Bingara Gorge Staged DA - AMENDED

Ecological Assessment – Addendum 1

Prepared for
Lend Lease

November 2015






DOCUMENT TRACKING

Item	Detail
Project Name	Bingara Gorge Staged DA Ecological Assessment - AMENDED. Addendum 1
Project Number	13WOLPLA_0011
Project Manager	Ashlee Clarke 02 4201 2206 Suite 204, Level 2 62 Moore Street, Austinmer, NSW, 2515
Prepared by	Steven House
Reviewed by	Brendan Dowd
Approved by	Steven House
Status	Final
Version Number	1.0
Last saved on	25 November 2015
Cover photo	Photos taken by Lucas McKinnon on 24-25 September, 2013

This report should be cited as 'Eco Logical Australia 14/4/2015 *Bingara Gorge Staged DA Ecological Assessment*. Prepared for Lend Lease.'

ACKNOWLEDGEMENTS

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

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Abbreviations

Abbreviation	Description
BBAM	BioBanking Assessment Methodology
CEEC	Critically Endangered Ecological Community
DEWHA	Department of the Environment, Water, Heritage and the Arts
DNG	Derived Native Grassland
DoE	Department of the Environment (formerly DSEWPaC)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
EEC	Endangered Ecological Community
ELA	Eco Logical Australia
EMP	Environmental Management Plan
EP&A Act	NSW Environment Planning and Assessment Act 1979
EP&R Lands	Environmental Protection and Recreation Lands
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
GPS	Global Positioning System
HBT	Hollow-bearing Tree
KPoM	Koala Plan of Management
KTP	key threatening process
SSTF	Shale / Sandstone Transition Forest

NES	National Environmental Significance
NPWS	NSW National Parks and Wildlife Service
NOW	NSW Office of Water
NW Act	NSW Noxious Weeds Act 1993
PMST	Protected Matters Search Tool
RBG	Royal Botanical Gardens
SEPP 44	State Environmental Planning Policy 44 – Koala Habitat Protection
TEC	Threatened Ecological Community
TPZ	Tree Protection Zone
TSC Act	NSW Threatened Species Conservation Act 1995
WMA Act	NSW Water Management Amendment Act 2008
WSGF	Western Sydney Gully Forest

Executive summary

This Addendum has been prepared to consider the ecological impacts of the Staged Development Application (DA 283-2015) (hereon referred to as 'the DA') that is under consideration of the Land and Environment Court.

This Addendum takes into account the following;

1. New field survey data and mapping undertaken to inform the State and Commonwealth approvals
2. The inclusion of a 15 lot subdivision as part of the development application
3. A reduction in the development footprint of approximately 5 hectares
4. An increase in the conservation lands on the site by approximately 16 hectares through reducing the development footprint and including additional golf lands into the conservation management framework
5. An offsite offset package of a minimum of 70 credits of Cumberland Plain Woodland
6. Revised location of fire trails on the site and inclusion of a 4 metre wide trail in impact calculations

This addendum provides information on the above matters and assesses the environmental impacts in accordance with Part 5A of the *Environmental Planning and Assessment Act, 1979*. This assessment of significance, otherwise known as the 7-part test has concluded that the development is unlikely to have a significant impact on threatened species or threatened ecological communities that are known or likely to occur on the site.

This assessment notes that the reduction in the development footprint by more than 5 hectares and increase in conservation area by approximately 16 hectares provides a considerably improved environmental outcome than was envisaged during the rezoning of the site and approved under the existing masterplan consent (ID993-05). The reduced impact and increased levels of conservation provides even greater support for the earlier conclusion that the development will not have a significant impact under the TSC Act.

The new information combined with the revised development/conservation footprints has had the following main effects:

1. Reduction in the impacts on Shale Transition Forest decreasing from 31.2 hectares to 8.3 hectares (5.7 hectares of good condition and 2.6 hectares of low condition/DNG)
2. Removal of 5.9 hectares of Cumberland Plain Woodland (0.9 hectares of good condition and 4.9 hectares of low condition/DNG)
3. The retention of 3453 threatened plants to mitigate the removal of 138 threatened plants. This equates to the retention of 96% of threatened plants found on the site

The 7-part tests provided in Appendix 1 have concluded that the proposal is unlikely to result in a significant impact under the *NSW Threatened Species Conservation Act, 1995*. Therefore a Species Impact Statement is not required.

1 Introduction

Following the intial Section 34 consultation, a revised development application is being prepared that incorporates a 15 lot subdivision, an overall reduction in the development footprint and an increase in the conservation lands.

Concurrently with this revised application, Eco Logical Australia has undertaken substantial additional fieldwork to assist with assessments under the *NSW Threatened Species Conservation Act, 1995* and the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

This addendum also addresses concerns raised by Wollondilly Council during the Section 34 consultation in relation to additional survey and mapping, and the location of fire trails.

This additional fieldwork has significantly added to the body of knowledge of ecology of the site. This information has been used by Lend Lease to reduce their development footprint to provide for greater conservation of ecological values on the site.

This addendum provides an overview of the findings on the site and an assessment of impacts on ecological values on the site pursuant to the *NSW Threatened Species Conservation Act, 1995*.

1.1 Expert Witness Code of Conduct

I have been furnished with, read and have abided by the Expert Witness Code of Conduct. A copy of my Curricula vitae is provided in Appendix C.

Figure 1. Study Area and Vegetation Removal Plan

2 Methods

2.1 Field survey

In addition to the approximately 30 hours of survey undertaken in September 2013 as part of the original development application in excess of an additional 300 hours of survey has been undertaken. This has included:

1. 61 systematic vegetation plots using the biometric survey methodology
2. Over 300 hours of targeted threatened flora and fauna surveys
3. Opportunistic recordings of threatened species

2.1 Data Analysis

2.1.1 Vegetation Communities

A total of sixty one (61) biometric plots were conducted and a list of all species recorded. Additionally, key diagnostic features and condition thresholds (including patch size, foliage cover and perennial understorey vegetation) were utilised to delineate areas of EPBC listed threatened communities (MNES) (DEWHA 2010).

Significant emphasis has been placed on preparing an accurate vegetation map for the site based on vegetation community descriptions contained in Tozer et al. (2010). More specifically, the approach to vegetation mapping has incorporated the following:

1. Initial review of Tozer (2003 and 2006 *mapping*) mapping with preliminary field survey. The Tozer (2006) mapping formed the basis of the EPBC Referral
2. Stratification of the site based on soil and topographic variations and variations in vegetation that were identified during the preliminary field survey
3. Completion of 61 systematic biometric quadrats (20m x 20m) and transects (50m)
4. Analysis of data obtained during the field survey using the OEH diagnostic tool (Tozer 2010) and preparation of a draft vegetation map. Additional data analysed during this stage included Soil and Geology Mapping (Wollongong 100k map sheet, Hazleton and Tille, 1990) and soil bore hole data (Douglas Partners, 2007)
5. Final data analysis and preparation of draft, and subsequently final, vegetation mapping

Mapping was undertaken within ArcGIS using high resolution October 2014 aerial photography (Nearmap) as a backdrop to allow refinement through aerial photographic interpretation (API). Surveys of disturbed areas were undertaken to identify the presence of derived native grasslands (DNG). Where DNG occurs this has been mapped as ‘low’ condition vegetation and attributed to the relevant EEC. Where paddock trees occur above exotic grassland these have not been mapped as part of an EEC.

2.1.2 Targeted Surveys

Targeted surveys for listed flora species identified through Atlas of NSW Wildlife and Protected Matters Search Tool searches, as well as species previously recorded in the Bingara Gorge locality, were carried out during field work (ELA 2013; 2015). Comprehensive survey was undertaken over more than 300 hours, and focussed on areas where known records occur and in patches with a lower disturbance history within intact bushland, or that represented expected potential habitat for the species. Survey effort included habitat assessment and targeted transects and walkovers as depicted in Figure 3. Where appropriate, random meander transects were undertaken, with two individuals walking on average approximately 5-10 metres apart. Surveys were conducted during optimal flowering periods for all species.

The species which required targeted searches are listed below:

- Small-flower Grevillea (*Grevillea parviflora* subsp. *parviflora*)
- Deane's Melaleuca (*Melaleuca deanei*)
- Bargo Geebung (*Persoonia bargoensis*)
- Hairy Geebung (*Persoonia hirsuta*)
- Sydney Plains Greenhood (*Pterostylis saxicola*)
- Bynoe's Wattle (*Acacia bynoeana*)
- Port Jackson Heath *(Epacris purpurascens var. purpurascens)*

Reference sites for Sydney Plains Greenhood (Simmo's Reserve at Macquaire Fields) were checked prior to targeted surveys during the 2015 surveys, where it was confirmed that this species was in flower.

Figure 2. Reference site showing Sydney Plains Greenhood in flower

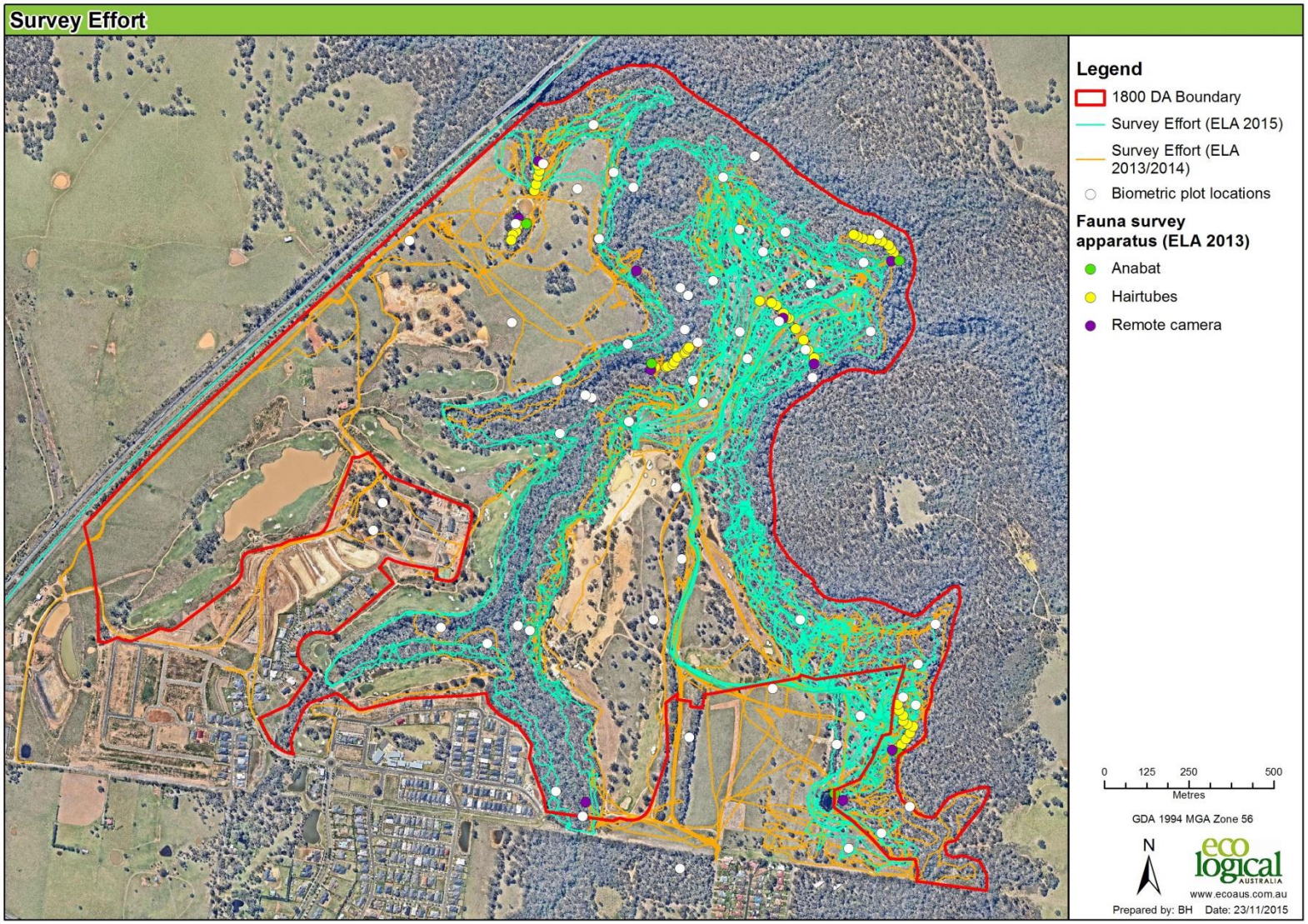

Figure 3. Bingara Surveys

3 Results

3.1 Vegetation Communities

Significant changes were made to the vegetation communities based on the results of analysing the biometric quadrats using the 'Tozer tool'. Much of the vegetation previously mapped as Shale Sandstone Transition Forest was found to be located on soils with no shale influence. Floristically the vegetation on these soils had a strong correlation with a Sandstone-based community, Burragorang Nepean Hinterland Woodland. Interestingly, nearly all threatened flora observed on the site were located within this community, with Shale Sandstone Transition Forest being depauperate for threatened flora.

An area of low condition Cumberland Plain Woodland was mapped on the western part of the site, adjacent to the Hume Highway. This area has been subject to an extended period of grazing and comprised of remnant paddock trees within a species-poor derived native grassland. This patch is isolated and off low long term management viability due to the high proportion of weeds in the understorey.

Table 1 below identifies the proposed clearing and retention of vegetation communities across the site.

Table 1. Vegetation community loss and retention calculations

	Area (ha)	
Vegetation Community	**Impacted**	**Retained**
Burragorang Nepean Hinterland Woodland	**21.3**	**64.2**
Moderate/Good	19.0	64.1
Low	2.3	0.0
Cumberland Plain Woodland	**5.9**	**0.4**
Moderate	0.9	0.4
Low	4.9	
Hinterland Sandstone Gully Forest	**0.0**	**28.1**
Good	0.0	28.1
Riparian Complex	**0.0**	**10.4**
Good	0.0	10.4
Shale Sandstone Transition Forest	**8.3**	**23.9**
Moderate	5.7	23.9
Low	2.6	0.0
Grand Total	**35.5**	**127.0**

3.1 Threatened Flora

Several species of threatened flora have been located on the site and the development footprint has been reduced to ensure retention of viable populations of all threatened flora species on the site. As the assessment of state and commonwealth requirements have been undertaken in parallel, the EPBC Offsets calculator has been used to determine required retention. Results of the revised development footprint within the EPBC Offsets calculator is provided below. For those individuals that are proposed to be retained a minimum buffer of 20 metres has been provided around each location.

Table 2. Threatened flora loss and retention calculations[1]

Species	Retained	Lost	% of EPBC Offset calculator met
Small-flower Grevillea *(Grevillea parviflora subsp. parviflora)*	929	67	121.3%
Deane's Melaleuca *(Melaleuca deanei)*	1246	29	369.8%
Bargo Geebung *(Persoonia bargoensis)*	20	4	130.1%
Hairy Persoonia *(Persoonia hirsuta)*	0	0	NA
Bynoe's Wattle *(Acacia bynoeana)*	120	9	115.3%
Sydney Plains Greenhood *(Pterostylis saxicola)*	0	0	NA
Port Jackson Heath *(Epacris purpurascens var. purpurascens)*	1138	29	NA – Not EPBC listed
Brown Pomaderris *(Pomaderris brunnea)*	0	0	NA

[1] Where the EPBC calculator has been used, this incorporates a slightly different study area to this development application as it overlaps multiple development applications

Given that extensive survey has now been undertaken for the above species in optimal survey times, it is considered unlikely that the Hairy Persoonia, Brown Pomaderris or Sydney Plains Greenhood occur on the site.

3.2 Threatened Fauna

Despite extensive targeted surveys and well in excess of 300 additional survey hours spent on the site, no additional threatened fauna species have been recorded. To date, only threatened bats and the varied sittella have been recorded on the site.

The woodland areas will provide foraging habitat for threatened bats and birds. Substantial areas of woodland habitat will be retained within the EP&R lands and the additional conservation lands.

The upper reaches of the creeklines may provide habitat for the Red-crowned Toadlet with a lower potential for the Giant Burrowing Frog to also utilise the streams. Management of water quality/quantity through Water Sensitive Urban Design (WSUD) is essential to reduce the potential for indirect impacts from the development.

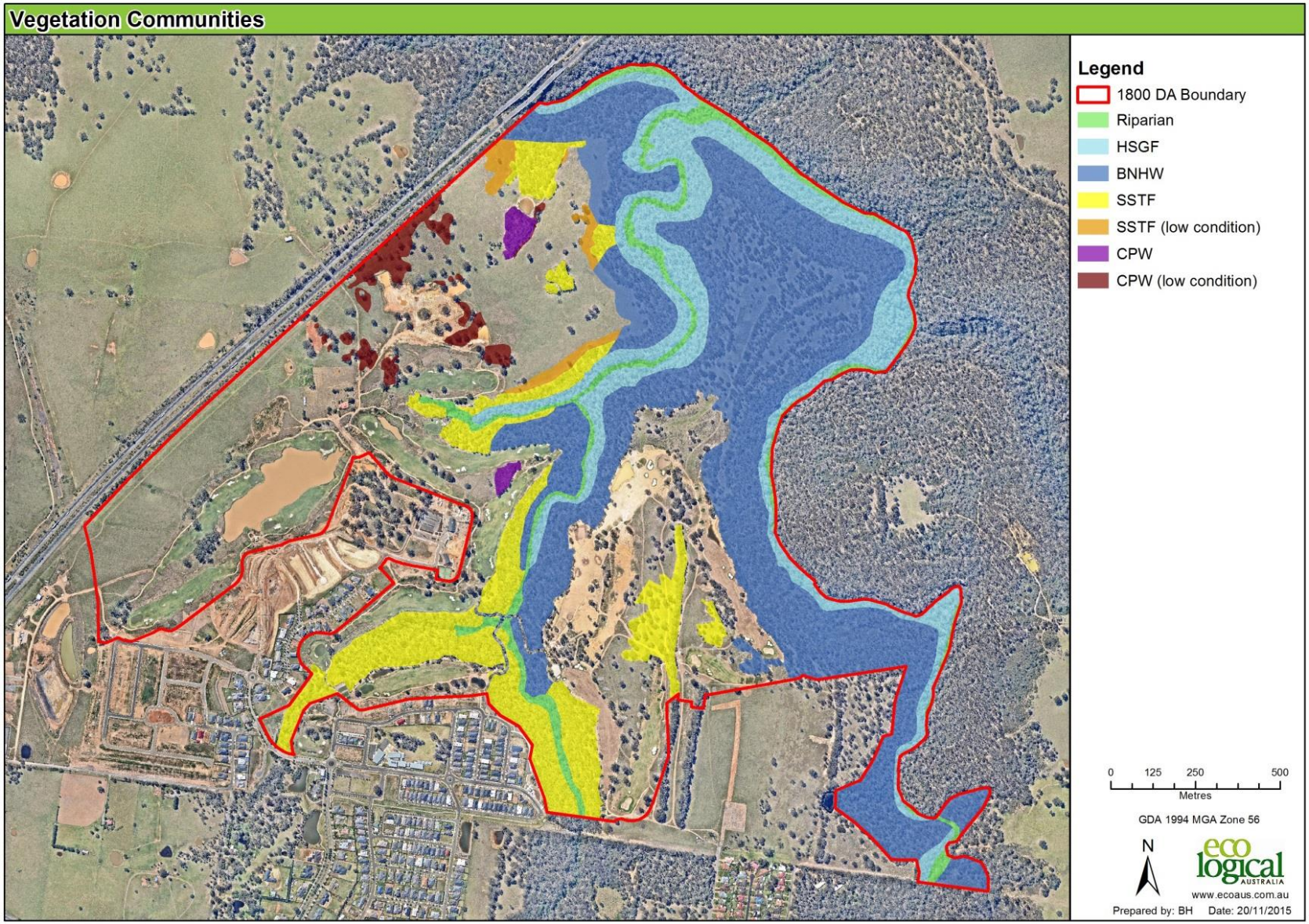

Figure 4. Vegetation Communities

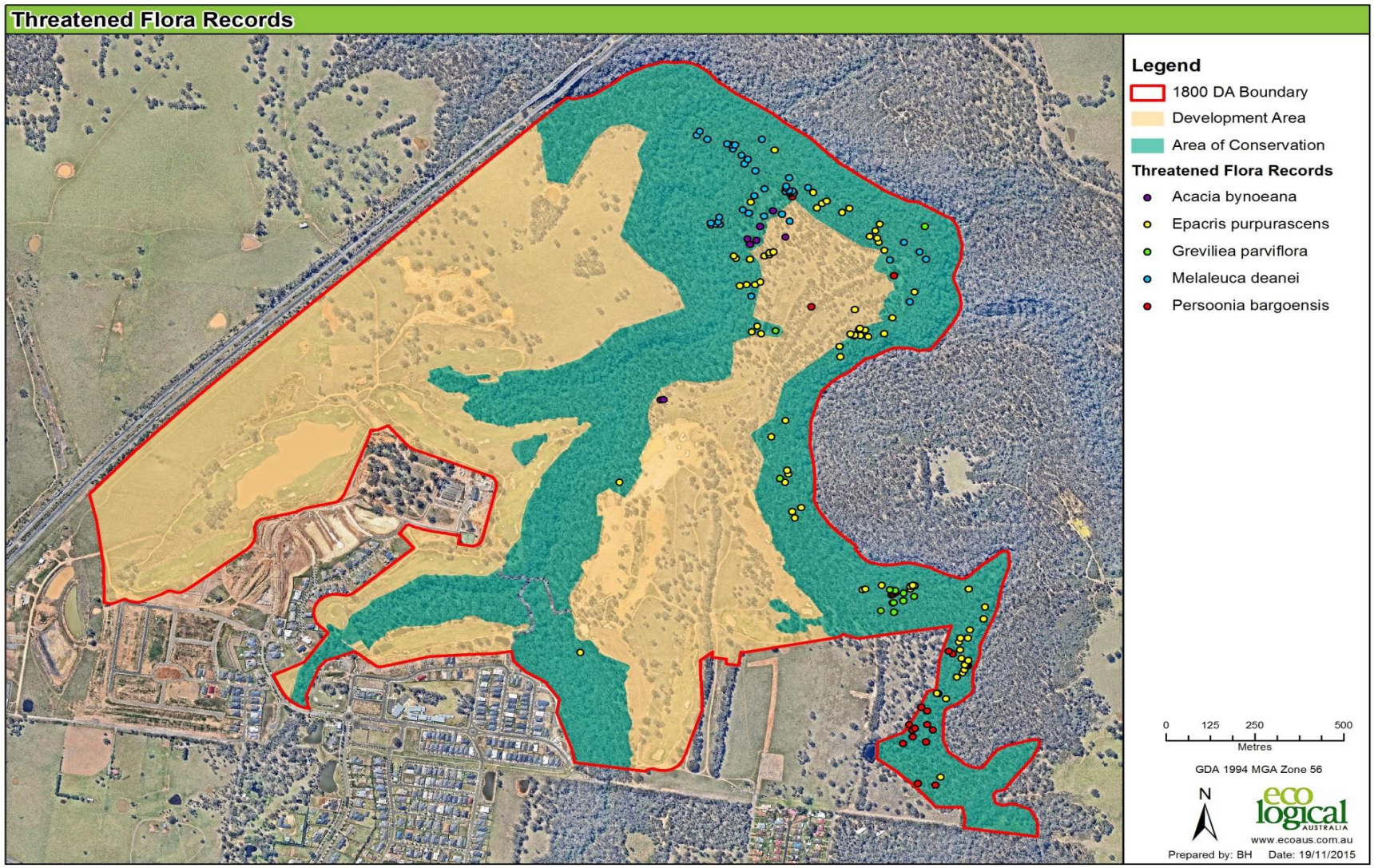

Figure 5. Threatened Flora

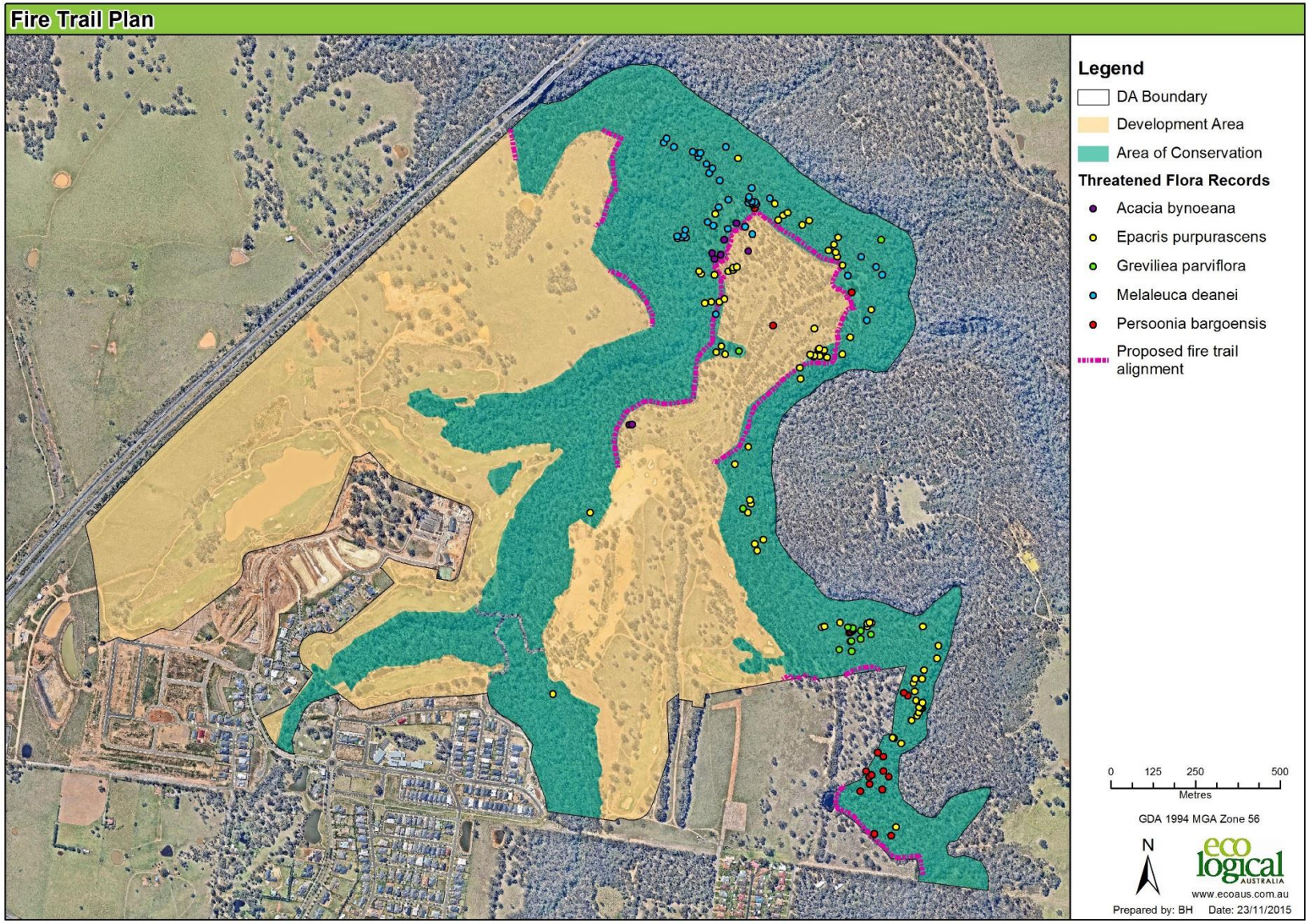

Figure 6. Fire Trails and Threatened Flora

4 Fire Trails

The proposed fire trail alignment has been design to avoid areas of high biodiversity value containing threatened plants. The fire trail will need to be constructed to RFS standards requiring an all-weather surface and trafficable width of 4 metres. As the site is located on a ridge-line there is no need to cross wetlands or other areas subject to frequent inundation. The shallow sandy soils across the site will require minimum soil disturbance and trails will be able to be constructed at grade.

It is not considered necessary to provide a sealed permanent surface such as bitumen or concrete, although it is acknowledged that this may be desirable in areas where the fire trail serves the function of both bushfire management and passive recreation. A graded and compacted trail using insitu soil will provide sufficient all weather access at this site.

The impact assessment has assumed that the full 4 metres will be cleared, although with sensitive design it is likely that substantial areas of the trail will be able to meander between trees and take advantage of outcropping sandstone bedrock where no trees are located, thus reducing impacts.

Performance Criteria	Acceptable solutions
The intent may be achieved where:	
• the width and design of the fire trails enables safe and ready access for firefighting vehicles	• a minimum carriageway width of four metres with an additional one metre wide strip on each side of the trail (clear of bushes and long grass) is provided. • the trail is a maximum grade of 15 degrees if sealed and not more than 10 degrees if unsealed. • a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches is provided. • the crossfall of the trail is not more than 10 degrees. • the trail has the capacity for passing by: - reversing bays using the access to properties to reverse fire tankers, which are six metres wide and eight metres deep to any gates, with an inner minimum turning radius of six metres and outer minimum radius of 12 metres; and/or - a passing bay every 200 metres, 20 metres long by three metres wide, making a minimum trafficable width of seven metres at the passing bay. *Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m) and extend for no more than 30m and where obstruction cannot be reasonably avoided or removed.*
• fire trails are trafficable under all weather conditions. Where the fire trail joins a public road, access shall be controlled to prevent use by non authorised persons.	• the fire trail is accessible to firefighters and maintained in a serviceable condition by the owner of the land. • appropriate drainage and erosion controls are provided. • the fire trail system is connected to the property access road and/or to the through road system at frequent intervals of 200 metres or less. • fire trails do not traverse a wetlands or other land potentially subject to periodic inundation (other than a flood or storm surge). • gates for fire trails are provided and locked with a key/lock system authorized by the local RFS.
• fire trails designed to prevent weed infestation, soil erosion and other land degradation	• fire trail design does not adversely impact on natural hydrological flows. • fire trail design acts as an effective barrier to the spread of weeds and nutrients. • fire trail construction does not expose acid-sulphate soils.

5 Impact Assessment

The proposed works will require the clearance of 8.3 ha of SSTF (5.7 hectares of moderate condition and 2.6 hectares of low condition/DNG), 5.9 hectares of Cumberland Plain Woodland (0.9 hectare of moderate condition and 4.9 hectares of low condition/DNG) and clearing of 21.3 hectares of BNHW.

The loss of threatened flora is identified in Table 2. The proposal would result in the loss of 4% of recorded threatened plants at the site and retention of the remaining 96% within the EP&R lands or additional conservation lands.

With regards to threatened fauna, the loss of foraging habitat for birds and bats equates to approximately 25.6 hectares of moderate to good vegetation on the site.

Such losses need to be considered in the context of the proposed habitat retention on such a large site. Overall, in excess of 127 hectares of high quality habitat will be retained within the EP&R lands, or in the additional conservation lands that will incorporate a protection and management structure of a similar or better legal standing.

All of the loss and retention calculations in this addendum are based on the maximum likely extent of fire trails across the site, with the potential for the amount of fire trails being located within the EP&R/conservation lands to be reduced during detailed design of the neighbouring urban development.

To compensate for the loss of CPW at Bingara Gorge, a minimum of 70 credits of Cumberland Plain Woodland will be purchased and retired. The credits will be *HN529 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion*.

To mitigate against indirect impacts, a comprehensive EMP will be prepared and implemented to ensure the long term viability of the species and ecological communities present with the EP&R lands. An EMP was prepared by ELA in 2012, which is likely to be updated to comply with any conditions of consent under this development application. This will ensure the value and ecological viability of the habitat will be maintained into the future, with funding provided through the sale of lots and enshrined via the State Planning Agreement.

5.1 Indirect impacts

The proposed residential development could result in the following indirect impacts if correct management is not undertaken:

- Erosion and sedimentation;
- Nutrient enrichment;
- Spread of weed propagules / edge effects;
- Increase in feral animals;
- Increase in vehicular access; and
- Increased pedestrian access throughout the EP&R Lands

5.2 Affected species and communities

The impacts of the proposed works were considered relevant to two critically endangered ecological communities, five threatened flora species, 25 threatened fauna species and two migratory species listed under the TSC Act and / or the EPBC Act;

Vegetation Communities

- Cumberland Plain Woodland
- Shale Sandstone Transition Forest

Flora

- *Acacia bynoeana*
- *Epacris purpurascens* var*. purpurascens*
- *Grevillea parviflora* subsp*. parviflora*
- *Melaleuca deanei*
- *Persoonia bargoensis*

Birds

- *Anthochaera phrygia* (Regent Honeyeater)
- *Daphoenositta chrysoptera* (Varied Sittella)
- *Glossopsitta pusilla* (Little Lorikeet)
- *Hieraaetus morphnoides* (Little Eagle)
- *Lathamus discolor* (Swift Parrot)
- *Lophoictinia isura* (Square-tailed Kite)
- *Melithreptus gularis (*Black-chinned Honeyeater - eastern subspecies)
- *Stagonopleura guttata* (Diamond Firetail)
- *Ninox connivens* (Barking Owl)
- *Ninox strenua* (Powerful Owl)

Mammals (excluding Bats)

- *Cercartetus nanus (*Eastern Pygmy-possum)
- *Dasyurus maculatus (*Spotted-tailed Quoll)
- *Phascolarctos cinereus (*Koala)

Bats

- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Miniopterus australis* (Little Bent-wing Bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bent-wing Bat)
- *Mormopterus norfolkensis* (Eastern Freetail-bat)
- *Myotis macropus* (Large-footed Myotis, Southern Myotis)
- *Pteropus poliocephalus* (Grey-headed Flying-Fox)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)

Amphibians

- *Heleioporus australiacus* (Giant Burrowing Frog)
- *Pseudophryne australis* (Red-crowned Toadlet)

Reptiles

- *Hoplocephalus bungaroides* (Broad-headed Snake)

5.3 Impact Assessment Results

The 7-part tests of significance (See Appendix A) have concluded that the impact to the above species and ecological communities is not likely to be a significant impact and a Species Impact Statement is not required.

The main reasons for the conclusion that the impact is unlikely to be significant are;

1. The area of vegetation/habitat being lost is of poorer quality and has a long history of agricultural use
2. A large area of high quality vegetation/habitat is being retained and managed within the 128[2] hectare EP&R and Additional Conservation Lands and the additional 16 hectare conservation lands providing for a total of 128 hectares of actively managed lands. These lands have been targeted towards the areas of highest biodiversity value on the site
3. The proposal will not fragment the habitat in the area or reduce connectivity in a manner that will affect the long term viability of the critically endangered ecological community or threatened species known or likely to occur on the site
4. 96% of the threatened plants found on the site will be retained within the 128 hectare EP&R and Additional Conservation Lands
5. The potential for indirect impacts can be mitigated through the preparation and implementation of the Environmental Management Plan

In essence the avoidance of clearing, retention and management of a large, high-quality 128 hectare area of vegetation/habitat within the EP&R/conservation Lands ensures the long term viability of the species and vegetation communities known or with the potential to occur in the local area.

[2] 128 hectares are located within the EP&R and Additional Conservation Lands. This includes the proposed fire trail. Once the fire trail is taken into consideration, there is approximately 127 hectares of bushland remaining. References hereon to the size of the EP&R and Additional Conservation Lands must be read in this context

6 Recommendations

In addition to the recommendations contained in the original Ecological Assessment, the following additional recommendations are made:

1. Pre-clearing surveys to be undertaken along the fire trail alignment to minister impacts
2. Translocation of threatened flora located within the development area to the conservation area. This is an additional measure beyond the avoidance and protection considered in the 7-part tests

7 Conclusions

The additional data obtained during the extensive field survey program has provided a greater level of certainty on the ecological values of the site. This data has been used to re-examine the proposed development and conservation footprints on the site, resulting in a 5 hectare reduction in development and a 16 hectare increase in the amount of land being managed for conservation purposes.

The fire trail plan has identified the maximum likely extent of fire trails across the site, with the potential for the amount of fire trails being located within the EP&R/conservation lands to be reduced during detailed design of the neighbouring urban development. The maximum amount of vegetation that could be impacted from fire trail construction is 1.2 hectares.

In conclusion, the increased level of information obtained during the field survey program combined with a reduction in the development footprint provides greater certainty for the conclusion that the proposal does not constitute a significant impact under the *NSW Threatened Species Conservation Act, 1995*.

Appendix A: EP&A Act Assessments of Significance (Seven Part Test)

Seven Part Tests were undertaken for the species and communities. The 7-part tests are based on the direct and indirect impacts identified in Chapter 5 and the recommendations outlined in Chapter 6.

Vegetation Communities

- Shale/Sandstone Transition Forest
- Cumberland Plain Woodland

Flora

- *Acacia bynoeana*
- *Epacris purpurascens* var*. purpurascens*
- *Grevillea parviflora* subsp*. parviflora*
- *Melaleuca deanei*
- *Persoonia bargoensis*

Birds

- *Xanthomyza phrygia* (Regent Honeyeater)
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- *Lophoictinia isura* (Square-tailed Kite)
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- *Stagonopleura guttata* (Diamond Firetail)
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- *Ninox strenua* (Powerful Owl)

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Amphibians

- *Heleioporus australiacus* (Giant Burrowing Frog)
- *Pseudophryne australis* (Red-crowned Toadlet)

Reptiles

- *Hoplocephalus bungaroides* (Broad-headed Snake)

VEGETATION COMMUNITY

Shale/Sandstone Transition Forest

Shale/Sandstone Transition Forest (SSTF) is a Critically Endangered Ecological Community (CEEC) which occurs at the edges of the Cumberland Plain, where clay soils from the shale rock intergrade with soils from sandstone, or where shale caps overlay sandstone. The boundaries are indistinct, and the species composition varies depending on the soil influences. The main tree species include *Eucalyptus tereticornis* (Forest Red Gum), *E. punctata* (Grey Gum), *E. globoidea* and *E. eugenioides* and *E. fibrosa* and *E. crebra*. Areas of low sandstone influence have an understorey that more closely resembles Cumberland Plain Woodland in composition (OEH 2011).

Before European settlement, this community was extensive around the edges of the Cumberland Plain, western Sydney, particularly the southern half. Today, only 9,950 ha remains intact (22.6% of its original extent) and the bulk of this occurs in the Hawkesbury, Baulkham Hills, Liverpool, Parramatta, Penrith, Campbelltown and Wollondilly local government areas. Good examples can be seen at Gulguer Nature Reserve (OEH 2013).

SSTF occurs throughout the study area and is contained within the subject site. As part of this residential development, 8.3 ha of poorer quality SSTF in the form of mainly under-scrubbed forest, DNG and young windrows will be cleared. Within the study area 23.9 ha of mostly high quality SSTF will be conserved within the 128 hectare EP&R and Additional Conservation Lands.

a. in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable – not a threatened species.

b. in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable – not an endangered population.

c. in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

The proposed residential development will involve the loss of 8.3 ha or mainly poorer quality SSTF vegetation (windrows and DNG). The habitat to be lost is generally of poor quality, exhibits low levels of structural diversity and high levels of weed invasion and disturbance from agricultural practices.

Within the study area a large area (23.9 ha) of SSTF will be conserved and managed within the designated 128 hectare EP&R and Additional Conservation Lands. The area being protected and managed is high quality vegetation. This area will ensure that the local extent and connectivity of SSTF is preserved. The area of SSTF to be cleared is generally isolated, of poorer quality and only represents a small proportion of the SSTF in the local area. As such it is unlikely that the proposed vegetation removal would place the local occurrence of SSTF at risk of extinction, given the extensive areas of high quality viable vegetation that will be retained with the EP&R and Additional Conservation Lands.

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The proposed vegetation clearance will involve the loss of disturbed vegetation, consisting of two small patches of young windrows and the edge portions of small patches of under-scrubbed forest and Open Forest SSTF. Substantially larger areas of SSTF will be retained and be conserved directly adjacent to the subject site, and throughout the wider Bingara development. Given the poorer quality of vegetation to be removed, and that larger areas of SSTF would remain within the study area, occur directly adjacent to the study area and are present throughout the locality, it is unlikely that the proposal would place the local occurrence of SSTF at risk of extinction.

d. in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed residential development will involve clearing 8.3 ha of generally poorer quality SSTF (mostly under-scrubbed and windrow). 81% of the high quality SSTF will be protected and managed within the 128 hectare EP&R and Additional Conservation Lands.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance involves poorer quality vegetation, isolated stands or vegetation on the fringe of the EP&R and Additional Conservation Lands. 81% of the main extent of SSTF, and the SSTF which is connected to the wider locality will be retained within the EP&R and Additional Conservation Lands. As such, this clearance will not lead to isolation of existing SSTF within the locality.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,

SSTF within the subject site is generally of poorer quality due to past and current grazing disturbance. Impacts of this grazing regime can be observed throughout the site in the form of increased weed invasion and modification and loss of ground and understorey vegetation. The vegetation to be removed is the most marginal vegetation on the site, whilst the vegetation being retained in the 128 hectare EP&R and Additional Conservation Lands is the highest quality and best connected habitat within the site. The habitat being removed is not considered to be important to the viability of SSTF in the locality.

e. whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Not applicable – no critical habitat has been declared on the site.

f. whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

SSTF is included in the Cumberland Plain Recovery Plan (DECCW 2011). The Recovery Plan has the overall objective of providing for the long-term survival and protection of the threatened biodiversity of the Cumberland Plain. The specific recovery objectives of this Recovery Plan are:

1. *To build a protected area network, comprising public and private lands, focused on the priority conservation lands* ['Priority conservation lands' represent 25,566 ha of mapped lands with

highest priority given to conservation of the Cumberland Plain threatened biodiversity].

Priority Conservation Lands are located with the northern section of the EP&R and Additional Conservation Lands. The protection and management of these lands is consistent with this objective.

2. *To deliver best practice management for threatened biodiversity across the Cumberland Plain, with a specific focus on the priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation.*

The management of the EP&R and Additional Conservation Lands is consistent with this objective.

3. *To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the recovery program Cumberland Plain Recovery Plan.*

This is not a site specific objective and the actions under this objective are the responsibility of OEH. However community awareness, engagement and involvement can be integrated into the management framework of the EP&R and Additional Conservation Lands which will be protected and managed under a Community Scheme.

4. *To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these in a strategic and effective manner.*

This is not a site specific objective and the actions under this objective are the responsibility of OEH. However, the information on the distribution of the threatened biodiversity at the site will be entered in the Atlas of NSW Wildlife to assist with understanding species composition. The long term management of the site will utilise information provided by OEH to inform management actions.

g. whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

A number of Key Threatening Processes (KTPs) are relevant to this proposal with respect to SSTF. These include:

- Clearing of native vegetation;
- Invasion of native plant communities by exotic perennial grasses; and
- Removal of dead wood and dead trees.

The proposal will result in the removal of approximately 8.3 ha of poorer quality SSTF for a residential development. Whilst this represents a large area, in a local context this represents 25% of SSTF on-site and less in the context of the surrounding region. Approximately 74% of the high quality SSTF will remain on site.

As part of the proposed development, mitigation measures will be implemented to prevent the spread of weeds throughout the study area. Weed management works will be undertaken throughout the subject site, as well as in the surrounding golf courses and other development areas, to ensure exotic species do not invade surrounding conservation areas as a result of the proposed development. Removal of the exotic pasture will remove a source of exotic perennial grasses and reduce the potential for invasion of native plant communities.

A number of dead trees were found to occur within the EP&R Lands, with only one dead stag located within the subject site. This is not considered to represent a significant impact to dead wood and trees.

It is therefore considered unlikely that the proposal would exacerbate any KTPs to such an extent that they would place any local occurrences of SSTF at risk of extinction or degradation.

Conclusion

The proposal would result in the clearance of approximately 8.3 ha of poorer quality SSTF and the retention and management of 23.9 hectares of high quality SSTF within the 128 hectare EP&R and Additional Conservation Lands. The proposed vegetation removal is not considered to be significant for the following reasons:

- Clearing is restricted to generally poorer quality vegetation and the disturbed fringe adjacent to the EP&R and Additional Conservation Lands;
- Large, intact areas of high quality SSTF will be retained within the EP&R and Additional Conservation Lands providing for the long term viability of this vegetation community;
- Mitigation measures would be implemented to prevent indirect impacts (e.g. weed infestation) of the proposal on the remaining SSTF; and
- The proposal would not further fragment existing areas of SSTF.

Overall the proposed clearance is considered unlikely to result in a significant impact and, therefore, a Species Impact Statement is not required.

Cumberland Plain Woodland in the Sydney Basin Bioregion (CPW)

Cumberland Plain Woodland (CPW) is listed as a Critically Endangered Ecological Community under the TSC Act. In the NPWS vegetation mapping of the Cumberland Plain, two forms of Cumberland Plain Woodland have been identified: Shale Hills Woodland and Shale Plains Woodland. Shale Hills Woodland occurs mainly on the elevated and sloping southern half of the Cumberland Plain and is the most widely distributed form of CPW (NPWS 2004). The dominant canopy trees in CPW include *Eucalyptus moluccana* (Grey Box), *E. tereticornis* (Forest Red Gum) and *E. crebra* (Narrow-leaved Ironbark), although *Corymbia maculata* (Spotted Gum) and *E. eugenioides* (Thin-leaved Stringybark) may also occur. The community has a shrub layer dominated by *Bursaria spinosa* (Blackthorn), with other shrubs, such as *Acacia implexa*, *Indigofera australis* and *Dodonaea viscosa* subsp. *cuneata*, also present. The diverse understorey layer is similar for both forms of Cumberland Plain Woodland. It is common to find grasses, such as *Themeda australis* (Kangaroo Grass), *Microlaena stipoides* var. *stipoides* (Weeping Meadow Grass) in the community, as well as herbs, such as *Dichondra repens* (Kidney Weed), *Brunoniella australis* (Blue Trumpet) and *Desmodium varians* (NPWS 2004).

Before European settlement, CPW was extensive across western Sydney, covering 125,000 ha. In 2002, there was only 9% of the original extent, with a further 14% remaining as scattered trees across the landscape (NPWS 2002). CPW is an important part of the western Sydney landscape and occurs on the well-structured clay soils, derived from Wianamatta shale (NPWS 2004). It is well adapted to drought and fire and the understorey plants often rely on underground tubers or profuse annual seed production to survive adverse conditions (DECC 2009).

Bushland remnants of CPW occur in an area bounded by Scheyville (north), Penrith (west), Parramatta (east) and Thirlmere (south). CPW also occurs in the Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly Local Government Areas (LGAs).

CPW is habitat for many flora and fauna species. Some threatened species supported by CPW include: *Pimelea spicata* (Spiked Rice Flower) and *Meridolum corneovirens* (Cumberland Plain Land Snail). Tree hollows are commonly found in the old growth canopy species, and are of high conservation value.

Clearing for agriculture and urban development is the greatest threat to CPW. Given it exists now only in fragments, CPW is vulnerable to disturbances, such as weed invasion, increased soil nutrients, rubbish dumping and frequent fire. Weeds, such as *Eragrostis curvula* (African Lovegrass), *Olea europaea* subsp. *cuspidata* (African Olive), *Asparagus asparagoides* (Bridal Veil Creeper) and *Chloris gayana* (Rhodes Grass), are major threats to the community (NPWS 2004).

CPW exists in the proposed developed footprint. The CPW that will be cleared is of very poor quality and comprises of scattered trees within a modified pasture. To mitigate impacts to Cumberland Plain Woodland at Bingara Gorge it is proposed to purchase and retire 70 CPW biobank credits.

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable to endangered ecological communities.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable to endangered ecological communities.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Approximately 0.9 ha of moderate quality CPW will be impacted with a further 4.9 ha of low quality CPW impacted. Due to its isolated nature, high levels of weed invasion and poor quality the vegetation is considered to have very low long term management viability. The loss of this poor quality vegetation is not considered to place the local occurrence of this community at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The vegetation that is proposed to be removed has low native species and poor structural diversity. Substantial areas of CPW have been mapped to the north, south and west of the site. The removal of this area of vegetation is not likely to place the local occurrence of this community at risk of extinction.

d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposal will remove approximately 5.9 hectares of predominantly poor quality CPW.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The vegetation proposed to be removed is poorly connected with other vegetation in the area. It is isolated and surrounded by exotic pasture and subject to high levels of weed invasion.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,

The vegetation to be removed is of low quality and is considered to be of negligible importance to the long term survival of this community in the locality. Due to the poor quality and isolated nature of the vegetation it is considered to have low long term management viability.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has been declared for CPW.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

The *Cumberland Plain Recovery Plan* (DECCW 2011) has four main objectives that are addressed below:

1. Building a protected area focused on Priority Conservation Lands

The vegetation proposed to be cleared is of low quality and is not included in the Priority Conservation Lands map

2. Best practice management focused on Priority Conservation Lands and Public Reserves
   No relevant to the subject site

3. Increase understanding and enhance community awareness
   Not relevant to the subject site

4. To increase knowledge of the threats to CPW and improve capacity to manage these in a strategic and effective manner
   Not relevant to the subject site

The proposal is considered to be consistent with the relevant objectives and actions of the recovery plan.

No relevant threat abatement plans have been prepared for CPW.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Clearing of native vegetation is listed as a key threatening process. The area of CPW to be cleared (5.9ha) is small, isolated and of low quality having low native diversity and cover. The loss of this low quality vegetation will not increase the impact of this key threatening process.

Conclusion

The proposal would result in the removal of approximately 5.9 ha of poor quality CPW at the subject site. The proposed vegetation removal is unlikely to be considered significant for the following reasons:

- the CPW is of low quality with low native species diversity and low native cover
- the areas of CPW to be removed is isolated and does not play an important role in habitat connectivity in the locality
- The area of CPW to be removed is considered to be of low long term management viability

FLORA

Acacia bynoeana (Bynoe's Wattle)

Acacia bynoeana (Bynoe's Wattle) is listed as an endangered species under Schedule 1 of the TSC Act. Its distribution ranges from Dora Creek in the north, to Berrima and the Illawarra in the south and west to the Blue Mountains (Harden 1991).

Acacia bynoeana is a decumbent shrub to 0.5 m high which occurs in heath or dry sclerophyll forest on infertile, well drained sandy soils, appearing to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches (Harden 1991). Commonly associated over-storey species include *Corymbia gummifera* (Red Bloodwood), *Eucalyptus haemastoma* (Scribbly Gum), *E. parramattensis* (Parramatta Red Gum), *E. sclerophylla* (Hard-leaved Scribbly Gum) *Banksia serrata* (Saw Banksia) and *Angophora bakeri* (Narrow-leafed Apple; NPWS 1999; DECC 2005). Shrubs often associated with the species include *Banksia spinulosa* (Hairpin Banksia), *Acacia oxycedrus* (Spike Wattle), *A. myrtifolia* (Red-stemmed Wattle) and *Kunzea* spp. (NPWS 1999).

Acacia bynoeana produces few globular inflorescences, singularly in leaf axils, from September to March with mature seedpods present from September to January. Seed production is considered to be minimal and seedlings are rare with little local dispersal of seed (NPWS 1999). It has a woody rootstock and it is considered likely that the species is able to resprout from this rootstock after fire. The species also maintains a long-term soil-stored seedbank with above ground individuals not always apparent and appearing periodically, possibly in response to local disturbance (NPWS 1999).

Key threatening processes listed in the TSC Act that have been identified as threats to *Acacia bynoeana* include Clearing of Native Vegetation, Bush rock Removal and High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition. Additional threats identified for this species include habitat disturbance during road, trail and powerline maintenance, recreational use of habitat by vehicles, horse riders and pedestrians use, weed invasions, and inappropriate fire regimes (DECC 2005). The response of *Acacia bynoeana* to fire is unknown, although it is predicted that individuals resprout from woody rootstock, and that germination from the soil seed bank occurs after fire (NPWS 1999). It is likely the species can cope with fires of a frequency of every 10-12 years with more frequent fires threatening the species' survival (DECC 2005).

129 individuals of this species were recorded within the study area, of which 120 are located within the 128 hectare EP&R and Additional Conservation Lands, leaving 9 individuals within the development lands.

a. in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The proposed residential development will involve the removal of 9 individuals. Within the EP&R and Additional Conservation Lands 120 records of this species have been identified. These individuals are within high quality bushland that will be managed into the future and given the size and connectivity of the EP&R and Additional Conservation Lands natural ecological process will continue into the future. Potential impacts from proximal urban development could affect the lifecycle of this species if not properly controlled. Control measures include:

Urban Runoff – implementation of water sensitive urban design mechanisms to regulate water quality and flows

Access – access will be controlled within the EP&R and Additional Conservation Lands through a formal trail system combined with educational signage

Fire Regimes – fire will be monitored to reduce the potential for inappropriate fire regimes being implemented (too few or too frequent). Asset protection zones are located outside of habitat for this species

Weed Invasion and management – weed invasion will be managed within the EP&R and Additional Conservation Lands to reduce the potential spread of weeds into this species habitat. Weed management will be undertaken by trained bush regenerators to reduce the potential for inappropriate techniques or accidental spraying occurring

As 120 specimens are located within the EP&R and Additional Conservation Lands, and managed to reduce the potential for indirect impacts, it is unlikely that the proposed removal of 9 individuals would place the local occurrence of the species at risk of extinction.

b. in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable. *Acacia bynoeana* is not an endangered population.

c. in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable. *Acacia bynoeana* is not an endangered ecological community.

d. in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed residential development will involve the removal of 9 individuals. 120 will be protected within the EP&R and Additional Conservation Lands.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The 120 individuals located 128 hectare EP&R and Additional Conservation Lands are well connected and will not become fragmented or isolated as a result of this development.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

The subject site has undergone previous and current grazing disturbances. Grazing impacts can be seen within the site through increased weed levels, removal of ground and understorey vegetation layers and sediment disturbance. 9 individuals have been located within the development area and 120 are located within the EP&R and Additional Conservation Lands. The proposal will result in the retention and long term management of 93% of the individuals located on the site. As such, it is unlikely that the area

proposed for clearing would represent an area of habitat that is important to the long-term survival of this species within the locality.

e. whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat for this species has been identified on the Register of Critical Habitat.

f. whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement

No recovery plan or threat abatement plan has been prepared for *Acacia bynoeana*. OEH has identified 14 state-wide conservation actions for this species. The following actions are of relevance to this proposal;

> *Increase the level of legislative protection for sites through land-use planning mechanisms and conservation agreements. Retain vegetative linkages between sites where possible.*
>
> *Liaise with private and public land managers to facilitate the preparation and implementation of management plans that address threatening processes.*
>
> *Restrict access to sites, where necessary.*
>
> *Undertake targeted bush regeneration works, where required.*
>
> *Incorporate appropriate fire regime into land management practices*

The proposal is consistent with the above priority actions.

g. the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

A number of KTPs are relevant to this proposal with respect to *Acacia Bynoeana*. These include:

- Clearing of native vegetation
- Invasion of native plant communities by exotic perennial grasses
- High Frequency Fires

Clearing of native vegetation will take place as part of this proposal but will only result in the loss of 7% of the individuals found on the site.

Invasion of exotic perennial grasses is currently an issue at this site given its history of agricultural use. The proposed development will reduce the potential for this KTP to impact this species through the removal of the major source of exotic perennial grasses at the site and the long term management of exotic grasses within the EP&R and Additional Conservation Lands.

Fires will be monitored and managed within the EP&R and Additional Conservation Lands. Asset Protection Zones are located outside of habitat for this species.

Conclusion

The proposal would result in the removal of approximately 7% of the individuals on the site whilst the remaining 93% of the individuals will be retained within the 128 hectare EP&R and Additional Conservation Lands. The proposed development is unlikely to result in a significant impact for the following reasons:

- 93% of the individuals of this species are located within the EP&R and Additional Conservation Lands.
- Large and intact habitat areas of habitat will remain within the EP&R and Additional Conservation Lands;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining *Acacia bynoeana*; and
- The proposal would not fragment any current populations of *Acacia bynoeana*.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the survival of *Acacia bynoeana.* Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

Epacris purpurascens* var. *purpurascens

Epacris purpurascens var*. purpurascens* is listed as a Vulnerable species under the NSW TSC Act. This species is an erect shrub 50-180 cm tall with prominent short, broad leaf scars, spreading and recurved ovate to heart-shaped leaves and showy white-pinkish flowers. The lifespan is recorded to be 5-20 years, requiring 2-4 years before seed is produced in the wild. This species has been recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. This species can be found in a range of habitats, most of which have strong shale soil influences (OEH, 2013).

This species has been recorded over 139 times within a 10 km radius of the subject site and has been recorded 1167 times on the site. ELA ecologists have recorded 1138 specimens within the EP&R and Additional Conservation Lands. 29 individuals of this species were found within the development area.

a. in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposed residential development will involve the removal of 29 individuals. Within the EP&R and Additional Conservation Lands 1138 records of this species have been identified. These individuals are within high quality bushland that will be managed into the future and given the size and connectivity of the EP&R and Additional Conservation Lands natural ecological process will continue into the future. Potential impacts from proximal urban development could affect the lifecycle of this species if not properly controlled. Control measures include:

Urban Runoff – implementation of water sensitive urban design mechanisms to regulate water quality and flows

Access – access will be controlled within the EP&R and Additional Conservation Lands through a formal trail system combined with educational signage

Fire Regimes – fire will be monitored to reduce the potential for inappropriate fire regimes being implemented (too few or too frequent). Asset protection zones are located outside of habitat for this species

Weed Invasion and management – weed invasion will be managed within the EP&R and Additional Conservation Lands to reduce the potential spread of weeds into this species habitat. Weed management will be undertaken by trained bush regenerators to reduce the potential for inappropriate techniques or accidental spraying occurring

As 1138 specimens are located within the EP&R and Additional Conservation Lands, and managed to reduce the potential for indirect impacts, it is unlikely that the proposed removal of 29 individuals would place the local occurrence of *Epacris purpurascens* var*. purpurascens* at risk of extinction.

b. in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable – not an endangered population.

c. in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable – not an EEC

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable – not an EEC

d. in relation to the habitat of a threatened species, population or ecological community:

iv. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed residential development will involve the removal of 29 individuals. 1138 will be protected within the EP&R and Additional Conservation Lands.

v. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The 1138 individuals located 128 hectare EP&R and Additional Conservation Lands are well connected and will not become fragmented or isolated as a result of this development.

vi. the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,

The *Epacris purpurascens* var. *purpurascens* is a threatened species which is well represented within the wider locality. The subject site has undergone previous and current grazing disturbances. Grazing impacts can be seen within the site through increased weed levels, removal of ground and understorey vegetation layers and sediment disturbance. 29 *Epacris purpurascens* var. *purpurascens* individuals have been located within the development area and 1138 are located within the EP&R and Additional Conservation Lands. As such, it is unlikely that the area proposed for clearing would represent an area of habitat that is important to the long-term survival of this species within the locality.

e. whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Not applicable – no critical habitat has been declared onsite.

f. whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Epacris purpurascens var. *purpurascens* has five priority actions outlined within its Priorities Action Statement (DECCW 2011), there is no recovery plan for this species. Priority Action Statements promote the recovery of threatened species and abatement of KTPs in NSW. The relevant priority actions (DECCW 2011) specify to:

- Monitor known populations so that potential local extinctions are detected before they occur and mechanisms can be put in place to reverse trends.
- Identify and survey potential habitat to detect new populations.

- Liaise with land managers to encourage the preparation of site management plans and the implementation of appropriate threat abatement measures, such as weed control/bush regeneration, site protection (fencing/signage) and fire management.
- Identify priority sites for formal habitat protection and seek to implement measures such as JMAs or VCAs.
- Monitor impact of fire on populations to inform DECC / RFS / local government planning.
- Undertake targeted bush regeneration works, where required.

Within the proposed development best-practice site management plans exist which specify the use of appropriate threat abatement measures such as weed control / bush regeneration, soil erosion controls and site protection measures (e.g. fencing and signage). The proposed residential development is consistent with the relevant priority actions.

g. whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

A number of KTPs are relevant to this proposal with respect to *Epacris purpurascens* var. *purpurascens*. These include:

- Clearing of native vegetation
- Invasion of native plant communities by exotic perennial grasses
- High Frequency Fires

Clearing of native vegetation will take place as part of this proposal but will only result in the loss of 3% of the individuals found on the site.

Invasion of exotic perennial grasses is currently an issue at this site given its history of agricultural use. The proposed develop will reduce the potential for this KTP to impact this species through the removal of the major source of exotic perennial grasses at the site and the long term management of exotic grasses within the EP&R and Additional Conservation Lands.

Fires will be monitored and managed within the EP&R and Additional Conservation Lands. Asset Protection Zones are located outside of habitat for this species.

Conclusion

The proposal would result in the removal of approximately 3% of the individuals on the site whilst the remaining 97% of the individuals will be retained within the 128 hectare EP&R and Additional Conservation Lands. The proposed development is unlikely to result in a significant impact for the following reasons:

- 97% of the individuals of this species are located within the EP&R and Additional Conservation Lands.
- Large and intact habitat areas of habitat will remain within the EP&R and Additional Conservation Lands;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining *Epacris purpurascens* var. *purpurascens*; and

- The proposal would not fragment any current populations of *Epacris purpurascens* var. *purpurascens*.

Overall the proposed clearance is considered unlikely to be significant and therefore does not require a Species Impact Statement.

***Grevillea parviflora* subsp. *parviflora* (Small-flowered Grevillea)**

Grevillea parviflora subsp. *parviflora* (Small-flowered Grevillea) is a low open to erect shrub up to one metre tall (Harden 2002) with narrow linear leaves and erect conflorescences, consisting of 6 to 12 white flowers with brown hairs on the perianth. It flowers from July to December. *Grevillea parviflora* subsp. *parviflora* grows sporadically throughout the Sydney Basin, with main occurrences centred around south-west Sydney and including the study area. Separate populations are also known from the Central Coast and in the Lower Hunter (NPWS 2002). It occurs in heaths or shrubby woodland, in sandy or light clay soils usually over shale substrates and is commonly found in relatively open, disturbed sites including along roads and tracks.

Little is known about the life cycle of Grevillea *parviflora* subsp. *parviflora*. The flowers are insect pollinated with one to two seeds released at maturity, although seed dispersal is limited to probably less than two metres (NPWS 2002). Plants are capable of suckering or regenerating from a rootstock with sucker stems usually occur in patches close to the parent plant (NPWS 2002). After disturbance, including fire, regeneration can occur from both the rhizomes and seed in the soil seedbank, however, after fire, adult plants are killed and seedling recruitment is uncommon (NPWS 2002). Threats to this species include inappropriate fire regimes with high fire frequency causing a decline in the soil seedbank and seedling recruitment and low fire frequency resulting in poor levels of seed germination and dense growth of the shrub layer. Urban development, road maintenance and weeds are also recognised as threats for this species (OEH, 2013).

This species was recorded at 69 locations within a 10 km radius of the subject site, with a number of records located just east of the study area. Within the study area 996 individuals where recorded, of which 929 are located within the EP&R and Additional Conservation Lands.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

67 individuals, comprising 7% of the individuals found on the site are located within the development area.

929 individuals were found within the 128 hectare EP&R and Additional Conservation Lands that will be protected and maintained. These individuals are within high quality bushland that will be managed into the future and given the size and connectivity of the EP&R and Additional Conservation Lands natural ecological process will continue into the future. Potential impacts from proximal urban development could affect the lifecycle of this species if not properly controlled. Control measures include:

Urban Runoff – implementation of water sensitive urban design mechanisms to regulate water quality and flows

Access – access will be controlled within the EP&R and Additional Conservation Lands through a formal trail system combined with educational signage

Fire Regimes – fire will be monitored to reduce the potential for inappropriate fire regimes being implemented (too few or too frequent). Asset protection zones are located outside of habitat for this species

Weed Invasion and management – weed invasion will be managed within the EP&R and Additional Conservation Lands to reduce the potential spread of weeds into this species habitat. Weed management will be undertaken by trained bush regenerators to reduce the potential for inappropriate techniques or accidental spraying occurring.

As such, it is unlikely that the development will have an adverse impact on the life cycle of this species such that a viable local population is likely to be placed at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

35.5 ha of poorer quality native vegetation will be removed whilst 128 hectares of high quality native vegetation will be retained, including 929 known locations of this species on the site. 67 records of this species are located within the development area, comprising 7% of the records on this site.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

929 of the known locations of this species are located within the 128 hectare EP&R and Additional Conservation Lands. This area of habitat contains 93% of the individuals, is well connected and will not become fragmented or isolated as a result of this development.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

The *Grevillea parviflora* subsp. *parviflora* individuals within the study area were observed to be part of a local population extending beyond the study area to the east of the site. The loss of 7% of the individuals on the site is not considered to be important in the context of retaining 93% of the individuals within the 128 hectare EP&R and Additional Conservation Lands.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

Not applicable – no critical habitat has been declared for *Grevillea parviflora* subsp. *parviflora*.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has prepared for *Grevillea parviflora* subsp. *parviflora*. Five Priority Actions have been identified for this species;

1. Identify and survey potential habitat to detect new populations.

Survey has been undertaken across the site and the location of the species has been identified.

Monitor known populations, so that potential local extinctions are detected before they occur and mechanisms can be put in place to reverse trends

Monitoring will be undertaken as part of the Environmental Management Plan

Investigate seed viability, germination, dormancy and longevity (in natural environment and in storage).

Not relevant

Investigate genetic variation in collaboration with BGT.

Not relevant

Liaise with land managers to encourage the preparation of site management plans and the implementation of appropriate threat abatement measures, particularly in fire management, bush regeneration, roadside management, weed control and fencing and signage

An environmental management plan has been prepared for the site that has considered the above measures.

The action is considered to be consistent with the Priority Actions for this species.

(g) The action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

A KTP is defined under the TSC Act as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*". The following KTPs listed under Schedule 3 of the TSC Act are relevant to the proposal and may pose a threat to *Grevillea parviflora* subsp. *parviflora.*

- Clearing of native vegetation
- Invasion of native plant communities by exotic perennial grasses
- High Frequency Fires

Clearing of native vegetation will take place as part of this proposal but no habitat for this species will be lost and it will not affect habitat connectivity for this species.

Invasion of exotic perennial grasses is currently an issue at this site given its history of agricultural use. The proposed develop will reduce the potential for this KTP to impact this species through the removal of the major source of exotic perennial grasses at the site and the long term management of exotic grasses within the EP&R and Additional Conservation Lands.

Fires will be monitored and managed within the EP&R and Additional Conservation Lands. Asset Protection Zones are located outside of locations of this species.

Conclusions

The proposal would result in the removal of approximately 7% of the individuals on the site. The reaming 93% (929 individuals) will be retained within the 128 hectare EP&R and Additional Conservation Lands. Any potential indirect impacts will be mitigated through the long term management of the EP&R and Additional Conservation Lands.

The proposed vegetation removal is unlikely to result in a significant impact for the following reasons:

- Large and intact habitat areas will remain within the EP&R and Additional Conservation Lands and this will protect existing known locations of the species;
- 93% of the individuals will be retained within the EP&R and Additional Conservation Lands;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining *Epacris purpurascens* var. *purpurascens*; and
- The proposal would not fragment any current populations of *Epacris purpurascens* var. *purpurascens*.

Overall the proposed clearance is considered unlikely to be significant and therefore does not require a Species Impact Statement.

***Melaleuca deanei* (Deane's Melaleuca)**

Melaleuca deanei (Deane's Melaleuca) is listed as Vulnerable under the TSC Act and the EPBC Act. It is a shrub to three metres high with fibrous, flaky bark which occurs in heath on sandstone in two distinct areas; the Ku-ring-gai / Berowra and Holsworthy / Wedderburn areas. Further isolated occurrences are known at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and the Central Coast (Hawkesbury River) areas.

Little is known about the life cycle of *Melaleuca deanei*. It is a clonal species with the ability to re-sprout from a lignotuber and sucker from rootstock. As with many clonal species, flowering and the setting of seed occurs infrequently and irregularly. When flowering does occur an inflorescence spike of up to six cm long occurs on a furry stem and insects are thought to be the main pollinators. When seeds are produced they are retained in woody capsule for lengthy periods of time until opening following a vascular break between the capsule and branch, thought to occur following fire (NPWS 1997). Seeds are thought to be wind dispersed although the length of time for which they remain viable is unknown. It has been suggested that seeds remain viable for only a short period of time as the conditions causing seed release (i.e. fire) also produce favourable conditions for germination and that soil seedbanks are unlikely to persist for long periods of time.

Threats to *Melaleuca deanei* include the small size of populations, regimes of frequent fire and urban development. Many locations occur on the edge of fire trails and may be impacted by trail maintenance and widening and by associated changes in runoff and weed encroachment. Small population sizes, a limited capacity to regenerate and many sites having little or no seed-set means this species is threatened by stochastic events (OEH,2013).

1275 individuals of this species have been recorded within the study area, of which 1246 are located within the EP&R and Additional Conservation Lands. A further three individuals have been recorded within a 10 km radius of the subject site, with two of those individuals are located 70 - 500 m to the east of the study area.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Factors likely to have an adverse effect on the life cycle of *Melaleuca deanei* would include removal of individuals from a known population, frequent fire and encroachment from urban development.

The proposed works will involve the clearing approximately 35.5 ha of poorer quality native vegetation containing 29 *Melaleuca deanei* individuals.

A further 1246 individuals, comprising 98% of the records on the site are located within high quality bushland that will be managed into the future and given the size and connectivity of the EP&R and Additional Conservation Lands natural ecological process will continue into the future. Potential impacts from proximal urban development could affect the lifecycle of this species if not properly controlled. Control measures include:

Urban Runoff – implementation of water sensitive urban design mechanisms to regulate water quality and flows

Access – access will be controlled within the EP&R and Additional Conservation Lands through a formal trail system combined with educational signage

Fire Regimes – fire will be monitored to reduce the potential for inappropriate fire regimes being implemented (too few or too frequent). Asset protection zones are located outside of habitat for this species

Weed Invasion and management – weed invasion will be managed within the EP&R and Additional Conservation Lands to reduce the potential spread of weeds into this species habitat. Weed management will be undertaken by trained bush regenerators to reduce the potential for inappropriate techniques or accidental spraying occurring

The 1246 individuals located within the EP&R and Additional Conservation Lands will be managed to reduce the potential for indirect impacts. It is believed that the proposed development would not pose any adverse effects to the life cycle of this species such that a viable local population of the species would be likely to be placed at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of native vegetation. The area proposed for clearing supports poor to moderate quality potential habitat for this species. However 128 ha will be retained within the EP&R and Additional Conservation Lands. These lands contain 1246 individuals of this species and will be protected and managed into the future.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

98% of the known locations of this species are located within the 128 hectare EP&R and Additional Conservation Lands. This area of habitat is well connected and will not become fragmented or isolated as a result of this development.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

29 *Melaleuca deanei* individuals have been recorded within the proposed development area, and 1246 are located within the EP&R and Additional Conservation Lands. Given the retention of 98% of the records within the better quality vegetation, the habitat supporting 2% of the individuals is not considered to be important to the long-term survival of this species in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

Not applicable – no critical habitat has been declared by for *Melaleuca deanei*.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

Currently, 15 priority actions exist for this species which are assessed below;

Undertake targeted bush regeneration works, where required.

Bush regeneration works will be undertaken within the EP&R and Additional Conservation Lands

Fence sites and exclude livestock and/or feral animals, where required.

The EP&R and Additional Conservation Lands will be fenced where they are adjacent to lots or will have a perimeter road system in place

Public authorities and landowners undertaking road, trail, or easement maintenance activities in potential habitat are to ensure that planning and maintenance staff are aware of the species and that processes are in place to avoid impacting upon it

Roads, trails etc will be located away from individuals. Education of maintenance workers can be incorporated in the EMP

Restrict vehicular and pedestrian access to sites, where necessary

Access will be restricted and formalised. Direct access to known occurrences of the species will not be available

Undertake management focused ecological studies (including investigation of the reported low levels of seed production and the threat posed by hybridisation).

Not Applicable – OEH action

Undertake surveys to locate sites that are recorded from Morton NP and Colymea SCA

Not Applicable – OEH action

Provide map of known occurrences to Rural Fire Service and seek inclusion of mitigative measures on Bush Fire Risk Management Plan(s), risk register and/or operation map(s).

Not Applicable – OEH action

Assess the relative conservation significance of sites to determine recovery priorities

Not Applicable – OEH action

Prepare species profile and EIA guidelines

Not Applicable – OEH action

Seek to increase the level of legislative protection for sites through land-use planning mechanisms and conservation agreements. Retain or, where lost, re-establish vegetative linkages between sites where possible

EP&R and Additional Conservation Lands protected and managed through LEP and community scheme

Ensure that sites on crown land are appropriately classified and managed

Not Applicable – OEH action

Incorporate site specific threat abatement measures for the species into Plans of Management for on-park sites

Not Applicable – OEH action

Prepare and implement management plans for sites that are located on public land outside the NPWS estate

Not Applicable – site is private land

Liaise with private and public land managers to facilitate the preparation and implementation of management plans that address threatening processes

Liaison could be undertaken during EMP preparation. This could be included as a condition of consent

Incorporate appropriate fire regime into land management practices

Incorporated into EMP

The action proposed is considered to be consistent with the actions identified in the Priority Action Statement.

(g) The action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

A KTP is defined under the TSC Act as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*". Three KTPs which are relevant to the proposed development include:

- Clearing of native vegetation
- Invasion of native plant communities by exotic perennial grasses
- High Frequency Fires

Clearing of native vegetation will take place as part of this proposal. This will result in removal of 2% of the individuals recorded on site.

Invasion of exotic perennial grasses is currently an issue at this site given its history of agricultural use. The proposed develop will reduce the potential for this KTP to impact this species through the removal of the major source of exotic perennial grasses at the site and the long term management of exotic grasses within the EP&R and Additional Conservation Lands.

Fires will be monitored and managed within the EP&R and Additional Conservation Lands. Asset

Protection Zones are located outside of locations of this species.

Conclusions

The proposal is unlikely to impose a significant impact on potential *Melaleuca deanei* given the following reasons:

- 2% of individuals have been found within the development area;
- 98% of individuals will remain within the EP&R and Additional Conservation Lands;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining *Melaleuca deanei* individuals; and
- The proposal would not fragment any the retained populations of *Melaleuca deanei*.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the survival of *Melaleuca deanei*. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

Persoonia bargoensis

Persoonia bargoensis is an endangered species listed under the TSC Act and a Vulnerable species listed under the EPBC Act. It is an erect shrub up to 2.5 m with short (to 2.5 cm), more or less linear leaves. It occurs within a restricted area bounded by the suburbs of Picton, Douglas Park, Yanderra, Cataract River and Thirlmere. In these areas it occurs within woodland to dry sclerophyll forest, commonly on sandstone and heavier, well drained, loamy, gravely soils. Within this habitat type it appears to prefer open areas including disturbance margins including roadsides and tracks.

The yellow, tubular flowers appear mainly during summer in leaf axils of new growth and are pollinated by native bees. Its fruits are pear-shaped, green and pendulous, to 12 mm long. Like other *Persoonia* species, this species is thought to be killed by fire with recruitment entirely from the seedbank. Additionally, fire and other disturbance are thought to play an important role in triggering germination from the soil seedbank. The role fire plays in the lifecycle of this species means that this species is threatened by high frequency fires which prevents seedbank establishment. Other threats recognised for *Persoonia* species includes actions which lead to the establishment of exotic bees (which are not successful pollinators) or actions which fragment populations so that pollination (by native bees) or seed dispersal (thought to be by native birds and mammals) between populations cannot occur (OEH, 2013).

Four (4) individuals have been recorded within the development area, located within the EP&R and Additional Conservation Lands by ELA staff.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The proposed works will involve clearing approximately 35.5 ha of poorer quality native vegetation located along edges of the EP&R and Additional Conservation Lands and adjacent to pasture. Currently 4 *Persoonia bargoensis* individuals are located in the proposed development area, and any habitat for this species would be considered lower quality when compared to the surrounding vegetation. Approximately 128 ha of native vegetation and potential *Persoonia bargoensis* habitat, including 20 recorded individuals, will be conserved on-site as part of the EP&R and Additional Conservation Lands.

It is considered this development is unlikely to have an adverse effect on the life cycle of this species, such that a viable local population of the species is likely to be placed at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

> **(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
>
> **(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. Four (4) individuals have been located within the proposed development area whilst 20 within the 128 ha area of EP&R and Additional Conservation Lands, which supports good quality potential habitat for this species, would be protected and managed into the future.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The retention of 20 individuals within the 128 hectare EP&R and Additional Conservation Land will ensure habitat does not become fragmented or isolated as a result of this development.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

Four (4) *Persoonia bargoensis* individuals have been recorded within the proposed development area, with 20 specimens located within the EP&R and Additional Conservation Lands. Some moderate quality habitat will be cleared as a result of the proposed development, however this area is considered to be of lesser value than the surrounding vegetation to be retained.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

Not applicable – no critical habitat has been declared for *Persoonia bargoensis*.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan or threat abatement plan has been prepared for *Persoonia bargoensis*. There are 21 priority actions which are addressed below;

DEWHA to prepare National Conservation Advice.

Not Applicable

Prepare and implement site management plans for sites that are located on public land outside the NPWS/SCA estate

Not Applicable

Advise and liaise with private land managers to facilitate the preparation and implementation of site management plans that address threatening processes

Liaison with OEH could be undertaken during EMP preparation as a condition of consent

Retain or re-establish vegetation and fauna movement linkages between sites

Fauna movement linkages are being retained

Incorporate best knowledge regarding appropriate fire regime into land management practices

Fire regimes will be monitored and managed via EMP

Undertake targeted bush regeneration works and weed control, where required.

Bush regeneration works will be undertaken via EMP

Fence sites and exclude livestock and/or feral animals, where required.

Livestock will be removed from site as part of the development. The interface with the EP&R and Additional Conservation Lands will incorporate fencing adjacent to private lots and/or a perimeter road system. Feral animals will be managed via the EMP

Develop and implement site-awareness and protection procedures for use by land owners/managers and public utilities and their contractors when undertaking road, trail, or easement maintenance

Roads and trails will avoid species location. Trained bush regenerators will maintain the land, an awareness procedure can be incorporated into the EMP.

Restrict vehicular and pedestrian access to sites, where necessary

Access restricted via urban design and formalisation of trail locations

Undertake management-focused ecological studies, including fire frequency requirements.

Not Applicable – OEH requirement

Collect seed for NSW Seedbank. Develop collection program in collaboration with BGT - multiple provenances

Not Applicable – OEH requirement

Prepare species profile

Not Applicable – OEH requirement

Reserve Fire Management Strategy to include operational guidelines to protect this species from fire

Not Applicable – OEH requirement

Investigate seed viability, germination, dormancy and longevity (in natural environment and in storage).

Not Applicable – OEH requirement

Prepare EIA guidelines

Not Applicable – OEH requirement

Carry out targeted surveys in potential habitat, particularly freehold lands, Crown land that may be alienated, leasehold Crown land and council-managed lands

Targeted surveys undertaken as part of ecological assessment

Assess all sites to determine recovery priorities

Not Applicable – OEH requirement

Seek to increase the level of legislative protection for sites through land-use planning mechanisms and conservation agreements.

EP&R and Additional Conservation Lands protected and maintained via LEP clauses and community scheme.

Review classification of Crown land where sites occur to ensure appropriate classification and management for nature conservation

Not Applicable

Ensure that council-managed land on which sites occur are appropriately classified and managed for conservation.

Not Applicable

Incorporate site-specific threat abatement measures for the species into Plans of Management for sites in Sydney Catchment Authority areas

Not Applicable

The proposed action is considered to be consistent with the Priority Action Statement.

(g) The action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

A KTP is defined under the TSC Act as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*". Three KTPs listed under Schedule 3 of the TSC Act are relevant to the current proposal and may pose a threat to *Persoonia bargoensis*, namely:

- Clearing of native vegetation
- Invasion of native plant communities by exotic perennial grasses
- High Frequency Fires

Clearing of native vegetation will take place as part of this proposal but the loss of habitat for this species will be minimal.

Invasion of exotic perennial grasses is currently an issue at this site given its history of agricultural use. The proposed develop will reduce the potential for this KTP to impact this species through the removal of the major source of exotic perennial grasses at the site and the long term management of exotic grasses within the EP&R and Additional Conservation Lands.

Fires will be monitored and managed within the EP&R and Additional Conservation Lands. Asset Protection Zones are located outside of locations of this species.

Conclusions

The proposal is unlikely to impose a significant impact to potential *Persoonia bargoensis* given the following reasons:

- Only individuals have been found within the development area;

- 20 individuals and large and intact habitat areas will remain within the EP&R and Additional Conservation Lands;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining *Persoonia bargoensis,* before, after, and during construction; and
- The proposal would not fragment the retained populations of *Persoonia bargoensis*

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact to *Persoonia bargoensis*. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

FAUNA

Xanthomyza phrygia (Regent Honeyeater)

The Regent Honeyeater is listed as an Endangered species under Schedule 1 of the TSC Act and as an Endangered and a Migratory species under the EPBC Act.

The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern - Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW, its distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. During certain years, non-breeding flocks converge on flowering coastal woodlands and forests (DECCW 2010b).

The Regent Honeyeater mostly inhabits dry-ironbark eucalypt woodland and dry sclerophyll forest associations, where it prefers the most fertile sites available, (e.g. along creek flats, or in broad river valleys and foothills). In NSW, riparian forests containing *Casuarina cunninghamiana* (River Oak) and with *Amyema cambagei* (Needle-leaf Mistletoe) are also important as feeding and breeding sites. This species may also use other woodland types and wet lowland coastal forest dominated by *Eucalyptus robusta* (Swamp Mahogany) or *Eucalyptus maculata* (Spotted Gum).

Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.

The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Oak.

The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. This species also utilises *E. microcarpa, E. punctata, E. polyanthemos, E. mollucana, Corymbia robusta, E. crebra, E. caleyi, C. maculata, E. mckieana, E. macrorhyncha, E. laevopinea,* and *Angophora floribunda*. Nectar and fruit from the mistletoes *A. miquelii, A. pendula* and *A. cambagei* are also eaten during the breeding season. When nectar is scarce, lerp and honeydew comprise a large proportion of the diet (DECCW 2010b).

Factors likely to have an adverse effect on the life cycle of the Regent Honeyeater would include:

- Historical loss, fragmentation and degradation of habitat from clearing for agricultural and residential development, particularly fertile Yellow Box-White Box-Blakely's Red Gum woodlands;
- Continuing loss of key habitat tree species and remnant woodlands from strategic agricultural developments, timber gathering and residential developments;
- Suppression of natural regeneration of overstorey tree species and shrub species from overgrazing. Riparian gallery forests have been particularly impacted by overgrazing;
- Inappropriate forestry management practices that remove large mature resource-abundant trees. Firewood harvesting in Box-Ironbark woodlands can also remove important habitat components;
- Competition from larger aggressive honeyeaters, particularly Noisy Miners, Noisy Friarbirds and Red Wattlebirds; and

- Egg and nest predation by native birds (OEH, 2013).

One Regent Honeyeater has been recorded within the study area in 1954, although given the age of this record the spatial accuracy is considered to be indicative only. Three other records of this species exists within 10 km of the site, however the most recent record is from 1996.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The proposal will result in the removal of approximately 35.5 ha of poorer quality native vegetation, some of which could provide potential foraging habitat for this species. However, 128 ha of high quality habitat will be conserved within the study area, and more high quality habitat exists within the local area.

This species is likely to be itinerant visitor to the area with connectivity and foraging habitat being relevant to its lifecycle. The species would not rely on the site for breeding purposes. The retention of extensive areas of high quality potential habitat and maintenance of connectivity within the 128 hectare Environmental Conservation will ensure adequate foraging and movement habitat is retained on the site and is unlikely to place a viable local population at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

This is not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

This is not an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. However, a large, 128ha area of native vegetation is to be conserved within an EP&R and Additional Conservation Lands as part of the proposed development, which supports good quality potential habitat. The potential habitat being removed is minimal in the context of the potential habitat being retained within the EP&R and Additional Conservation Lands.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation to be cleared as a result of the proposed development occurs on the fringes of a continuous stand of vegetation proposed as an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

No Regent Honeyeaters have been recorded within the study area in the last 60 years, and the last record was located within the EP&R and Additional Conservation Lands. However, some areas of poorer quality habitat within the proposed development area would be cleared as a result of the proposed development. The vegetation to be cleared as part of the proposal is not considered to be important to the long-term survival of the species in the locality, given the amount of habitat being retained in the EP&R and Additional Conservation Lands and surrounding lands.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

Not applicable – no critical habitat has been declared for the Regent Honeyeater.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

A recovery plan has been prepared for the Regent Honeyeater entitled *The Regent Honeyeater (Anthochaera phrygia) Recovery Plan 1999 - 2003*. A revised recovery plan for this species is currently in preparation.

The following specific objectives are included in the 1999 - 2003 plan:

- Maintain and enhance the value of Regent Honeyeater habitat at the key sites and throughout the former range;
- Monitor trends in the Regent Honeyeater population size and dispersion across its range;
- Facilitate research on strategic questions which will enhance the capacity to achieve the long-term objectives;
- Maintain and increase community awareness, understanding and involvement in the recovery effort; and
- Maintain the captive population of Regent Honeyeaters at an adequate stock size.

The proposed works do not conflict with any of these objectives.

41 priority actions have been identified for this species. All but one of these actions is based on scientific or administrative measures to be implemented by OEH that are not applicable to this proposal. The single applicable priority action is addressed below;

Ensure appropriate environmental impact assessment of proposals impacting on Regent Honeyeater habitat

This ecological assessment report is an appropriate method for assessing the impact of this proposal on this species

(g) The action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Two KTP is relevant to this proposal with respect to the Regent Honeyeater:

- Clearing of native vegetation
- Loss of hollow-bearing trees

The proposed development would involve the clearing of approximately 35.5 ha of poorer quality native vegetation, some of which has the potential to provide habitat for the Regent Honeyeater. However, 128 ha of higher quality potential habitat, would be preserved within the study area as part of the proposed development. As such, it is not considered the proposed vegetation clearing would significantly impact or increase KTPs in relation to this species.

The species is unlikely to breed on the site and the loss of hollow-bearing trees is unlikely to affect breeding patterns for this species.

Conclusions

The proposal is unlikely to constitute a significant impact on the Regent Honeyeater given that:

- This is a wide-ranging species and is only likely to visit the site on an intermittent basis;
- Large and intact habitat areas will remain within the EP&R and Additional Conservation Lands;
- The proposal will not affect habitat connectivity for this species; and
- The proposal would not fragment any current populations of Regent Honeyeater

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the Regent Honeyeater. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

***Daphoenositta chrysoptera* (Varied Sittella)**

Varied Sittella is a small, short-tailed bird (10 - 11 cm long), listed as Vulnerable under the TSC Act. It has a widespread range across mainland Australia, excluding some areas of the arid interior (Nullarbor, Pilbara and Simpson Desert). The species inhabits eucalypt forests and woodlands, especially those dominated by rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. The Varied Sittella feeds on arthropods gleaned from crevices in rough bark, dead branches, standing dead trees and from small branches and twigs in the tree canopy (NSW Scientific Committee, 2009).

Threats to this species include:

- Apparent decline has been attributed to declining habitat. The sedentary nature of the Varied Sittella makes cleared land a potential barrier to movement.
- The Varied Sittella is also adversely affected by the dominance of Noisy Miners in woodland patches
- Threats include habitat degradation through small-scale clearing for fencelines and road verges, rural tree decline, loss of paddock trees and connectivity, 'tidying up' on farms, and firewood collection.

Two individuals were recorded within the proposed EP&R and Additional Conservation Lands during the current surveys. Twenty records of this species also occur within a 10 km radius of the study area.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposal will result in the removal of approximately 35.5 ha of poorer quality native vegetation for residential development. The proposal will also see the protection of 128 ha of high quality habitat within the EP&R and Additional Conservation Lands.

The vegetation being lost is unlikely to provide a core habitat resource for this species given the poor quality and open nature of the vegetation. The vegetation being retained within the 128 hectare EP&R and Additional Conservation Lands is of considerably higher quality and is better connected to proximal areas of habitat. This is also where the species was recorded.

As the vegetation being removed is of poorer quality and is only a small proportion of the habitat within the locality it is unlikely that the proposal will have an adverse effect on the life-cycle of this species that would place a viable local population at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable – not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable – not an endangered ecological community.

(d) In relation to the habitat of a threatened species, population or ecological community:

i. The extent to which habitat is likely to be remove or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. However, a large, 128 ha area of native vegetation onsite is proposed as an EP&R and Additional Conservation Lands within the study area, which provides good quality habitat for this species and is where the species was recorded.

ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The retention of the high quality habitat within the EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,

Two individuals of this species have been recorded within the EP&R and Additional Conservation Lands, this area will be protected and managed into the future. The loss of the poorer quality potential habitat is not considered to be important to the long term survival of this species.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

Not applicable – no critical habitat has been declared for the Varied Sittella.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan or threat abatement plan of relevance to the Varied Sittella has been prepared. Two priority actions have been listed for this species which are addressed below;

Encourage habitat linkages through PVP process.

Not Applicable

Raise awareness about importance of microhabitats. Encourage retention of intact foraging and breeding habitat through PVP process

Not Applicable

Whilst a PVP is not proposed for the site the retention of the habitat within the EP&R and Additional Conservation Lands is consistent with the priority action.

(g) The action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

One KTP is relevant to this proposal with respect to the Varied Sittella:

- Clearing of native vegetation.

35.5 ha of poorer quality native vegetation would be cleared as part of the proposed development. However 128 ha of higher quality native vegetation would also be retained and managed on-site within the EP&R and Additional Conservation Lands. Given the retention of a large area of high quality habitat for this species, the loss of the poorer quality potential habitat is unlikely to exacerbate the KTP.

Conclusion

The proposal is unlikely to result in a significant impact to the Varied Sittella, for the following reasons:

- No individuals have been recorded within the development area and the habitat is considered to be poor quality;
- Large and intact habitat areas will remain within the EP&R and Additional Conservation Lands where this species was recorded;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining Varied Sittella habitat; and
- The proposal would not fragment any known populations of Varied Sittella.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the Varied Sittella. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

***Glossopsitta pusilla* (Little Lorikeet)**

The Little Lorikeet is listed as Vulnerable under the TSC Act. It is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. The species primarily forages in the canopy of open eucalypt forest and woodland though also uses other trees including *Angophora* spp., *Melaleuca* spp. and other tree species. Riparian habitats are commonly used, due to higher soil fertility and greater productivity. The Little Lorikeet forages mostly on nectar and pollen and only occasionally on native fruits such as mistletoes (OEH, 2013).

The species roosts in canopy vegetation, often at distances from feeding habitat. Nesting occurs in hollow-bearing eucalypts in proximity to feeding areas if possible, with this species most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Hollows are typically small and located high above the ground with riparian trees often chosen, including *Allocasuarina* spp. (OEH, 2013).

Little Lorikeet has not been recorded within the study area. 14 records of Little Lorikeet exist within a 10 km radius of the study area, the closest of which is approximately 100 m to the south of the study area.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposal will result in the removal of approximately 31.7 ha of poorer quality native within the residential development area. However, 128 ha of high quality habitat will be conserved within the EP&R and Additional Conservation Lands, and additional quality habitat exists within the locality.

The potential habitat proposed for removal is of poor quality and represents only a small proportion of the overall habitat within the locality, with significant areas of potential habitat to be retained. The retention of this land will include retention of breeding habitat (hollows), foraging habitat and provide for ongoing habitat connectivity. It is considered unlikely the proposal would place a local population of this species at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable – not an endangered population.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. **Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**

ii. **Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Not applicable – not an endangered ecological community.

(d) In relation to the habitat of a threatened species, population or ecological community:

i. The extent to which habitat is likely to be remove or modified as a result of the action proposed, and

The proposed works involve clearing approximately 35.5 ha of poorer quality native vegetation and 76.1 ha of pasture. However, a significant area (128 ha) of high quality native vegetation is proposed for conservation within an EP&R and Additional Conservation Lands, which supports good quality potential habitat.

ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation to be cleared as a result of the proposed development occurs on the fringes of a continuous stand of vegetation proposed for the EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,

No Little Lorikeets have been recorded within the study area. The area being cleared is of poorer quality and is not considered to be important to the long term survival of the species in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Not applicable – no critical habitat has been declared for this the Little Lorikeet.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plan or threat abatement plan has been prepared for the Little Lorikeet. Two priority actions have been listed for this species:

- Encourage retention of old-growth Eucalyptus trees through Property Vegetation Plans (PVPs) and Environmental Impact Assessments (EIAs).
- Encourage retention of the hollow bearing trees through PVPs and EIA.

Substantial numbers of hollow-bearing trees will be retained within the EP&R and Additional Conservation Lands, likely to number into the thousands. The proposal is considered to be consistent with the priority actions.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Two KTPs are relevant to this proposal with respect to the Little Lorikeet:

- Loss of hollow-bearing trees
- Clearing of native vegetation.

Substantial numbers of hollow-bearing trees will be retained within the EP&R and Additional Conservation Lands, likely to number into the thousands. As such, the proposed tree clearing within the development area is not considered to exacerbate this KTP.

35.5 ha of poorer quality native vegetation would be cleared as part of the proposed development. However 128 ha of higher quality native vegetation would also be retained and managed on-site within the EP&R and Additional Conservation Lands. Given the retention of a large area of high quality habitat for this species, the loss of the poorer quality potential habitat is unlikely to exacerbate the KTP.

Conclusion

The proposal is unlikely to result in a significant impact on the Little Lorikeet, given the following reasons:

- No individuals have been located within the development area and the potential habitat is of poor quality;
- Large and intact high quality habitat areas will remain within the EP&R and Additional Conservation Lands;
- A large number of hollow-bearing trees are located within the EP&R and Additional Conservation Lands;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining Little Lorikeet habitat; and
- The proposal would not fragment any current populations of Little Lorikeet

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the Little Lorikeet. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

***Hieraaetus morphnoides* (Little Eagle)**

Little Eagle is listed as a Vulnerable species under Part 1 of Schedule 2 of the TSC Act. The Little Eagle is a medium sized (45 - 55 cm) bird of prey that occurs in two colour forms. The Little Eagle is distributed throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment (Marchant and Higgins, 1993). The Little Eagle occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. She-oak or Acacia woodlands and riparian woodlands of interior NSW are also used by this species (Marchant and Higgins, 1993; Aumann, 2001). This species requires a tall living tree within a remnant patch for nest sites, where pairs build a large stick nest in winter and lay in early spring. This species' young fledge in early summer. Generation length has been estimated as 10 years (Debus and Soderquist, 2008). Little Eagle eats birds, reptiles and mammals, occasionally adding large insects and carrion (Marchant and Higgins, 1993; Debus *et al,.* 2007). The species was formerly heavily dependent on rabbits, but following the spread of rabbit calicivirus disease, and consequent decline in rabbit numbers by 65 - 85% in the arid and semi-arid zones (Sharp *et al.,* 2002) the Little Eagle is increasingly dependent on native prey. Most of its former native mammalian prey species in inland NSW are extinct (NSW Scientific Committee 2011).

Threats to this species include:

- Secondary poisoning from rabbit baiting.
- Rural-residential subdivision and associated land uses (e.g. horse and goat grazing).
- Urban expansion.
- Clearing and degradation of foraging and breeding habitat.

The Little Eagle was not recorded within the study area during the current field surveys, but is known from four records within a 10 km radius of the study area. There are no potential nesting trees within the subject site, though the site and surrounding area may present potential foraging habitat.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The proposal will result in the removal of approximately 35.5 ha of poorer quality native vegetation and approximately 70 ha of pasture (as potential habitat) for residential development. However, 128 ha of high quality habitat will be conserved within the EP&R and Additional Conservation Lands, and additional high quality habitat exists within the local area.

The potential habitat being removed is of poor quality and unlikely to provide a nesting site for this species. The development will therefore result in the loss of poor quality potential foraging habitat. The loss of poor quality foraging habitat is unlikely to effect the life cycle of this species. Given the extensive areas of vegetation to be retained within the EP&R and Additional Conservation Lands and lack of records of this species on the site, it is unlikely that the proposal will place a viable local population at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable – not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable – not an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. The native vegetation and pasture proposed for clearing may support potential foraging habitat for this species, but no nesting habitat exists within the development area. A significant, 128 ha area of native vegetation is proposed for retention within an EP&R and Additional Conservation Lands, which supports good quality potential habitat for this species.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation proposed for clearing as a result of this development occurs on the fringe of a continuous stand of vegetation to be retained within an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

No Little Eagles have been recorded within the study area, however poorer quality habitat within the development area would be cleared as a result of the proposed development. The vegetation proposed for clearing is not considered to be important habitat in terms of the long term survival of this species. The vegetation proposed for clearing is of a lower quality when compared to the significant areas of vegetation in the surrounding area, and is not considered to provide breeding habitat for this species.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

Not applicable – no critical habitat has been declared for the Little Eagle.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery or threat abatement plans have been prepared for this species for NSW. Four priority actions have been outlined for this species and these are addressed below;

Raise awareness non-target poisoning from baits

Not applicable

Liaise with planning authorities to minimise the loss of habitat by clearing and fragmentation associated with urban and rural development.

Liaison with council has been ongoing from rezoning through to development applications. The proposed action has been designed in a manner to minimise clearing of high quality habitat and to concentrate clearing on low quality habitat.

Raise awareness of loss of habitat through population pressure.

Not applicable

Raise awareness about microhabitats used by Little Eagle. Encourage habitat retention through PVP process.

Not applicable

The proposed action is considered to be consistent with the priority actions for this species.

(g) The action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

One KTP is relevant to this proposal with respect to the Little Eagle:

- Clearing of native vegetation

This development will involve the clearing of approximately 35.5 ha of poorer quality native vegetation and approximately 70 ha of pasture which may represent potential poor quality foraging habitat for the Little Eagle. However, 128 ha of higher quality potential habitat would be preserved within the study area as part of the proposed development. As such, it is not believed the proposal represents a significant impact or exacerbates the KTP identified for this species.

Conclusions

The proposal is unlikely to result in a significant impact on the Little Eagle, given the following reasons:

- No individuals have been located within the development area and the area being impacted is unlikely to provide breeding habitat for this species;
- Large and intact habitat areas will remain within the EP&R and Additional Conservation Lands;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining Little Eagle habitat; and
- The proposal would not fragment any known populations of Little Eagle.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the Little Eagle. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

***Lathamus discolor* (Swift Parrot)**

Swift Parrot (*Lathamus discolor*) are winter migrants to the south-eastern Australia mainland (March – October) from Tasmania, where they feed on winter-flowering eucalypts, such as *Eucalyptus tereticornis* (OEH, 2013). The Swift Parrot is a highly mobile species able to utilise a variety of nectar sources over large areas (OEH, 2013).

On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as *E. robusta* (Swamp Mahogany), *Corymbia maculata* (Spotted Gum), *C. gummifera* (Red Bloodwood), *E. sideroxylon* (Mugga Ironbark) and *E. albens* (White Box). Commonly used lerp-infested trees include *E. microcarpa* (Inland Grey Box), *E. moluccana* (Grey Box) and *E. pilularis* (Blackbutt). This species breeds from September to January, nesting in old trees with hollows and feeding in forests dominated by *E. globulus* (Tasmanian Blue Gum) (OEH, 2013).

Threats to Swift Parrot include:

- On the mainland the main threat is loss of habitat through clearing for agriculture, and urban and industrial development.
- Collisions with wire netting fences, windows and cars, during the breeding season and winter migration (especially where such obstacles are in close proximity to suitable habitat) (OEH, 2013).

Swift Parrots were not recorded within the study area during the current field surveys, but are known from two records within a 10 km radius of the study area. There is potential for the species to occur within the study area due to the presence of suitable foraging habitat.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The proposal will result in the removal of approximately 35.5 ha of poorer quality native vegetation for residential development. However 128 ha of high quality habitat would be conserved within the study area as part of the proposal, and additional high quality habitat exists within the local area.

The potential habitat proposed for clearing represents a small proportion of the overall habitat within the local area. Significant areas of potential habitat are proposed for retention on-site and in adjacent areas, and no known breeding sites would be impacted as part of the proposal. Swift Parrot is a highly mobile species and the loss of this habitat is unlikely to affect migration, foraging or breeding patterns. As such it is considered unlikely the proposal would place the local population of this species at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable – not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable – not an endangered ecological community.

(d) to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. The native vegetation to be cleared may represent potential habitat for this species. However, a significant, 128 ha area of high quality native vegetation is proposed for retention within an EP&R and Additional Conservation Lands.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in habitat becoming fragmented or isolated or this highly mobile species. The vegetation to be cleared as a result of the proposed development occurs on the fringe of a continuous stand of vegetation to be retained within an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

No Swift Parrots have been recorded within the study area, however some areas of poorer quality habitat exist within the proposed development area would be cleared as a result of this proposal. The vegetation proposed for clearing is not considered to represent significant habitat in terms of the long term survival of the species. The vegetation proposed for clearing is of a lower quality when compared to the significant areas of vegetation in the surrounding area and is not considered to be important for the long term survival of this species in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

Not applicable – no critical habitat has been declared for the Swift Parrot.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery or threat abatement plans have been prepared for Swift Parrot within NSW. However, a Swift Parrot recovery plan has been prepared under the EPBC Act. A summary of the objectives and actions outlined in this plan are included below (Swift Parrot Recovery Team, 2001):

Overall objectives

- To change the conservation status of the Swift Parrot from Endangered to Vulnerable within 10 years.
- To achieve a demonstrable sustained improvement in the quality of Swift Parrot habitat to increase carrying capacity.

Specific objectives

- To identify priority habitats and sites across the range of the Swift Parrot.
- To implement management strategies to protect and improve priority habitats and sites resulting in a sustained improvement in carrying capacity.
- To reduce the incidence of collisions with man-made structures.
- To determine population trends within the breeding range.
- To quantify improvements in carrying capacity by monitoring changes in extent and quality of habitat.
- To increase public awareness about the recovery program and to involve the community in the recovery.

Recovery Criteria

- Priority habitats and sites have been identified and protected.
- Management strategies to protect breeding and foraging habitat have been implemented.
- The incidence of collisions is reduced.
- The population density or extent and quality of habitat is not reduced and ideally is enhanced.
- Community based networks are maintained and a newsletter is produced.

Actions Needed

- Identify the extent and quality of foraging habitat.
- Protect and manage the habitat of Swift Parrots at a landscape scale.
- Reduce the incidence of collisions.
- Monitor population trends and habitat use.
- Keep the public, volunteers and community networks informed.
- Manage the recovery process through a recovery team.

The proposal does not conflict with any of the objectives under this Plan.

Thirteen priority actions have been identified for this species and these are addressed below. The actions that are relevant to this proposal are addressed below;

Protect, manage and restore Swift Parrot habitat on private land through conservation agreements, management agreements and incentive payments

Habitat will be protected and managed within the EP&R and Additional Conservation Lands

Enhance habitat for Swift Parrots by planting suitable tree species to complement natural regeneration or to enhance remnants

If planting is required within the EP&R and Additional Conservation Lands a high proportion of winter flowering species could be used

The action is considered to be consistent with the National Recovery Plan and the relevant priority actions for this species.

(g) The action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

One KTP is relevant to this proposal with respect to the Swift Parrot:

- Clearing of native vegetation.

This development will involve the clearing of approximately 35.5 ha of poorer quality native vegetation which could provide potential habitat for the Swift Parrot. However, 128 ha of higher quality potential habitat will be conserved within the study area within the EP&R and Additional Conservation Lands. As such, it is considered unlikely that vegetation clearing as part of this proposal would exacerbate KTPs in relation to this species.

Conclusions

The proposal is unlikely to constitute a significant impact on the Swift Parrot, for the following reasons:

- No individuals have been located within the development area and the vegetation being cleared is of poorer quality;
- Large and intact habitat areas of high quality potential habitat will remain within the EP&R and Additional Conservation Lands:
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining Swift Parrot habitat; and
- The proposal would not fragment any current populations of Swift Parrot.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the Swift Parrot. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

***Lophoictinia isura* (Square-tailed Kite)**

The Square-tailed Kite is listed as Vulnerable under Schedule 2 of the TSC Act. The species is endemic to Australia and is distributed coastal forest and woodlands of tropical and temperate areas. Throughout NSW it is associated with ridge and gully forests dominated by Woollybutt, Spotted Gum and Peppermint Gum.

Square-tailed Kite nest in forks or large horizontal limbs of *Angophora* spp. or *Eucalyptus* spp. located along watercourses. Breeding for this species occurs between July and February. This species is a specialized predators within the canopy layer, hunting for passerines (especially honeyeaters) and insects in the tree canopy. The species hunts over a range of approximately 100 square kilometers.

Threats to the Square-tailed kite include clearing of habitat through logging, burning, and grazing. The removal of large *Angophora* spp. or *Eucalyptus* spp. near waterways specifically causes a loss of nesting habitat. Illegal egg-collection and shooting have also been identified as threats at the margins of this species' distribution (OEH, 2013).

The Square-tailed Kite was not recorded during the current surveys, although one sighting has been recorded within 10 km of the study area. This species is likely to utilise the study area for foraging, rather than roosting or breeding habitat.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Factors likely to have an adverse effect on the life cycle of the Square-tailed Kite would include a substantial loss and / or fragmentation of foraging habitat and loss of suitable nesting and roosting habitat. The proposal will result in the removal of approximately 35.5 ha of poorer quality native vegetation and approximately 70 ha of pasture which represents potential foraging habitat for Square-tailed Kite. However, 128 ha of high quality habitat would be conserved within the EP&R and Additional Conservation Lands, and additional quality habitat exists within the local area.

The potential foraging habitat proposed for clearing represents a small proportion of the overall habitat within the local area. Significant areas of potential habitat are proposed for retention on-site and in adjacent areas, and the development area is unlikely to provide breeding habitat for this species. This species typically breeds along creeklines and all such vegetation is located within the EP&R and Additional Conservation Lands. It is considered unlikely that the proposal would place a local population of this species at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable- not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable - not an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

i. The extent to which habitat is likely to be remove or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. The loss of this area or poorer quality habitat is minor in comparison to the 128 hectares of potential habitat being protected and managed within the EP&R and Additional Conservation Lands.

ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation to be cleared as a result of the proposed development occurs on the fringe of a continuous stand of vegetation to be retained as an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,

No Square-tailed Kite have been recorded within the study area, however some existing areas of poorer quality habitat within the proposed development area would be cleared as a result of this proposal. The vegetation proposed for clearing is not considered to represent significant habitat in terms of the long term survival of the species. The vegetation proposed for clearing is of a lower quality when compared to the significant areas of vegetation in the surrounding area, and as such is not important for the long term survival of this species in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

Not applicable – no critical habitat has been declared for the Square-tailed Kite.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been developed for the Square-tailed Kite. However, three Priority Actions have been identified to help recover this species, these are addressed below;

Ensure implementation of management strategies that reduce disturbance of riparian areas

The riparian areas are located within the EP&R lands and will be maintained by the community scheme

Identify and protect nest trees, and monitor reproduction

No nest trees have been located on site

Liaise with local field ornithologist to obtain data on the Square-tailed Kite in the area

Data on this species has been collated by ELA ecologists who have extensive experience in the local area. This information has been combined with database searches and literature review.

(g) The action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

One KTP is relevant to this proposal with respect to the Square-tailed Kite:

- Clearing of native vegetation

This development will involve the clearing of approximately 35.5 ha of poorer quality native vegetation which may represent potential habitat for the Square-tailed Kite. However, 128 ha of higher quality potential habitat will be conserved within the study area as part of the proposed development. As such, the proposed vegetation clearing is not considered to represent a significant impact or exacerbate KTPs in relation to this species.

Conclusions

The proposal is unlikely to result in a significant impact on Square-tailed Kite given that:

- No individuals have been recorded within the development area and the area being developed is of poorer quality;
- Large and intact habitat areas will remain within the EP&R and Additional Conservation Lands;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining Square-tailed Kite habitat;
- No riparian areas will be impacted by the development; and
- The proposal would not fragment any known populations of Square-tailed Kite.

On the basis of the above considerations, it is unlikely the proposal will result in a significant impact on the Square-tailed Kite. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

***Melithreptus gularis gularis* (Black-Chinned Honeyeater)**

The Black-chinned Honeyeater (*Melithreptus gularis gularis*) mostly inhabits the upper levels of drier Box and Ironbark open forests or woodlands and is also known to inhabit open forests supporting smooth-barked eucalypts, Stringybarks, Ironbarks and Tea-trees. This species is usually seen in pairs and in small groups of up to 12 birds. Their feeding territories are broad and they moving quickly from tree to tree probing for insects, feeding on nectar and honeydew from foliage (OEH, 2013).

Threats to this species include:

- Clearing of remnant open forest and woodland habitat.
- Poor regeneration of open forest and woodland habitats by intense grazing.
- May be excluded from smaller remnants by aggressive species such as the Noisy Miner (*Manorina melanocephala*)
  (OEH, 2013).

The Black-chinned Honeyeater was not recorded during the field survey, however this species is known from eight records within a 10 km radius of the study area. Potential habitat for the Black-chinned Honeyeater to forage or pass through exists within the study area.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposal will result in the removal of approximately 35.5 ha of poorer quality native vegetation. However, 128 ha of high quality habitat would be conserved within the EP&R and Additional Conservation Lands as part of the proposal, and additional high quality habitat exists within the local area.

The potential habitat proposed for clearing represents a small proportion of the overall habitat within the local area. Significant areas of potential habitat are proposed for retention on-site and in adjacent areas, and no known breeding sites would be impacted as part of the proposal.

The species is wide ranging and nests in the upper crowns of trees. The retention of the extensive bushland in the EP&R and Additional Conservation Lands will ensure that nesting, foraging and movement requirements for this species are met. As such, it is considered unlikely the proposal would place a local population of this species at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable – not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable – not an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

i. The extent to which habitat is likely to be remove or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. However, a significant, 128 ha area of native vegetation is proposed for retention within an EP&R and Additional Conservation Lands, which supports good potential habitat for this species. In this context, the vegetation proposed to be removed is minor.

ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation to be cleared as a result of the proposed development occurs on the fringe of a continuous stand of vegetation to be retained as an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,

No Black-chinned Honeyeaters have been recorded within the study area, however some existing areas of poorer quality habitat within the proposed development area would be cleared as a result of this proposal. The vegetation proposed for clearing is of a lower quality when compared to the significant areas of vegetation in the surrounding area, and as such is not considered important to the long term survival of this species in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Not applicable – no critical habitat has been declared for the Black-chinned Honeyeater.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plan exists for this species, so no consistency can be determined. No relevant threat abatement plans have been prepared for this species. Five Priority Actions have been declared for this species and are addressed below;

Conduct ecological research to determine habitat and resource requirements, threats and conservation issues.

Not Applicable

Conduct annual monitoring of key populations that are managed under property agreements or are within DECCW estate, conservation reserves, council reserves and crown reserves.

Not Applicable

Provide stewardship payments, develop property agreements and apply other land management incentives for the protection and enhanced management of priority woodland vegetation that is used by the Black-chinned Honeyeater.

The highest quality potential habitat will be retained and managed within the EP&R and Additional Conservation Lands.

Increase community awareness about the Black-chinned Honeyeater through promotion of the DECCW Threatened Species Website and the development of education and extension material for threatened woodland birds.

Not Applicable

Implement sympathetic habitat management in DECCW estate, conservation reserves, council reserves, and crown reserves where the species occurs.

Not Applicable

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

One KTP is relevant to this proposal with respect to the Black-chinned Honeyeater:

- Clearing of native vegetation

This development will involve the clearing of approximately 35.5 ha of poorer quality native vegetation which may represent potential habitat for the species. However, 128 ha of higher quality potential habitat will be conserved within the study area as part of the proposed development. As such, the proposed vegetation clearing is not considered to represent a significant impact or exacerbate KTPs in relation to this species.

Conclusion

The proposal is unlikely to result in a significant impact on Black-chinned Honeyeater, given the following reasons:

- No individuals have been recorded within the development area and the area of potential habitat proposed for clearing is of poorer quality;
- Large and intact habitat areas will remain within the EP&R and Additional Conservation Lands;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining Black-chinned Honeyeater habitat; and
- The proposal would not fragment any known populations of Black-chinned Honeyeater.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the Black-chinned Honeyeater. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

Barking Owl (*Ninox connivens*) and Powerful Owl (*Ninox strenua*)

The Barking Owl *(Ninox connivens)* is found throughout Australia except for the central arid regions and Tasmania. It is quite common in parts of northern Australia, but is generally considered uncommon in southern Australia due to declines across much of NSW. This species inhabits eucalypt woodland, open forest, swamp woodlands and (especially in inland areas) timber along watercourses. During the day they roost along creek lines, usually in tall understorey trees with dense foliage such as Acacia and Casuarina species, or the dense clumps of canopy leaves in large Eucalypts. Territories range from 30 to 200 hectares and birds are present all year. Three eggs are laid in nests in hollows of large, old eucalypts including *E. camaldulensis* (River Red Gum), *E. albens* (White Box), *E. polyanthemos* (Red Box) and *E. blakelyi* (Blakely's Red Gum) (DECC, 2011).

The Powerful Owl (*Ninox strenua*) is listed as Vulnerable under Schedule 2 of the TSC Act. It is endemic to eastern and south-eastern Australia and in NSW it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered, mostly historical records on the western slopes and plains (OEH 2013). Powerful Owls occur primarily in densely vegetated gullies of open and tall open forest. While they are also found in a wider range of habitats, including forests and woodlands within the metropolitan regions of cities, this species prefers large tracts of forest or woodland habitat, including a tall shrub layer and abundant hollows supporting high densities of arboreal marsupial prey species (Cooke *et al*. 2002; DEC 2006).

This species roosts in dense mid-canopy trees (such as Turpentine, She-oak and rainforest trees) or tall shrubs in sheltered gullies, typically on wide creek flats and at the heads of minor drainage lines (DEC 2006). Nesting occurs from late autumn to mid winter in large hollows (greater than 45 cm wide and greater than 100 cm deep) in eucalypts in unlogged, un-burnt gullies and lower slopes within 100 m of streams or minor drainage lines (DEC 2006). Nest trees are typically emergent, and are often the largest and oldest in a stand (Debus and Chafer 1994). Powerful Owls are faithful to traditional nesting hollows but can also use other hollows within the nesting gully.

Pairs of birds occupy large home ranges (300 - 1500 ha) and utilise various portions of this area at different times, depending on the local abundance of arboreal mammals as a food source (Debus and Chafer, 1994; DEC, 2006). Powerful Owl particularly prey on the Greater Glider and Ringtail Possum, although the relative importance of prey items appears to vary regionally, with other prey such as Sugar Gliders, Brushtail Possums, Grey-headed Flying-foxes, insects and birds also used (Debus and Chafer 1994; DEC 2006).

Threats to these species include:

- Clearing and degradation of habitat, mostly through cultivation, intense grazing and the establishment of exotic pastures.
- Inappropriate forest harvesting practices that remove old, hollow-bearing trees and change open forest structure to dense regrowth.
- Firewood harvesting resulting in the removal of fallen logs and felling of large dead trees.
- Too-frequent fire leading to degradation of understorey vegetation which provides shelter and foraging substrates for prey species.
- Disturbance of nesting and excessive disturbance of foraging by inappropriate use of call-playback surveys.
- Road kills.
- Secondary poisoning.
- Predation of fledglings by foxes, dogs and cats.
  (OEH, 2013)

Although Barking Owl and Powerful Owl were not recorded during this survey, a Powerful Owl was observed in the study area in 2000 by Conacher Travers and a pair of Barking Owls were recorded in 2002 by HWR Environmental Consultants. There are 11 records of Powerful Owl within 10 km of the study area, but no other records of the Barking owl have been made within 10 km of the site.

Potential foraging habitat for both species is present within the subject site. However, suitable nesting habitat in the form of hollow-bearing trees with hollows large enough for nesting does not exist within the development area, though potential nesting habitat may be present within the gorges of the EP&R and Additional Conservation Lands.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposal will result in the removal of approximately 35.5 ha of poorer quality native vegetation. However, 128 ha of high quality habitat would be conserved within the EP&R and Additional Conservation Lands as part of the proposal, and additional high quality habitat exists within the local area.

The potential habitat proposed for clearing represents a small proportion of the overall habitat within the local area. Significant areas of potential habitat are proposed for retention on-site and in adjacent areas, and no known breeding sites would be impacted as part of the proposal. As breeding habitat would not be impacted and substantial foraging and movement habitat will be retained within the EP&R and Additional Conservation Lands, it is considered unlikely the proposal would place a local population of these species at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable – not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable - not an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. However, a significant, 128 ha area of native vegetation is proposed for retention within an EP&R and Additional Conservation Lands, which supports good potential habitat for this species. In this context, the vegetation proposed to be removed is minor.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation to be cleared as a result of the proposed development occurs on the fringe of a continuous stand of vegetation to be retained as an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,

Both Powerful Owl and Barking Owls have been recorded within study area or the development area, which does support poorer quality foraging habitat for these species. As part of the proposed development, 128 ha of native vegetation will be conserved in an EP&R and Additional Conservation Lands. This area supports potential nesting habitat for this species.

The vegetation proposed for clearing is not considered to represent significant habitat in terms of the long term survival of these species. The vegetation proposed for clearing is of a lower quality when compared to the significant areas of vegetation in the surrounding area, and as such is not considered to be important for the survival of these species in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Not applicable – no critical habitat has been declared for these species.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A recovery plan for large forest owls (including the Powerful Owl) has been produced by the former Department of Environment and Conservation (DEC 2006), along with the following objectives:

- Model and map owl habitat and validate with surveys;
- Monitor owl population parameters;
- Audit forestry prescriptions;
- Manage and protect habitat off reserves and state forests;
- Undertake research;
- Increase community awareness and involvement in owl conservation; and
- Provide organisational support and integration.

A draft recovery plan for the Barking Owl was released for public comment in 2003, including the following objectives:

- Increase understanding of the biology, ecology and management of the Barking Owl.
- Increase education and awareness of and involvement in the conservation of the Barking Owl and its habitat in NSW.
- Undertake threat abatement and mitigation.
    - Protect known Barking Owl nest sites and surrounding habitat.
    - Assist with the protection of Barking Owl habitat from disturbance due to developments and activities.
- Gain efficiencies through links with other conservation plans and conservation groups.

- Provide organisational support.

17 priority actions for Barking Owl and 24 priority actions for Powerful Owl have been specified. One of the Powerful Owl priority actions is relevant to this proposal and is addressed below. The remainder of the priority actions relate to administrative or scientific actions to be undertaken by OEH. Similarly for the Barking Owl one priority action is relevant to this proposal and is addressed below;

Powerful Owl – Encourage private landholders to undertake management options to conserve and/or actively manage forest owl habitat.

Potential Powerful Owl habitat will be retained and managed within the EP&R and Additional Conservation Lands.

Barking Owl – Establish formal conservation arrangements for properties with Barking Owls, which can be used to protect wildlife habitat.

The EP&R and Additional Conservation Lands will provide a formal level of protection and management for Barking Owl habitat.

The proposed development is consistent with these priority actions and the objectives of the recovery plans.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

One KTP is relevant to this proposal with respect to the Barking Owl and Powerful Owl:

- Clearing of native vegetation.

This development will involve the clearing of approximately 35.5 ha of poorer quality native vegetation which may represent potential foraging habitat for these species. However, 128 ha of higher quality potential habitat will be conserved within the study area as part of the proposed development. As such, the proposed vegetation clearing is not considered to represent a significant impact or exacerbate KTPs in relation to these species.

Conclusion

The proposal is unlikely to constitute a significant impact on Barking Owl and Powerful Owl, given the following reasons:

- No individuals are currently believed to be located within the development area;
- Large and intact habitat areas will remain within the EP&R and Additional Conservation Lands;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining habitat; and
- The proposal would not fragment any current populations of Barking Owl or Powerful Owl.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the Barking Owl or Powerful Owl. Consequently, a Species Impact Statement is not required for the proposal with respect to these species.

***Stagonopleura guttata* (Diamond Firetail)**

The Diamond Firetail can be found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Woodlands. This species can also be found in open forest, mallee, riparian vegetation, and grasslands. This species is usually seen in flocks of between five to forty birds. This species is a ground feeder, feeding on ripe and partly-ripe grass, herb seeds, green leaves, and on insects (DEC 2007c).

A number of factors threaten Diamond Firetail, including:

- Clearing and fragmentation of woodland, open forest, grassland and mallee habitat for agriculture and residential development, and firewood collection.
- Poor regeneration of open forest and woodland habitats.
- Invasion of weeds, resulting in the loss of important food plants.
- Modification and destruction of ground- and shrub layers within habitat through: removal of native plants, litter and fallen timber; introduction of exotic pasture grasses; heavy grazing and compaction by stock; and frequent fire.
- Predation of eggs and nestlings by increased populations of native predators such as the Pied Currawong *Strepera graculina*.
- Risk of local extinction due to small, isolated populations.
  (OEH, 2013)

No Diamond Firetails were recorded within the study area, however 10 records of the species exist within 10 km of the study area. The study area supports potential habitat for the Diamond Firetail to forage, breed or utilise.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposal will result in the removal of approximately 35.5 ha of poorer quality native vegetation. However, 128 ha of high quality habitat would be conserved within the EP&R and Additional Conservation Lands as part of the proposal, and additional high quality habitat exists within the local area.

The potential habitat proposed for clearing represents a small proportion of the overall habitat within the local area. Significant areas of potential habitat are proposed for retention on-site and in adjacent areas, and no known breeding sites would be impacted as part of the proposal. Retention of extensive areas of high quality habitat within the EP&R and Additional Conservation Lands will provide habitat for nesting, foraging and species movement. As such, it is considered unlikely the proposal would place a local population of this species at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable – not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable – not an endangered ecological community

(d) in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. However, a significant, 128 ha area of native vegetation is proposed for retention within an EP&R and Additional Conservation Lands, which supports good potential habitat for this species. In this context, the vegetation proposed to be removed is minor.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation to be cleared as a result of the proposed development occurs on the fringe of a continuous stand of vegetation to be retained as an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,

This species has not been recorded within the study area, however, some areas of poorer quality habitat within the development area would be cleared as a result of the proposed development.

The vegetation proposed for clearing is not considered to represent significant habitat in terms of the long term survival of this species. The vegetation proposed for clearing is of a lower quality when compared to the significant areas of vegetation in the surrounding area, and as such is not considered to be important for the survival of this species in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Not applicable – no critical habitat has been declared for the Diamond Firetail.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plan has been developed for this species. Five Priority Actions exist for this species, of which one is relevant to the proposed action and is addressed below;

Provide stewardship payments, develop property agreements and apply other land management incentives for the protection and enhanced management of priority woodland vegetation used by the Diamond Firetail.

> Whilst no incentives have been proposed as part of this development, potential habitat for this species will be retained and managed within the EP&R and Additional Conservation Lands.

The proposal is considered to be consistent with the Priority Actions Statement.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Significant threats relevant to the proposed action include:

- Clearing of native vegetation
- Loss of hollow-bearing trees

This development will involve the clearing of approximately 35.5 ha of poorer quality native vegetation which may represent potential habitat for the species. However, 128 ha of higher quality potential habitat will be conserved within the study area as part of the proposed development. Substantial numbers of hollow bearing trees will be retained within the EP&R and Additional Conservation Lands. As such, the proposal is not considered to exacerbate KTPs in relation to this species.

Conclusion

The proposal is unlikely to constitute a significant impact on the Diamond Firetail, given the following reasons:

- No individuals have been recorded within the development area and the area being developed is of poorer quality;
- Large and intact habitat areas will remain within the EP&R and Additional Conservation Lands;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining Diamond Firetail habitat; and
- The proposal would not fragment any current populations of Diamond Firetail.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the Diamond Firetail. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

Eastern Pygmy-possum (*Cercatetus nanus*)

The Eastern Pygmy-possum is a tiny (15 to 43 gram) marsupial. This species is an active climber, with an almost bare, prehensile tail, and big, forward pointing ears. This species is generally found in south-eastern Australia, from southern Queensland to eastern South Australia. Eastern Pygmy possums are found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred. This species feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes, with soft fruits eaten when flowers are unavailable. This species also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests (OEH, 2013).

This species generally shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (*Pseudocheirus peregrinus*) dreys or thickets of vegetation (e.g. grass-tree skirts). Typically nest-building is restricted to breeding females and tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks (OEH, 2013).

This species appears to be mainly solitary with each individual using several nests. Males have non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares. Young can be born whenever food sources are available, however most births occur between late spring and early autumn (OEH, 2013).

A number of factors threaten this species including:

- Loss and fragmentation habitat through land-clearing for agriculture, forestry and urban development.
- Changed fire regimes that affect the abundance of flowering proteaceous and myrtaceous shrubs, particularly banksias.
- Declining shrub diversity in forests and woodlands due to overgrazing by stock and rabbits.
- Predation from cats, dogs and foxes.
- Loss of nest sites due to removal of firewood.

This species has not been recorded within the study area, and only one sighting of the species has been recorded within 10 km of the site. However, potential habitat may exist for this species, primarily within the proposed EP&R and Additional Conservation Lands. Despite targeted survey during the optimal spring season this species has not been recorded on the site.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposal will result in the removal of approximately 35.5 ha of poorer quality native vegetation. However, 128 ha of high quality habitat would be conserved within the EP&R and Additional Conservation Lands as part of the proposal, and additional high quality habitat exists within the local area.

The potential habitat proposed for clearing represents a small proportion of the overall habitat within the local area. Significant areas of potential habitat are proposed for retention on-site and in adjacent areas, and no known breeding sites would be impacted as part of the proposal. The EP&R and Additional Conservation Lands provide habitat for breeding, foraging and species movement, as such, it is considered unlikely that the proposal would place a local population of this species at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable – not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable – not an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. However, a significant, 128 ha area of native vegetation is proposed for retention within an EP&R and Additional Conservation Lands, which supports good potential habitat for this species. In this context, the vegetation proposed to be removed is minor.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation to be cleared as a result of the proposed development occurs on the fringe of a continuous stand of vegetation to be retained as an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,

This species has not been recorded within the study area, however, some areas of poorer quality habitat within the development area would be cleared as a result of the proposed development.

The vegetation proposed for clearing is not considered to represent significant habitat in terms of the long term survival of this species. The vegetation proposed for clearing is of a lower quality when compared to the significant areas of vegetation in the surrounding area, and as such is not considered to be important for the survival of this species in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Not applicable – no critical habitat has been declared for these species.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plan exists for this species, however seven Priority Actions have been declared for this species, two of which are relevant to this development and are addressed below;

Conduct field surveys using "Elliot" traps in trees and on the ground and pitfall traps to further delineate distribution and key populations. Avoid periods of cold weather. Areas identified for development should receive high priority.

Elliot traps were used in the field survey for this species.

Encourage and support land managers to undertake management actions that benefit the species

Management actions that benefit this species include control of feral animals, weed management and interfire periods of a minimum of 10 years. These are included in the EMP.

The proposed action is considered to be consistent with the relevant priority actions for this species.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

One KTP is relevant to this proposal with respect to the Eastern Pygmy-possum:

- Clearing of native vegetation.

This development will involve the clearing of approximately 35.5 ha of poorer quality native vegetation which may represent potential habitat for the species. However, 128 ha of higher quality potential habitat will be conserved within the study area as part of the proposed development. As such, the proposed vegetation clearing is not considered to represent a significant impact or exacerbate KTPs in relation to this species.

Conclusion

The proposal is unlikely to constitute a significant impact on Eastern Pygmy-possum, given the following reasons:

- No individuals have been recorded within the development area and the area being developed is of poorer quality;
- Large and intact habitat areas will remain within the EP&R and Additional Conservation Lands;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining Eastern Pygmy-possum habitat; and
- The proposal would not fragment any current populations of Eastern Pygmy-possum.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the survival of Eastern Pygmy-possum. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

Spotted-tailed Quoll (*Dasyurus maculatus*)

The Spotted-tailed Quoll a small-medium sized distinctive marsupial carnivore, (about the size of a domestic cat), with short legs and a pointed face. The average weight of an adult male is about 3500 grams and an adult female about 2000 grams. It has rich-rust to dark-brown fur above, with irregular white spots on the back and tail and a pale belly. The spotted tail distinguishes it from all other Australian mammals, including other quoll species. This species range has contracted considerably since European settlement. It is now found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered a commonly occurring species. This species has been found across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline (OEH, 2013).

Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. The Spotted-tailed Quoll is mostly nocturnal, although it will hunt during the day. This species spends most of the time on the ground, although it is also an excellent climber and may raid possum and glider dens and prey on roosting birds. The Spotted-tailed Quoll consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits and insects - it also eats carrion and takes domestic fowl. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares and they usually traverse their ranges along densely vegetated creeklines (OEH, 2013).

A number of factors threaten this species including:

- Loss, fragmentation and degradation of habitat.
- Accidental poisoning during wild dog and fox control programs. Deliberate poisoning, shooting and trapping may also be an issue.
- Competition with introduced predators such as cats and foxes.
  (OEH, 2013)

No individuals have been recorded within the study area during any surveys of the area, but potential habitat for the species and movement corridors are located along gorges within the EP&R and Additional Conservation Lands. There are seven records of this species within a 10 km radius of the site.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposal will result in the removal of approximately 35.5 ha of poorer quality native vegetation. However, 128 ha of high quality habitat would be conserved within the EP&R and Additional Conservation Lands as part of the proposal, and additional high quality habitat exists within the local area.

The potential habitat proposed for clearing represents a small proportion of the overall habitat within the local area. Significant areas of potential habitat are proposed for retention on-site and in adjacent areas, and no known breeding sites would be impacted as part of the proposal. Key habitat for this species is within gullies and creeklines which will be retained within the EP&R land. This will provide necessary habitat for breeding, foraging and species movement. As such, it is considered unlikely that the proposal would place a local population of this species at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable – not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable – not an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. However, a significant, 128 ha area of native vegetation is proposed for retention within an EP&R and Additional Conservation Lands, which supports good potential habitat for this species. In this context, the vegetation proposed to be removed is minor.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation to be cleared as a result of the proposed development occurs on the fringe of a continuous stand of vegetation to be retained as an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,

This species has not been recorded within the study area, however, some areas of poorer quality habitat within the development area would be cleared as a result of the proposed development.

The vegetation proposed for clearing is not considered to represent significant habitat in terms of the long term survival of this species. The vegetation proposed for clearing is of a lower quality when compared to the significant areas of vegetation in the surrounding area, and as such is not considered to be important for the survival of this species in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Not applicable – no critical habitat has been declared for these species.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A Recovery Plan for the Spotted-tailed Quoll is currently being prepared by the NSW OEH, but it has not yet been released to the public. A National Recovery Plan for the Spotted-tailed Quoll exists, and the objectives within that plan are as follows:

- Determine the distribution and status of Spotted-tailed Quoll populations throughout the range.
  Increase knowledge of the biology and ecology of the Spotted-tailed Quoll throughout its range to refine management of the species and its habitat.
- Reduce the rate of habitat loss and fragmentation on private land.
- Evaluate and manage the risk posed by silvicultural practices.
- Determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on Spotted-tailed Quoll populations.
- Determine and manage the impact of fire regimes on Spotted-tailed Quoll populations.
- Reduce deliberate killings of Spotted-tailed Quolls.
- Reduce the frequency of Spotted-tailed Quoll road mortality.
- Assess the threat Cane Toads pose to Spotted-tailed Quolls and develop threat abatement actions if necessary.
- Determine the likely impact of climate change on Spotted-tailed Quoll populations.
- Increase community awareness of the Spotted-tailed Quoll and involvement in the Recovery Program.

Of the 35 priority actions one is relevant to this project;

Habitat requirements of Spotted-tailed Quolls to be adequately conserved within environmental planning instruments and through other legislative protection mechanisms, including property vegetation plans.

> The habitat for this species is contained within the EP&R and Additional Conservation Lands which will be protected and managed into the future.

The proposed action is considered to be consistent with the relevant objectives of the National Recovery Plan and the Priorities Action Statement as the best quality potential habitat for this species will be protected and managed within the EP&R and Additional Conservation Lands.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

One KTP is relevant to this proposal with respect to the Spotted-tailed Quoll:

- Clearing of native vegetation.

This development will involve the clearing of approximately 35.5 ha of poorer quality native vegetation which may represent potential habitat for the species. However, 128 ha of higher quality potential habitat will be conserved within the study area as part of the proposed development. As such, the proposed vegetation clearing is not considered to represent a significant impact or exacerbate KTPs in relation to this species.

Conclusion

The proposal is unlikely to constitute a significant impact on Spotted-tailed Quoll, given the following reasons:

- No individuals have been recorded within the development area and the area being developed is of poorer quality;
- Large and intact habitat areas will remain within the EP&R and Additional Conservation Lands;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining Spotted-tailed Quoll habitat; and
- The proposal would not fragment any current populations of Spotted-tailed Quoll.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the Spotted-tailed Quoll. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

Koala (*Phascolarctos cinereus*)

Koalas are listed as Vulnerable under both the NSW TSC Act and Commonwealth EPBC Act. Koalas have a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW they mainly occur on the central and north coast with some populations in the west of the Great Dividing Range. This species was briefly historically abundant in the 1890s in the Bega District on the south coast of NSW, although not elsewhere, but it now occurs in sparse and possibly disjunct populations. Koalas traditionally inhabit eucalypt woodlands and forests. They feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Generally they spend most of their time in trees, but will descend and traverse open ground to move between trees (OEH, 2013).

Koalas are solitary and territorial (particularly males) yet live in established sedentary polygamous breeding aggregates arranged in a matrix of overlapping home ranges whose size varies according to sex and carrying capacity of the habitat (Phillips and Callaghan 1995). An established koala home range is usually occupied for several years or throughout its life (Phillips and Callaghan 1995, Sharp and Phillips 1997). The size of a Koala home range may vary from a hectare to hundreds of hectares.

A number of factors threaten Koalas, including:

- Loss, modification and fragmentation of habitat.
- Predation by feral and domestic dogs.
- Intense fires that scorch or kill the tree canopy.
- Road-kills.
- Human-induced climate change, especially drought.
  (OEH, 2013)

Koalas were not recorded during the current field survey, but are known from 55 records within a 10 km radius of the study area. HWR Pty Ltd prepared a Koala Plan of Management (KPoM) for the Wilton Area in 2006. This KPoM stated this area did not contain any significant Koala habitat and found no signs of Koalas throughout the wider study area, though it may be used as refuge from bushfire.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposal will result in the removal of approximately 35.5 ha of poorer quality native vegetation. However, 128 ha of high quality habitat would be conserved within the EP&R and Additional Conservation Lands as part of the proposal, and additional high quality habitat exists within the local area.

HWR Pty Ltd prepared a Koala Plan of Management for the Wilton Area in 2006. This KPoM concluded that no Koalas currently utilised the study area for habitat, however the study area may include some areas of potential fire refuge.

The potential habitat proposed for clearing represents a small proportion of the overall habitat within the local area. Significant areas of potential habitat are proposed for retention on-site and in adjacent areas, and no known breeding sites would be impacted as part of the proposal. The EP&R and Additional Conservation Lands provide habitat for foraging and species movement. As such, it is considered unlikely the proposal would place a local population of this species at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable – not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable – not an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. However, a significant, 128 ha area of native vegetation is proposed for retention within an EP&R and Additional Conservation Lands, which supports good potential habitat for this species. In this context, the vegetation proposed to be removed is minor.

ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation to be cleared as a result of the proposed development occurs on the fringe of a continuous stand of vegetation to be retained as an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

iii. importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality

This species has not been recorded within the study area, however, some areas of poorer quality habitat within the development area would be cleared as a result of the proposed development.

The vegetation proposed for clearing is not considered to represent significant habitat in terms of the long term survival of this species. The vegetation proposed for clearing is of a lower quality when compared to the significant areas of vegetation in the surrounding area, and as such is not considered to be important for the survival of this species in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Not applicable – no critical habitat has been declared for these species.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A recovery Plan for the Koala was approved in November 2008. The main objectives of the recovery plan are listed below:

- To conserve koalas in their existing habitat.
- To rehabilitate and restore koala habitat and populations.
- To develop a better understanding of the conservation biology of koalas.
- To ensure that the community has access to factual information about the distribution, conservation and management of koalas at a national, state and local scale.
- To manage captive, sick or injured koalas and orphaned wild koalas to ensure consistent and high standards of care.
- To manage over-browsing to prevent both koala starvation and ecosystem damage in discrete patches of habitat.
- To coordinate, promote the implementation, and monitor the effectiveness of the NSW Koala Recovery Plan across NSW.

The protection and management of koala habitat within the EP&R and Additional Conservation Lands will assist with the conservation, rehabilitation and restoration of this species. The proposed action is considered to be consistent with the relevant recovery strategy objectives.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

One KTP is relevant to this proposal with respect to the Koala:

- Clearing of native vegetation.

This development will involve the clearing of approximately 35.5 ha of poorer quality native vegetation which may represent potential habitat for the species. However, 128 ha of higher quality potential habitat will be conserved within the study area as part of the proposed development. As such, the proposed vegetation clearing is not considered to represent a significant impact or exacerbate KTPs in relation to this species.

Conclusion

The proposal is unlikely to constitute a significant impact on Koala, given the following reasons:

- No individuals have been recorded within the development area and the area being developed is of poorer quality;
- Large and intact habitat areas will remain within the EP&R and Additional Conservation Lands;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining Koala habitat; and
- The proposal would not fragment any current populations of Koala.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the Koala. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

Grey-headed Flying-fox (*Pteropus poliocephalus*)

The Grey-headed Flying-fox is listed as Vulnerable under Schedule 2 of the TSC Act. The species is endemic to the east coast of Australia with a distribution from Bundaberg in the north to Melbourne in the south, from the western slopes of the Great Dividing Range to the coast (Eby 2000). The distribution of this species has recently suffered a southward contraction and a 30% population decline over the last ten years (Tidemann *et al*. 1999).

Grey-headed Flying-fox is a highly mobile species whose migration patterns are determined by the availability of flowering food resources (Eby 1991). The species is a canopy-feeding frugivore, blossom-eater and nectarivore, and occurs in rainforest, woodlands, Paperbark swamps and Banksia woodlands (NSW Scientific Committee 2001). This species feeds in particular on the nectar and pollen of native trees, especially *Eucalyptus* spp., *Melaleuca* spp. and *Banksia* spp., and fruits of rainforest trees and vines. During times when native food resources are limited, Grey-Headed Flying-foxes forage on fruit crops and cultivated gardens. Grey-headed Flying-foxes congregate in large colonies of up to 200,000 individuals in the summer season (Churchill 1998). Camp sites are generally located next to rivers or creeks, and occur in a range of vegetation communities including rainforest, wet sclerophyll forest, Melaleuca woodland, Casuarina forest or Mangroves (Eby 2000). These sites have a dense canopy, providing them with the moist, humid microclimate they require. Campsites are critical for mating, birthing, rearing of young and as diurnal refuge from predators (Tidemann *et al.* 1999). Urban gardens, cultivated fruit crops and roadside verges may also provide temporary roosting habitat for this species (OEH, 2013).

This species is threatened by a number of processes including loss of foraging habitat, disturbance of roosting sites, unregulated shooting and electrocution on powerlines (OEH 2013).

A number of factors threaten this species, including:

- Loss of foraging habitat.
- Loss and disturbance of roosting sites.
- Unregulated shooting.
- Electrocution on powerlines, entanglement in netting and on barbed-wire.
- Competition with Black Flying-foxes.
- Negative public attitudes and conflict with humans.
- Impacts from climate change.
- Disease.
  (OEH, 2013)

Grey-headed Flying-foxes were not recorded within the study area during the field surveys, but are known from 14 records from within a 10 km radius of the study area, including a camp some 7.5 kilometres away at Picton. There is potential for the species to occur within the study area due to the presence of suitable foraging habitat, although the study area does not contain current or historic campsites.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposal will result in the removal of approximately 35.5 ha of poorer quality native vegetation. However, 128 ha of high quality habitat would be conserved within the EP&R and Additional Conservation Lands as part of the proposal, and additional high quality habitat exists within the local area.

The potential habitat proposed for clearing represents a small proportion of the overall habitat within the local area. Significant areas of potential habitat are proposed for retention on-site and in adjacent areas. There are no flying-fox camps on the site so breeding habitat will not be affected. The retention of large areas of potential habitat within the EP&R and Additional Conservation Lands will provide habitat for foraging and movement. As such, it is considered unlikely that the proposal would place a local population of this species at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable – not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable – not an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. However, a significant, 128 ha area of native vegetation is proposed for retention within an EP&R and Additional Conservation Lands, which supports good potential habitat for this species. In this context, the vegetation proposed to be removed is minor.

ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation to be cleared as a result of the proposed development occurs on the fringe of a continuous stand of vegetation to be retained as an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

iii. importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality

This species has not been recorded within the study area, however, some areas of poorer quality habitat within the development area would be cleared as a result of the proposed development.

The vegetation proposed for clearing is not considered to represent significant habitat in terms of the long term survival of this species. The vegetation proposed for clearing is of a lower quality when compared to the significant areas of vegetation in the surrounding area, and as such is not considered to be important for the survival of this species in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No mapping which shows habitat critical to the survival of Grey-headed Flying-foxes exists, however the existing recovery plan for this species outlines the criteria for critical Grey- headed Flying-fox foraging and roosting habitat.

Criteria for foraging habitat critical to survival of the Grey- headed Flying-fox:

- productive during winter and spring, when food bottlenecks have been identified;
- known to support populations of > 30 000 individuals within an area of 50 km radius (the maximum foraging distance of an adult);
- productive during the final weeks of gestation, and during the weeks of birth, lactation and conception (September to May);
- productive during the final stages of fruit development and ripening in commercial crops affected by Grey-headed Flying-foxes (months vary between regions); and
- known to support a continuously occupied camp.

Criteria for roosting habitat critical to survival of the Grey- headed Flying-fox:

- is used as a camp either continuously or seasonally in > 50% of years;
- has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 10,000 individuals, unless such habitat has been used only as a temporary refuge, and the use has been of limited duration (i.e. in the order of days rather than weeks or months); and
- has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 2,500 individuals, including reproductive females during the final stages of pregnancy, during lactation, or during the period of conception (i.e. September to May).

Under these definitions, this study area does not qualify as critical habitat for Grey- headed Flying-fox.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A recovery Plan for the Grey-headed Flying-fox was approved in July 2009. The main objectives of the recovery plan are listed below:

- To identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes throughout their range;
- To protect and increase the extent of key winter and spring foraging habitat of Grey-headed Flying-foxes;
- To identify roosting habitat critical to the survival of Grey-headed Flying-foxes;
- To protect and enhance roosting habitat critical to the survival of Grey-headed Flying-foxes;
- To substantially reduce deliberate destruction of Grey-headed Flying-foxes in fruit crops;
- To reduce negative public attitudes toward Grey-headed Flying-foxes and reduce conflict with humans;
- To increase public awareness and understanding of Grey-headed Flying-foxes and the recovery program, and to involve the community in recovery actions, where appropriate, to reduce the threat of negative public attitudes and conflict with humans;
- To monitor population trends in Grey-headed Flying-foxes so as to monitor the species' national distribution and status;

- To assess and reduce the impact on Grey-headed Flying-foxes of electrocution on powerlines and entanglement in netting and on barbed-wire;
- To improve knowledge of the demographics and population structure of Grey- headed Flying-foxes in order to increase understanding of the ecological requirements of the species;
- To increase the effectiveness and efficiency of recovery initiatives for Grey- headed Flying-foxes by working cooperatively with conservation and management programs with overlapping objectives to remove or reduce the impact of threatening processes on the species;
- To maintain an effective Grey-headed Flying-fox National Recovery Team to oversee the implementation of the Grey-headed Flying-fox National Recovery Plan to remove or reduce the impact of threatening processes on the species; and
- To provide long-term economic benefits associated with the protection of ecosystem services, promotion of sustainable forest management, improved crop protection regimes, promotion of sustainable agricultural practices and increased viability of some commercial fruit industries.

The protection and management of the EP&R and Additional Conservation Lands will protect winter and spring foraging habitat for this species. The proposal is considered to be consistent with the relevant recovery plan objectives.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

One KTP is relevant to this proposal with respect to the Grey-headed Flying-fox:

- Clearing of native vegetation.

This development will involve the clearing of approximately 35.5 ha of poorer quality native vegetation which may represent potential habitat for the species. However, 128 ha of higher quality potential habitat will be conserved within the study area as part of the proposed development. As such, the proposed vegetation clearing is not considered to represent a significant impact or exacerbate KTPs in relation to this species.

Conclusion

The proposal is unlikely to constitute a significant impact on Grey-headed Flying-fox, given the following reasons:

- No individuals have been recorded within the development area and the area being developed is of poorer quality;
- Large and intact habitat areas will remain within the EP&R and Additional Conservation Lands;
- No known roosting sites are located within or adjacent to the study area;
- This species is highly mobile and forages widely;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining Grey-headed Flying-fox habitat; and
- The proposal would not fragment any current populations of Grey-headed Flying-fox.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the Grey-headed Flying-fox. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

Microchiropteran Bats - Cave Dwelling

Due to similar habitat requirements and associated impacts, a single Seven Part Test has been undertaken for the following cave dwelling microchiropteran bats:

- ***Chalinolobus dwyeri* (Large-eared Pied Bat)**
- ***Miniopterus australis* (Little Bent-wing Bat)**
- ***Miniopterus schreibersii oceanensis* (Eastern Bent-wing Bat); and**
- ***Myotis macropus* (Large-footed Myotis).**

The **Large-eared Pied Bat (*Chalinolobus dwyeri*)** is listed as Vulnerable under Schedule 2 of the TSC Act. It is a small to medium-sized bat with long, prominent ears and glossy black fur. The lower body has broad white fringes running under the wings and tail-membrane, meeting in a V-shape in the pubic area. The species is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes.

Large-eared Pied Bat roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Hirundo ariel*). Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves. They remain loyal to the same cave over many years.

Large-eared Pied Bat is found in well-timbered areas containing gullies. It frequents low to mid-elevation dry open forest and woodland. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy.

The threats to this species include clearing and isolation of forest and woodland habitats near cliffs, caves and old mine workings for agriculture or development, loss of foraging habitat close to cliffs, caves and old mine workings from forestry activities, too-frequent burning (usually associated with grazing), damage to roosting and maternity sites from mining operations / recreational caving activities and use of pesticides (OEH, 2013).

Large-eared Pied Bat was recorded by three separate AnaBat units located within the EP&R and Additional Conservation Lands. This species has been recorded four times within 10 km of the site. There is potential for the species to use the study area on occasion while foraging.

The **Little Bentwing Bat (*Miniopterus australis)*** is a small, dark chocolate brown, insectivorous bat with a body length of about 45 mm. This species prefers moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, *Melaleuca* swamps, dense coastal forests and Banksia scrub and is generally found in well-timbered areas. This species roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forages for small insects beneath the canopy of densely vegetated habitats. They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters. In NSW the largest maternity colony is in close association with a large maternity colony of Eastern Bentwing-bats (*Miniopterus schreibersii*) and appears to depend on the large colony to provide the high temperatures needed to rear its young. Only five nursery sites / maternity colonies are known in Australia (OEH, 2013).

The Little Bentwing Bat was recorded on-site by one AnaBat unit located within the EP&R and Additional Conservation Lands.

The **Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis)*** is listed as a Vulnerable species under Schedule 2 of the TSC Act. This species occupies a range of forested environments (including wet and dry sclerophyll forests) along the coastal portion of eastern Australia, and throughout the Northern Territory and Kimberley area (subject to subdivision of this species).

This species has a fast, level flight exhibiting swift shallow dives. It forages from just above the tree canopy, to many times the canopy height in forested areas, and will utilise open areas where it is known to forage at lower levels. Moths appear to be its main dietary component. This highly mobile species is capable of large regional movements in relation to seasonal differences in reproductive behaviour and winter hibernation. Though individuals often use numerous roosts, it congregates in large numbers at a small number of nursery caves to breed and hibernate. Although roosting primarily occurs in caves, it has also been recorded in mines, culverts, stormwater channels, buildings and occasionally tree-hollows. This species occupies a number of roosts within specific territorial ranges, usually within 300 km of the maternity cave, and may travel large distances between roost sites (OEH, 2013).

The Eastern Bent-wing Bat was recorded by one AnaBat unit located within the EP&R and Additional Conservation Lands.

The **Large-footed Myotis (*Myotis macropus)*** is listed as Vulnerable under the TSC Act. This species has a primarily coastal distribution, rarely found more than 100 km inland, although it does occur further inland along major rivers (Churchill 1998). This species inhabits most habitat types as long as they are near water, where this species forages (Churchill 1998). The Large-footed Myotis forages along streams and pools, feeding on insects and small fish caught by raking their long feet across the water surface.

The Large-footed Myotis is a cave dweller but is also known to roost in tree hollows, under bridges, in clumps of vegetation, buildings, mine tunnels and stormwater drains (Churchill 1998). Roosts are usually in groups of 10-15, in close proximity to water over which the bats forage (OEH, 2013).

The Large-footed Myotis was recorded by four AnaBat recorders located within the EP&R and Additional Conservation Lands and over twenty records of this species exist within a 10 km radius of the study area. There is potential for the species to utilise the study area for roosting and the adjacent gorge within the EP&R and Additional Conservation Lands provides potential foraging habitat.

This species is threatened by a number of processes including the loss or disturbance of roosting sites, clearing adjacent to foraging areas and reduction in stream water quality affecting food resources (OEH 2013).

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

All of these bat species were recorded by AnaBat units located throughout the study area. It is likely that these species would primarily roost within the EP&R and Additional Conservation Lands, but may use the proposed development area as foraging habitat.

The proposal will result in the removal of approximately 35.5 ha of poorer quality native vegetation. However, 128 ha of high quality habitat would be conserved within the EP&R and Additional Conservation Lands as part of the proposal, and additional high quality habitat exists within the local area.

The potential habitat proposed for clearing represents a small proportion of the overall habitat within the local area.

No caves will be removed as part of this development and large numbers of hollows will be retained within the EP&R and Additional Conservation Lands providing roosting and nesting sites for mico-bats. The extensive areas of high quality habitat within the EP&R and Additional Conservation Lands provide habitat for foraging and species movement. As such, it is considered unlikely the proposal would place a local population of these species at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable – not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable – not an endangered ecological community

(d) in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. However, a significant, 128 ha area of native vegetation is proposed for retention within an EP&R and Additional Conservation Lands, which supports good potential habitat for this species. In this context, the vegetation proposed to be removed is minor.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation to be cleared as a result of the proposed development occurs on the fringe of a continuous stand of vegetation to be retained as an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

All these species have been recorded within the study area, however, all records were located within the EP&R and Additional Conservation Lands or at the margin of the proposed development area, bordering the EP&R and Additional Conservation Lands.

The vegetation proposed for clearing is not considered to represent significant habitat in terms of the long term survival of these species. The vegetation proposed for clearing is of a lower quality when compared

to the significant areas of vegetation in the surrounding area, and as such is not considered to be important for the survival of these species in the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Large-eared Pied Bat National Recovery Plan states that any maternity roosts must be considered habitat critical to the survival of the species. It has stated that maternity roosts appear to be arch caves with dome roofs (DERM, 2011). No such formations have been identified within the development area, and thus will not be affected by the proposed development.

No critical habitat has been declared for the Little Bentwing-Bat, Eastern Bentwing-bat or Large-footed Myotis.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

The Large-eared Pied Bat National Recovery Plan has outlined the following objectives in relation to protecting this species:

- Identify priority roost and maternity sites for protection.
- Implement conservation and management strategies for priority sites.
- Educate the community and industry to understand and participate in the conservation of the large-eared pied bat.
- Research the large-eared pied bat to augment biological and ecological data to enable conservation management.
- Determine the meta-population dynamics throughout the distribution of the large-eared pied bat (DERM, 2011).

There are no priority sites within the subject sites and the education and research measures are not relevant to this proposal.

No recovery plan has been prepared for the Little Bentwing-bat or the Eastern Bentwing-bat, however 25 priority actions are listed for these species. No recovery plan has been prepared for the Large-footed Myotis, but 15 priority actions for this speces have been determined by the NSW Government. The relevant actions are addressed below.

Little Bentwing-bat and Eastern Bentwing-bat

Undertake non-chemical removal of weeds (e.g. lantana, blackberry) to prevent obstruction of cave entrances.

> Whilst no roosts are known from the site there is potential for caves to be located within the EP&R and Additional Conservation Lands. Management of weeds adjacent to any caves could be undertaken by hand. This measure can be identified in the EMP.

Control foxes and feral cats around roosting sites, particularly maternity caves and hibernation sites.

> Feral animal control is a key part of the EMP and control of these animals is a high priority thoughout the EP&R and Additional Conservation Lands.

Large-footed Myotis

Ensure the largest hollow bearing trees in riparian zones are given highest priority for retention in PVP assessments or other land clearing assessment tools.

Riparian zones have will be protected and managed within the EP&R and Additional Conservation Lands

Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees.

All hollow bearing trees in the riparian areas will be protected within the EP&R and Additional Conservation Lands

Better regulate pollution of waterways e.g. sewage and fertilizer run-off (eutrophication) and pesticide/herbicide leakage (chemical pollution) and thermal pollution.

The development site will be fully sewered. The golf-course and development area incorporate extensive used of bioswales, water sensitive urban design and water re-use

Encourage recovery of natural hydrological regimes, including retention and rehabilitation of riparian vegetation.

Water sensitive urban design measures will capture, treat and control runoff to mimic pre-development hydroligcal regimes

The proposed action is considered to be consistent with the objectives of the recovery plans and relevant priority actions.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The KTPs for these species relevant to the proposed development include:

- Clearing of native vegetation
- Invasion, establishment and spread of Lantana camara
- Loss of hollow-bearing trees
- Predation by the feral cat (Felis catus)
- Predation by the European red fox (Vulpes vulpes]

This development will involve the clearing of approximately 35.5 ha of poorer quality native vegetation which may represent potential habitat for these species. However, 128 ha of higher quality potential habitat will be conserved within the study area as part of the proposed development. This will protect potential cave and hollow roosting sites, forgaing habitat and riparian vegetation. Lantana will be actively managed under the EMP and feral animal control will be a key objective of the EMP.

As such, the proposed action is not considered to exacerbate KTPs in relation to these species.

Conclusions

The proposal is unlikely to constitute a significant impact on these species, given the following reasons:

- Large and intact habitat areas will remain within the EP&R and Additional Conservation Lands;
- These species are highly mobile and forage widely;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on retained habitatt;
- Management of the EP&R and Additional Conservation Lands could improve habitat quality for these species; and
- The proposal would not fragment any current populations.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on these cave-dwelling microchiropteran bat species. Consequently, a Species Impact Statement is not required for the proposal with respect to these species.

Microchiropteran Bats - Tree Hollows

Due to similar habitat requirements and associated impacts, a single Seven Part Test has been undertaken for the following microchiropteran bats which dwell in tree-hollows:

- **Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);**
- **Eastern Freetail Bat (*Mormopterus norfolkensis*);**
- **Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*); and**
- **Greater Broad Nosed Bat (*Scoteanax rueppellii*).**

The **Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)** is listed as Vulnerable under Schedule 2 of the TSC Act. The species is wide-ranging, occurring along the southeast coast of Australia with records from south-east Queensland, New South Wales, Victoria and Tasmania.

The species occurs in sclerophyll forests from the Great Dividing Range to the coast, and generally prefers wet habitats where trees are more than 20 m high. Roosting occurs in hollow trunks of eucalypt trees, usually in single sex colonies, but the species has been recorded roosting in caves under loose bark and occasionally in old wooden buildings (Churchill 1998). Their flight pattern is high and fast and they forage within or just below the tree canopy. They feed on a variety of prey including moths, rove beetles, weevils, plant bugs, flies and ants (OEH, 2013).

The Eastern False Pipistrelle was potentially recorded within the study area by three AnaBat units during the current survey. As this species call is similar call of Eastern Broad-nosed Bat, it is difficult to determine which species was recorded. Two existing records of the species exist within 10 km of the study area and potential foraging habitat is located on-site indicates this species is potentially within the study area.

The **Eastern Freetail-bat (*Mormopterus norfolkensis)*** is listed as Vulnerable under the TSC Act. It is found in dry eucalypt forests and woodlands on the east coast where they utilise tree hollows for roosting (Churchill 1998). They forage for insects among canopy gaps and on edges of vegetation and mainly roost in hollow-bearing trees (OEH 2013). This species will utilise paddock trees and remnant vegetation in farmland where these are in proximity to larger forest remnants. This species usually forages within a few kilometres of its roost (OEH, 2013).

The Eastern Freetail-bat was recorded by five AnaBat units located throughout the study area during the current surveys, and has been previously been recorded six times within 10 km of the study area.

The **Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)** roosts singly or in groups of up to six, in tree hollows and buildings. In treeless areas they are known to utilise mammal burrows. They forage in most habitats throughout their very wide range, including areas with and without trees and appear to defend an aerial territory (OEH, 2013)).

The Yellow-bellied Sheathtail-bat was recorded by one AnaBat unit within the study area. This species has not previously been recorded within 10 km of the study area.

The **Greater Broad-nosed Bat (*Scoteanax rueppellii*)** is listed as Vulnerable under the TSC Act. It utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings (OEH 2013).

This species has been recorded by four AnaBat units located within the study area, and seven previous records exist within 10 km of the study area.

These species are threatened by a number of processes including loss of trees for foraging and hollow-bearing trees for roosting, disturbance roosting and breeding sites, application of pesticides in or adjacent to foraging areas and changes to water regimes (OEH 2013).

a. In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

All of these species have been recorded by AnaBat units located throughout the study area.

The proposal will result in the removal of approximately 35.5 ha of poorer quality native vegetation. However, 128 ha of high quality habitat would be conserved within the EP&R and Additional Conservation Lands as part of the proposal, and additional high quality habitat exists within the local area.

High levels of bat activity were recorded within the EP&R and Additional Conservation Lands and a large number of tree hollows were observed in this area. A number of water sources were also identified in this area and at the base of the gorge, providing for watering and foraging. The retention of this area of high quality habitat will provide for roosting and breeding, foraging and species movement. The loss of marginal habitat combined with the protection and management of high quality habitat means it is unlikely the proposal would place a local population of these species at risk of extinction.

b. In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable – not an endangered population.

c. in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable – not an endangered ecological community

d. in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. However, a significant, 128 ha area of native vegetation is proposed for retention within an EP&R and Additional Conservation Lands, which supports good potential habitat for this species. In this context, the vegetation proposed to be removed is minor.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation to be cleared as a result of the proposed development occurs on the fringe of a continuous stand of vegetation to be retained as an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

All species have been recorded within the study area, however, all records were located within the proposed EP&R and Additional Conservation Lands or at the margin of the proposed development area, bordering the EP&R and Additional Conservation Lands. Some areas of moderate quality habitat exist within the development area and would be cleared as a result of the proposed development.

The vegetation proposed for clearing is not considered to represent significant habitat in terms of the long term survival of these species. The vegetation proposed for clearing is of a lower quality when compared to the significant areas of vegetation in the surrounding area, and as such is not considered to be important for the survival of these species in the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

Not applicable – no critical habitat has been declared for these species.

f. Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan or threat abatement plan has been prepared for these species. 38 Priority Actions for these species have been outlined, the three that are relevant to this project are addressed below;

Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees.

Whilst EIA guidelines have not been prepared this proposal protects the largest area of structural diversity and areas with large hollow bearing trees within the EP&R and Additional Conservation Lands

Identify areas of private land that contain high densities of large hollow-bearing trees as areas of high conservation value planning instruments and land management negotiations e.g. LEP, CAPs, PVPs.

Whilst the densities of large hollow-bearing trees is typical of what occurs in the local area, the EP&R and Additional Conservation Lands provide for the protection and management of an extensive area of habitat that contains hollow-bearing trees.

Promote the conservation of these private land areas using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other means.

No incentive funding will be provided however conservation will be achieved through the protection and management of the EP&R and Additional Conservation Lands

The proposed action is considered to be consistent with the Priority Actions Statement for these species.

g. The action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Three KTPs listed under Schedule 3 of the TSC Act are relevant to the proposal and may pose a threat to these bat species:

- Clearing of native vegetation
- Loss of hollow-bearing trees
- Predation by the feral cat (*Felis catus*)

This development will involve the clearing of approximately 35.5 ha of poorer quality native vegetation which may represent potential habitat for these species. However, 128 ha of higher quality potential habitat will be conserved within the study area as part of the proposed development.

Extensive numbers of hollow-bearing trees will be retained within the EP&R and Additional Conservation Lands and management of feral animals is an integral component of the EMP.

As such, the proposal is unlikely to exacerbate KTPs in relation to these species.

Conclusions

The proposal is unlikely to constitute a significant impact on these species, given that:

- Large and intact habitat areas will remain within the EP&R and Additional Conservation Lands;
- These species are highly mobile and forage widely;
- Mitigation measures will be implemented to prevent indirect impacts of the proposal on the remaining habitat;
- Management of the EP&R and Additional Conservation Lands could improve habitat quality for these species;
- A large number of HBTs will be retained onsite;
- The proposal would not fragment any current populations.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on these hollow-dwelling microchiropteran bat species. Consequently, a Species Impact Statement is not required for the proposal with respect to these species.

Giant Burrowing Frog (*Heleioporus australiacus*) and Red-crowned Toadlet (*Pseudophryne australis*)

The **Giant Burrowing Frog (*Heleioporus australiacus*)** is listed as a Vulnerable species under Schedule 2 of the TSC Act and under the EPBC Act. The Giant Burrowing Frog is distributed in south-eastern NSW and Victoria occurring predominately on the sandstone geology of the Sydney Basin, extending as far south as Jervis Bay and as isolated 'pockets' from about Narooma south into eastern Victoria.

Within the Sydney Sandstone environment this species prefers sandstone ridgetop habitats and broader upland valleys. It is associated with small headwater creeklines and along slow flowing to intermittent creeklines. The preferred vegetation is typically woodland, open woodland and heath and may be associated with 'hanging swamp' seepage lines and where small pools form from the collected water. They have also been observed occupying artificial pond structures such as farm dams, gravel 'borrows', detention basins and box drains that have naturalised over time and are still surrounded by other undisturbed habitat (DECC 2005).

The Giant Burrowing Frog often spends significant periods of time burrowed underground during unfavourable conditions and to avoid detection during the day. It has an ability to range widely, frequently being recorded at considerable distance from suitable riparian breeding, or other moist habitat (DECC 2005). Breeding occurs mainly between mid-summer to autumn, although calling has also been recorded between August and March (DECC 2005).

No Giant Burrowing Frogs were recorded during the current field survey and no records of the species occur within a 10 km radius, however some potential habitat is located within the proposed EP&R and Additional Conservation Lands.

The **Red-crowned Toadlet (*Pseudophryne australis*)** is listed as a Vulnerable Species under Schedule 2 of the TSC Act. The Red-crowned Toadlet has a restricted distribution, known only from a relatively small area of mid-eastern New South Wales.

Known only from Triassic sandstones of the Sydney Basin, Red-crowned Toadlets are found in steep escarpment areas and plateaus, as well as low undulating ranges with benched outcroppings. Within these geological formations, this species mainly occupies the upper parts of ridges, usually being restricted to within about 100 metres of the ridgetop. Red-crowned Toadlets may also occur on plateaus or more level rock platforms along the ridgetop. This area is usually less preferred than the first talus slope areas below the upper escarpment or just below benched rock platforms.

The species has been recorded from near sea level to about 1000 m elevation, but most sites are on fairly low coastal ranges under 200 m in elevation. Favoured micro-habitats for shelter sites are under flat sandstone rocks ('bush-rock') either resting on bare rock or damp loamy soils. This species has also been found under logs on soil, beneath thick ground litter, particularly near large trees and in horizontal rock crevices near the ground. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Eggs are laid in moist leaf litter, from where they are washed by heavy rain; a large proportion of the development of the tadpoles takes place in the egg.

Known prey for Red-crowned Toadlets are ants, termites, mites, pseudo-scorpions, collembolans and small cockroaches, although they are likely to eat most small invertebrates encountered (OEH, 2013).

No Red-crowned Toadlets were recorded during the current field survey and only one record of the species occurs within a 10 km radius of the study area. Potential habitat for this species is located within the EP&R and Additional Conservation Lands.

Threats to Red-crowned Toadlet and Giant Burrowing Frog include:

- loss of / degradation of habitat;
- high frequency fire;
- bush rock removal;
- disease;
- water pollution and high nutrient flows;
- altered hydrological regimes;
- erosion and sedimentation of headwater creeklines;
- disturbance to forest habitat and breeding sites;
- predation by feral and domestic animals;
- pH changes due to urban runoff; and
- infection by the amphibian chytrid fungus.
- (OEH, 2013)

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

There is no habitat for these species located within the development area which will be directly impacted by the proposed development. Potential habitat is located within the EP&R and Additional Conservation Lands which may be indirectly impacted by the proposal through the spread of weeds, urban water runoff and potential predation by domestic animals. Ample breeding, foraging and movement habitat is located within the EP&R and Additional Conservation Lands such that the lifecycle of these species will be maintained.

Given the dependence of these species on the aquatic environment, changes in hydrology and water chemistry have a potential to effect these species. The development has incorporated Water Sensitive Urban Design (WSUD) requirements including basins and bioretention swaled, to contain, treat and attenuate flows. WSUD design aims to ensure that post-development flows mimic pre-development flows and to ensure that water is treated prior to discharge into riparian areas.

Weed invasion is often more prevalent along riparian areas due to the moister environment. Weed management is an integral component of the EMP and it is unlikely that weed invasion would place the life cycle of this species at risk.

Given the amount of habitat contained with the EP&R and Additional Conservation Lands, implementation of WSUD principles and long term management of the EP&R and Additional Conservation Lands the proposal is unlikely to cause adverse effects on the life cycle of these species in such a way that a viable local population of these species would be placed at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable – not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable – not an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed works involve the clearance of approximately 35.5 ha of poorer quality native vegetation. However, a significant, 128 ha area of native vegetation is proposed for retention within an EP&R and Additional Conservation Lands, which supports good potential habitat for this species. In this context, the vegetation proposed to be removed is minor.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation to be cleared as a result of the proposed development occurs on the fringe of a continuous stand of vegetation to be retained as an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

These species have not been recorded within the study area, however, some areas of poorer quality habitat within the development area would be cleared as a result of the proposed development.

The vegetation proposed for clearing is not considered to represent significant habitat in terms of the long term survival of these species. The vegetation proposed for clearing is of a lower quality when compared to the significant areas of vegetation in the surrounding area, and as such is not considered to be important for the survival of these species in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

Not applicable – no critical habitat has been declared for these.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No Recovery Plan has been prepared for the Giant Burrowing Frog. The Priority Actions Statement identifies 19 Priority Actions for this species. Similarly, no Recovery Plan has been prepared for the Red-crowned Toadlet. The Priority Actions Statement identifies 14 Priority Actions for this species. One priority action is relevant for both species to this proposal and is discussed below;

Assess the threat of changed hydrological regimes on the habitat of this species. Include the impacts of increasing urbanisation, groundwater extraction, and climate change into this assessment.

Unmitigated urbanisation has the potential to alter hydrological flows and water quality. At this site, WSUD mechanisms inclusing extensive swales, detention/treatment basins and water reuse will be implemented so that post development flows are within the natural range of pre-development flows.

(g) The action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The KTPs relevant to this proposal includes:

- Clearing of native vegetation
- Predation by the feral cat (*Felis catus*)
- Predation by the European red fox (*Vulpes vulpes*]

This development will involve the clearing of approximately 35.5 ha of poorer quality native vegetation which may represent potential habitat for these species. However, 128 ha of higher quality potential habitat will be conserved within the study area as part of the proposed development.

Management of feral animals is an important objective of the EMP and actions will be undertaken to control feral animals within the EP&R and Additional Conservation Lands.

The proposed action is not considered to increase the impacts of these KTPs in relation to these species.

Conclusions

The proposal is unlikely to significantly impact Giant Burrowing Frog or Red-crowned Toadlet given that:

- no potential habitat is located within the development area;
- development controls and management plans will be in place to ensure indirect impacts on the EP&R and Additional Conservation Lands will be minimal; and
- no known individuals are located on-site.

On the basis of the above considerations, it is considered unlikely the proposal will result in a significant impact on the Giant Burrowing Frog or Red-crowned Toadlet. Consequently, a Species Impact Statement is not required for the proposal with respect to these species.

Broad-headed Snake (*Hoplocephalus bungaroides)*

The Broad-headed Snake (*Hoplocephalus bungaroides*) is listed as Endangered under the NSW TSC Act and Vulnerable under the Commonwealth EPBC Act. This species is generally black above with yellow spots forming narrow, irregular cross-bands. Other yellow scales may link these cross-bands laterally to form a straight or zig-zagged stripe along the body. Its head is flattened on top and distinct from the body. The average length is about 60 cm, to a maximum of around 150 cm.

The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney. This species generally shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring and moves from the sandstone rocks to shelters in hollows in large trees within 200 m of escarpments in summer.

The Broad-headed Snake is nocturnal, and feeds mostly on geckos and small skinks, but will also eat frogs and small mammals occasionally. Females produce four to 12 live young from January to March, which is a relatively low level of fecundity.

Threats to this species include:

- Being hit by vehicles, with increasing human use and vehicular traffic leading to many deaths of adults and young.
- Removal of bushrock from sandstone escarpments.
- Unintentional or intentional killing of snakes discovered during bushrock collecting or other outdoor activities.
- Illegal collection of individuals by reptile collectors.
- Removal of large hollow-bearing trees adjacent to sandstone escarpments.
- Damage to habitat by feral goats

This species was not been recorded within the study area during the current survey, and four existing records of this species occur within a 10 km radius of the study area.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

No known habitat for this species occurs within the proposed development area and as such this species would not be directly impacted by the proposal. Potential habitat for this species is located within the proposed EP&R and Additional Conservation Lands which may be indirectly impacted by the development. However, development controls and management of the EP&R and Additional Conservation Lands are likely to prevent these impacts from affecting potential habitat for this species.

Retention of rocky scarps and direct links to the gullies will retain the habitat for these species within the EP&R and Additional Conservation Lands. Given that all of the potential habitat will be retained within the EP&R and Additional Conservation Lands and that this land will be maintained under the community scheme it is considered unlikely to cause adverse impacts upon the life cycle of this species in such a way a viable local population would be placed at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable – not an endangered population.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable – not an endangered ecological community.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

No potential habitat for this species is located within the study area and as such no habitat would be directly impacted by the proposal. Areas of potential habitat are located within the EP&R and Additional Conservation Lands which may be indirectly impacted by the proposed development. However, development controls and management of the EP&R and Additional Conservation Lands should prevent any impacts from affecting this potential habitat.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed vegetation clearance will not result in any habitat becoming fragmented or isolated. The vegetation to be cleared as a result of the proposed development occurs on the fringe of a continuous stand of vegetation to be retained as an EP&R and Additional Conservation Lands. The EP&R and Additional Conservation Lands will maintain all vegetation corridors leading from the study area into the adjacent landscape.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

This species have not been recorded within the study area, however, some areas of poorer quality habitat within the development area would be cleared as a result of the proposed development.

The vegetation proposed for clearing is not considered to represent significant habitat in terms of the long term survival of these species. The vegetation proposed for clearing is of a lower quality when compared to the significant areas of vegetation in the surrounding area, and as such is not considered to be important for the survival of this species in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

Not applicable – no critical habitat has been declared for these species.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No Recovery Plan has been prepared the Broad-headed Snake. 25 Priority Actions have been identified for this species, all of which relate to the preparation of administrative guidelines or research priorities at identified key sites or across the species range. OEH have not developed guidelines for this species as identified in the Priority Actions, however there are themes with the priorites actions which can be applied at this site;

Promote active management of Broad-headed Snake habitat on private land

> Active management of broad-headed snake can be incorporated into the EMP for the site. Consutlation with OEH regarding specific actions could be included as a condition of consent.

Promote options to control and regulate bushrock removal

> The two best mechanisms for regulating bush rock removal will be through restricting vehicular access to the bushland and educating residents on the importance of bush-rock to this species. Vehciluar access can be restricted through urban deisgn and fencing whilst education can be incorporated into the EMP.

The proposed action is considered to be consistent with the Priorities Action Statement for this species.

(g) The action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The KTP relevant to this proposal is:

- Clearing of native vegetation
- Bushrock removal
- Competition and habitat degradation by feral goats *(Capra hircus)*

This development will involve the clearing of approximately 35.5 ha of poorer quality native vegetation which is unlikely to represent potential habitat for the species. However, 128 ha of higher quality potential habitat will be conserved within the study area as part of the proposed development.

Bushrock removal will not be undertaken as part of this proposal. However as identified in Section (f) of this AoS, mechanisms can be implemented to minimise the potential for future bushrock removal from this site.

The development will reduce the potential for habitat degradation by feral goats through the active management of feral animals within the EP&R and Additional Conservation Lands under the EMP.

They impact of these key threatening processes of relevance to this species are unlikely to be increased as a result of this development.

Conclusions

The proposal is unlikely to significantly impact Broad-headed Snake given that:

- No individuals have been recorded within the development area and the area being developed is of poorer quality;
- development controls and management plans would be in place to ensure indirect impacts on the proposed EP&R and Additional Conservation Lands are minimal; and
- no known individuals are located on-site.

On the basis of the above considerations, it is considered unlikely the proposal would result in a significant impact on the Broad-headed Snake. Consequently, a Species Impact Statement is not required for the proposal with respect to this species.

Appendix B: Interface Treatment

During early discussions with council, information was requested on how the interface between the residential development and the bushland would be treated. This was of specific concern where threatened plants or key habitat features for threatened fauna were adjacent to the perimeter of the EP&R and Additional Conservation Lands.

There are two main considerations in the proposed treatments:

- Vehicular access
- Pedestrian access

Vehicular access

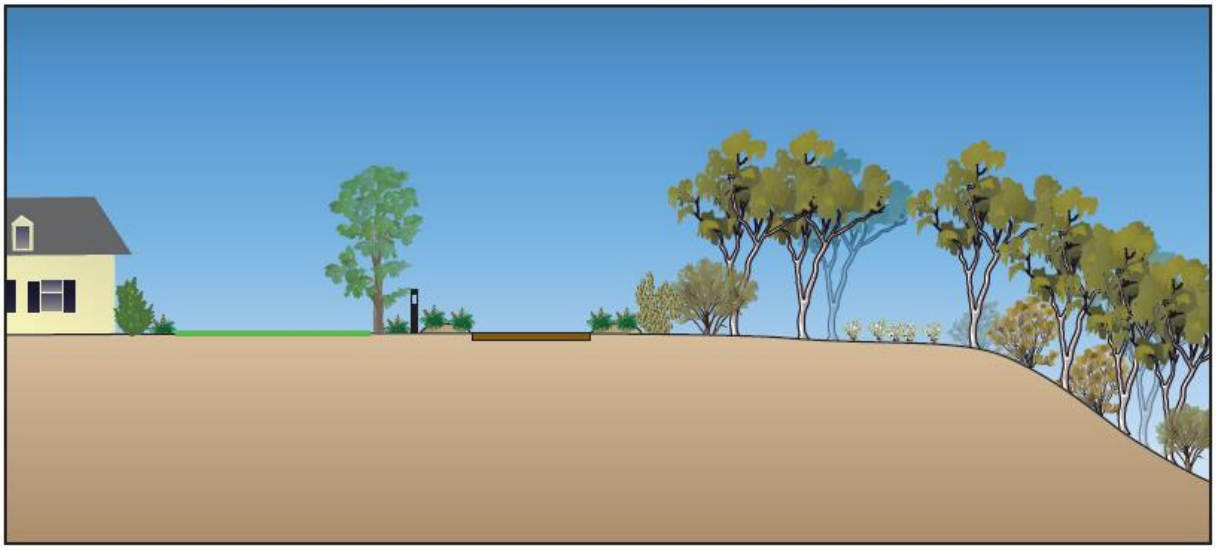
Vehicluar access includes cars and trail bikes. Vehicular access by the general public is to be excluded from the EP&R and Additional Conservation Lands. This will be achieved through a combination or urban design, gates and fencing. Where a perimeter road interfaces with the EP&R and Additional Conservation Lands, fencing or bollards will be installed to prevent vehicular access. Where lots back onto the EP&R and Additional Conservation Lands, it is likely that perimeter fire trails will be required to link perimter roads. Access to perimeter fire trails will be restricted through the installation of locked vehicular gates with RFS compliant keys. Pedestrian access to fire trails will be via formailsed points that will be designed to prevent trail bike access. A schematic of the perimeter road edge treatment is provided below.

Pedestrian Access

Pedestrian access will be through a formal network of paths and trails. Soft landscaping approaches will be used on the bushland side to discourage access into sensitive areas of the site. The landscaping approach will use a combination of dense planting of the spikey-matt rush *(Lomandra longifolia)* with a 1 metre setback from the path, followed by a dense shrub layer of the native blackthorn *(Bursaria spinosai)* and tickbush *(Kunzea ambigua)*.

It will be important to monitor pedestrian access to identify if there are any informal 'desire lines' being established within the bushland. Any identified desire lines should be assessed from the perspective of whether they have the potential to impact on sensitive areas. If there is a potential impact, these desire lines should be shut down through a combination of landscaping as above and education. If sensitive areas are not going to be impacted, consideration should be given to formalising the desire lines.

The entire trail network should be subject to ongoing monitoring to identify management issues such as erosion and weed invasion. A schematic of the perimeter trail treatment is provided below.



Appendix C: Curricula vitae

CURRICULUM VITAE

Steven House

DIRECTOR

QUALIFICATIONS

- Graduate Diploma in Design for Bushfire Prone Areas, University of Western Sydney, 2008.
- Bachelor of Science, Majors in Biology (Plant Resource Management, Terrestrial Ecology) and Physical Geography (Geographical Information Systems, Fluvial Geomorphology), University of Sydney, 1994.
- Completion of NSW Consulting Planners Bushfire Training Course, 2003
- Bushland Regeneration Certificate, Yallah TAFE, 1995.

Steven has over 20 years experience in large scale ecological assessment and strategic planning projects. He possesses an excellent knowledge of the policy and legislation that drives many of the planning processes and possesses a strong technical background enabling his involvement from data collation and analysis through to planning and presentation.

He has an excellent knowledge of landscape processes and has been involved with a number of key natural resource management projects including the Comprehensive Regional (Forestry) Assessments, Lower Hunter and Central Coast Regional Biodiversity Strategy, Georges River Biodiversity Study, the NSW Native Vegetation Change Mapping Project and the Western Sydney Structure Planning Project.

Steven has worked extensively with Commonwealth, State and Local Government throughout his career which has enabled him to develop a thorough understanding of policies, processes and legislation under which various organisations operate.

More recently Steven has been involved with a series of urban release and Master-planning projects primarily in Western Sydney where he has been required to assess bushfire and ecological impacts, identify priority areas for biodiversity conservation and undertake negotiations with key Government agencies and other stakeholders.

Relevant Project Experience:

- *Harrington Park Stage 2 and Mater Dei LES:* Undertaking ecological and bushfire assessments as part of the LES. Provide GIS support to a multi-disciplinary project team and facilitating map-based interactive planning workshops with private, state and local government stakeholders.
- *Kings Hill LES Review:* Undertaking a review of the ecological and bushfire components of the Kings Hill LES on behalf of Port Stephens Council.
- *West Dapto LES and Master plan:* Undertaking the ecological and bushfire components of the West Dapto LES and Master plan for Wollongong City Council.
- *Sussex Inlet Settlement Strategy:* Preparing a settlement strategy to outline future growth options for the township of Sussex Inlet and surrounds on behalf of Shoalhaven City Council and DIPNR. Entails environmental constraints analysis and lot yield assessments in conjunction with social and infrastructure planning consultants.
- *Managing Sydney's Urban Growth – Ecological Assessment:* Undertook an assessment of ecological values including threatened species, endangered ecological communities and habitat corridors to identify priority conservation areas. This information was used as part of a multi-criteria analysis and workshop program with Local and State Government to identify strategic development options and 15 years of land supply in Western Sydney.
- *NSW Native Vegetation Change Mapping Project:* Worked with the Australian Greenhouse Office in preparing a series of vegetation change maps based on statistical analysis of historical and contemporary LANDSAT images.
- *Edmondson Park Master Planning:* Undertook an assessment of ecological values and recovery potential of lands with the Edmondson Park urban release area to inform the master planning project. Developed customised process for assessing conservation values that is now regarded as current best practice by the NSW NPWS. Undertook an assessment of bushfire planning issues and prepared guidelines for the protection from bushfire hazard.
- *Newcastle City Council Bushfire Prone Lands:* Undertook mapping of bushfire prone land and property as per Rural Fire Service requirements. Involved mapping, analysis and consultation with Council and fire protection authorities.
- *Lower Hunter and Central Coast Regional Biodiversity Conservation Strategy:* Undertook aerial photo interpretation of over 600 000 hectares of land to identify extant vegetation communities and vegetation condition. Analysed biodiversity values in relation to current State and Federal policy and legislation and provided an assessment of conservation priorities across the region. Prepared a framework for strategic biodiversity protection to be implemented across the region by various statutory bodies.
- *Wingecarribee Vegetation Mapping and Conservation Assessment Project:* Managed a multi-discipline team in surveying, analysing and modelling the distribution of vegetation communities and threatened species habitat for Wingecarribee Shire Council. This project worked closely with council, NSW NPWS, DLWC and the Sydney Catchment Authority to facilitate a whole of government approach to conservation assessment in the study area.
- *Eden RFA Private Lands Mapping:* Project managed high resolution mapping of vascular vegetation and grasslands on private land in the Eden RFA area. Used Imagine image analysis software to undertake a temporal difference analysis to identify native grasslands form Landsat images.
- *Southern CRA Forest Ecosystems Modelling:* Was part of a team that produced a pre1750 and extant forest ecosystems map covering the southern CRA area. These maps were

produced through two statistical processes; Generalised additive models, and decision tree models. The project required extensive levels of database management and GIS analysis.

- *Bankstown Biodiversity Strategy:* Produced high resolution vegetation maps and threatened species data. Prepared a thorough, site specific biodiversity conservation strategy for the Bankstown Local Government area.
- *National Vegetation Information System (NVIS):* Coordinated the input of existing NSW vegetation datasets into this MS-Access based system and undertook the processing of GIS layers to produce a statewide vegetation map.
- *Sydney Basin CRA:* Produced a composite vegetation map from existing vegetation data extending beyond the Sydney Basin CRA area. Involved collating data, matching vegetation classifications between datasets and compiling a GIS map. This was used to identify trends in land management and to assess the relationship between the distribution of individual fauna species and vegetation communities.
- *Eden CRA:* Identified areas of high fauna value for inclusion into NPWS conservation planning software, C-plan.
- *Georges River Biodiversity Study:* Undertook systematic field survey, mapping and analysis and identified areas of high biodiversity value and features intrinsic to maintaining biodiversity (e.g. Corridors, wetlands).
- *Assessment of Sydney Catchment Authority Lands:* Analysed SCA lands in relation to known and predicted distributions of vegetation communities and rare fauna species. Identified lands that featured biodiversity values that were under-represented in the reserve system.

HEAD OFFICE
Suite 4, Level 1
2-4 Merton Street
Sutherland NSW 2232
T 02 8536 8600
F 02 9542 5622

SYDNEY
Level 6
299 Sussex Street
Sydney NSW 2000
T 02 8536 8650
F 02 9264 0717

ST GEORGES BASIN
8/128 Island Point Road
St Georges Basin NSW 2540
T 02 4443 5555
F 02 4443 6655

CANBERRA
Level 2
11 London Circuit
Canberra ACT 2601
T 02 6103 0145
F 02 6103 0148

NEWCASTLE
Suites 28 & 29, Level 7
19 Bolton Street
Newcastle NSW 2300
T 02 4910 0125
F 02 4910 0126

NAROOMA
5/20 Canty Street
Narooma NSW 2546
T 02 4476 1151
F 02 4476 1161

COFFS HARBOUR
35 Orlando Street
Coffs Harbour Jetty NSW 2450
T 02 6651 5484
F 02 6651 6890

ARMIDALE
92 Taylor Street
Armidale NSW 2350
T 02 8081 2681
F 02 6772 1279

MUDGEE
Unit 1, Level 1
79 Market Street
Mudgee NSW2850
T 02 4302 1230
F 02 6372 9230

PERTH
Suite 1 & 2
49Ord Street
West Perth WA 6005
T 08 9227 1070
F 08 9322 1358

WOLLONGONG
Suite 204, Level 2
62 Moore Street
Austinmer NSW 2515
T 02 4201 2200
F 02 4268 4361

GOSFORD
Suite 5, Baker One
1-5 Baker Street
Gosford NSW 2250
T 02 4302 1220
F 02 4322 2897

DARWIN
16/56 Marina Boulevard
Cullen Bay NT 0820
T 08 8989 5601

BRISBANE
51 Amelia Street
Fortitude Valley QLD 4006
T 07 3503 7193

1300 646 131
www.ecoaus.com.au