental weeds contained within the Conservation areas	Implement bush regeneration/restoration activities to ensure that the Conservation areas remain relatively free of weed infestation Identification of weed hot spots and commencement of weed treatments. Maintenance of native cover and diversity and a demonstrated decrease in exotic cover	Environmental Trust Contractors
Bushland Management	Permanent fencing	Erect long-term fencing around Conservation areas to encourage regeneration and control access points to Conservation areas	Establish fencing to reduce vehicle access into Conservation areas, and provide controlled access points for authorised maintenance. Trails for recreational users can be constructed within the APZ/vegetation buffer.	Developer
Bushland Management	Rubbish Dumping	Establish a community education program to encourage responsible rubbish removal methods	Create a community education program to encourage residents to not place garden refuse, household waste and hard rubbish within bushland areas. Explore possibility of community compost disposal to provide appropriate responsible green waste disposal.	Environmental Trust Community

THEME	ISSUE	GOAL	PERFORMANCE CRITERIA	RESPONSIBILITY
Weed eradication and management	Weed introduction from retained topsoil and introduced landscaping material	Avoid transporting weeds and establishing new infestations from retained topsoil and introduced landscaping material	Landscaped areas should be periodically inspected to ensure no infestations of noxious and environmental weeds are introduced by retained or introduced topsoil or mulch	Developer Contractors
Pest Management	Rabbits, Hares and Foxes	Ensure pest animals do not become established within the Conservation areas	Monitor pest numbers to ensure the population is not increasing Ask residents to report all sightings of pest animals within the Conservation areas If warranted, implement controls: bait stations, shooting or biological control	Environmental Trust Community
Pest Management	Feral Cats, Dogs and Goats	Ensure pest animals do not become established within the Conservation areas	Monitor pest numbers to ensure the population is not increasing Ask residents to report all sightings of pets and feral animals within the Conservation areas Encourage responsible pet ownership	Environmental Trust Community
Stormwater, water quality and flooding	Run-off from the Golf Course	Ensure that run-off from golf course areas is controlled or treated before reaching the Conservation areas	Ensure the appropriate treatment of run-off, successfully ameliorates impacts on surrounding bushland areas Ensure the golf course managers are successfully avoiding run-off from the golf course entering the Conservation areas	Developer Golf Course Environmental Trust
Recreational facilities	Diversity of recreation users	Ensure Conservation areas provides for a range of recreational users without impacting heavily on the environment	Install recreation facilities within the buffer of the Conservation areas Design and implement educational and community programs Install interpretive signage to encourage responsible use of the area	Developer Environmental Trust Community Ranger Contractor

THEME	ISSUE	GOAL	PERFORMANCE CRITERIA	RESPONSIBILITY
Stormwater, water quality and flooding	Soils and water pollution	Prevent erosion and water pollution	Remove soil erosion and sedimentation controls upon stabilisation of construction area	Developer Contractors
Koala Management	Property boundary fencing and Dog confinement fencing	To prevent Koala from entering residential areas including Dog areas	Property boundary fencing is maintained Dog confinement fencing must exclude Koalas and be situated on the property as per Section 7.2.4.	Developer Contractors Environmental Trust
Koala Management	Education	To educate the community about Koalas and potential impacts	Evidence of community consultation actions including signage and pamphlet drops	Developer Contractors Environmental Trust
Maintenance / long-term ongoing				
Bushland Management	Bush Regen / Weed Removal	Control and suppress all noxious and environmental weeds contained within the Conservation areas Ensure Conservation areas support a range of locally occurring flora and fauna	Implement bush regeneration/restoration activities to ensure that the Conservation areas remain relatively free of weed infestation. Undertake weed control in accordance with local control authority weed management plans. All native plantings to be of local provenance, and to achieve an 85% survival rate	Environmental Trust Bush Care group
Bushland management	Reporting	All reporting undertaken as per the VMP	Prepare annual vegetation works plan Bi-monthly reviews and report on progress by contractors/ranger	Environmental Trust
Weed eradication and management	Weed introduction from retained topsoil and introduced landscaping material	Avoid transporting weeds and establishing new infestations from retained topsoil and introduced landscaping material	Landscaped areas should be periodically inspected to ensure no infestations of noxious and environmental weeds are introduced by retained or introduced topsoil or mulch	Environmental Trust Contractors Bush Care group

THEME	ISSUE	GOAL	PERFORMANCE CRITERIA	RESPONSIBILITY
Bushland Management	Permanent fencing	Maintain permanent fencing around Conservation areas to control access points to Conservation areas, and reduce damage to flora, fauna and vandalism of recreational facilities	Maintain fencing to reduce vehicle access into Conservation areas, and provide controlled access points for authorised maintenance Maintain trails for recreational users, ensuring that pedestrian or bicycle traffic stays on the path	Environmental Trust Ranger Contractor
Bushland Management	Rubbish Dumping	Maintain a community education program to encourage responsible rubbish removal methods	Maintain a community education program to encourage residents to not place garden refuse, household waste and hard rubbish within bushland area	Developer for establishment Environmental Trust Community
Pest Management	Rabbits, Hares and Foxes, Feral Cats, Dogs, Goats	Ensure pest animals do not become established within the Conservation areas	Monitor pest numbers to ensure the population is not increasing Ask residents to report all sightings of pest animals within the Conservation areas If warranted, implement controls: bait stations, shooting or biological control	Environmental Trust Community
Stormwater, water quality and flooding	Run-off from the Golf Course	Ensure that run-off from golf course areas is controlled or treated before reaching the Conservation areas	Ensure the golf-course managers appropriately treat run-off, and use fertilisers and pesticides appropriately Ensure there are no impacts on surrounding bushland areas	Golf Course Ranger Environmental Trust
Recreational facilities	Diversity of recreation users	Ensure Conservation areas provides for a range of recreational users without impacting heavily on the environment	Promote values and uses of Conservation areas through educational and community programs Encourage responsible use of the area	Environmental Trust Community

THEME	ISSUE	GOAL	PERFORMANCE CRITERIA	RESPONSIBILITY
Native fauna & Koala Management	Threatened species	Improve threatened species habitat within the Conservation areas	Implement Vegetation Management Plan to improve habitat Consider monitoring Koala (not recorded on site, but known to be in the region), plus Powerful Owl and Barking Owl (previously recorded on site) numbers	Environmental Trust
Stormwater, water quality and flooding	Water quality	Maintain water quality	Annual monitoring of water quality for five years Golf course to use fertilisers and pesticides appropriately	Environmental Trust
Heritage	Aboriginal Cultural Heritage	Protect Aboriginal cultural heritage	Bi-annual review of ACHMP	Environmental Trust
Safety	High Risk areas	Control access to high risk cliffs	Utilise signage, fencing and community education programs to prevent access to steep drop offs at identified high risk areas.	Environmental Trust Ranger
Koala Management	Property boundary fencing and Dog confinement fencing	To prevent Koala from entering residential areas including Dog areas	Property boundary fencing is maintained Dog confinement fencing must exclude Koalas and be situated on the property as per Section 7.2.4.	Developer Contractors Environmental Trust
Koala Management	Educate	To educate the community about Koalas and potential impacts	Evidence of community consultation actions including signage and pamphlet drops	Developer Contractors Environmental Trust



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