

CARLINGFORD BLOCK STUDY

Ecological Constraints Analysis

For:

BaptistCare

November 2016

Final



**PO Box 2474
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Report No. 16183RP1

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

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Glossary of Terms

BaptistCare	BaptistCare NSW & ACT
CEEC	Critically Endangered Ecological Community
DOEE	Commonwealth Department of Environment and Energy
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FFA	Flora and Fauna Assessment
KTP	Key Threatening Process
LGA	Local Government Area
Locality	The area within a 5km radius of the study area
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
SIS	Species Impact Statement
Study Area	All areas identified as 'study area' in Figure 1.1
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>

Introduction

Cumberland Ecology was commissioned by BaptistCare NSW & ACT (BaptistCare) and ACN 608698497 Pty Ltd trading as Sydney Properties Development Consultants to undertake an ecological constraints analysis to inform a 'block analysis' for land bound by Martins Lane, Pennant Hills Road, Tintern Avenue and Homelands Avenue, Carlingford (the 'study area'). The study area includes Planning Proposals which propose to rezone land.

1.1 Purpose

The purpose of this report is to document the findings of an ecological investigation completed across the study area (see **Figure 1.1**) and to identify the potential ecological constraints to any increase in residential density on land within the study area. Specifically, the objectives of this ecological constraints analysis are to:

- Describe the vegetation communities within the study area;
- Describe fauna habitats and fauna usage of the study area;
- Identify any threatened species, populations and/or ecological communities (as listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and/or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) existing within the study area;
- Assess the likelihood of occurrence of threatened species, populations or communities (as listed under the TSC Act and/or EPBC Act) within the study area;
- Identify areas of ecological constraint and assess the potential impacts (both direct and indirect) of future development on threatened communities, flora and fauna, including the completion of Assessments of Significance under Section 5A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act); and
- Where relevant, recommend mitigation measures to reduce the impacts of future development on the biodiversity values of the study area.

1.2 Project Background

A request for a Planning Proposal was previously submitted by DFP Planning on behalf of BaptistCare to the City of Parramatta Council (Council) to amend zoning (from R2 – Low Density Residential to R4 High Density Residential), height and floor space ratio controls applying to land at 264-268 Pennant Hills Road, Carlingford. As part of this Planning Proposal, an ecological constraints analysis was undertaken by Cumberland Ecology (2015). Following this request for a Planning Proposal by DFP Planning, Think Planners lodged a preliminary Planning Proposal with Council for properties located adjacent to the BaptistCare land located at 258-262 Pennant Hills Road, and 17 and 20 Azile Court, Carlingford (see **Figure 1.1**).

In response to the Planning Proposals made by Think Planners and DFP Planning (the 'clients'), Council declared that neither of the proposals should proceed until further planning analysis are undertaken. The applicants of the two proposals were given the option to work in partnership to prepare a 'block analysis' of the area which requires an ecological constraints analysis.

1.3 Study Area

The study area is located within the suburb of Carlingford in the Parramatta City Local Government Area (LGA) and is currently zoned as R2 – Low Density Residential under the *Parramatta Local Environmental Plan 2011*. It is bound by Pennant Hills Road to the north, Martins Lane to the east, Homelands Avenue to the south and Tintern Avenue to the west (**Figure 1.1**). The study area is approximately 7.15 ha in size and encompasses numerous residential dwellings, BaptistCare Waldock Centre, BaptistCare Yallambi Centre, associated infrastructure and patches of treed vegetation.



Legend

- Study Area
- Lot Boundaries

Image Source:
Image © 2016 Google
(dated 16-10-2015)



Figure 1.1. Location of the Study Area

Methodology

2.1 Desktop Assessment

2.1.1 Database Analysis

Database analysis was conducted for the locality using both the NSW Office of Environment and Heritage (OEH) Atlas of NSW Wildlife (OEH, 2016) and the Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool (DoEE, 2016). The locality is defined as the area within a 5 km radius of the study area. The Atlas of NSW Wildlife Database search was used to generate records of threatened flora and fauna species listed under the TSC Act within the locality of the study area. The Protected Matters Search Tool generated a list of Matters of National Environmental Significance listed under the EPBC Act potentially occurring within the locality of the study area. The lists generated from these databases were reviewed against available knowledge of the study area, in conjunction with the abundance, distribution and age of records, to ascertain the likelihood of occurrence of threatened species within the study area.

2.1.2 Literature Review

A review of ecological literature relevant to the project area was undertaken as part of the desktop assessment to evaluate the flora and fauna values associated with the project area. Key documents reviewed for this ecological constraints analysis include:

- Existing Ecological Constraints Assessment by Cumberland Ecology (2015) for 264-268 Pennant Hills Road Carlingford;
- Tree Assessment Report by Bradshaw Tree Services (2014) for 250 Pennant Hills Road, Carlingford;
- Background material (Council reports of 14 June 2016 and the Planning Proposal at Attachment 1 to the Council report of 8 August 2016); and
- Building footprints of the BaptistCare concept plan and impact on mapped area of Blue Gum High Forest.

2.2 Flora Survey

Surveys of the study area were conducted by an ecologist on 10 and 21 October 2016. During surveys, areas of vegetation present within the study area were surveyed and photographs taken of representative areas of vegetation. Characteristic species were identified in order to determine the potential presence of threatened ecological communities (TECs) listed under the TSC Act and/or EPBC Act.

All vascular plants recorded or collected were identified using keys and nomenclature provided in Harden (1990-1993). Where known, taxonomic and nomenclatural changes have been incorporated into the results, as derived from *PlantNET* (Botanic Gardens Trust, 2016).

2.2.1 *Vegetation Mapping*

Previous broad-scale vegetation mapping conducted for the Sydney Metropolitan Catchment Management Authority (SMCMA) Vegetation Mapping project (OEH, 2013) was utilised to determine potential vegetation communities likely to occur within the study area. Cumberland Ecology conducted additional vegetation surveys to revise and update the vegetation mapping prepared by OEH. The vegetation within the study area was ground-truthed to examine and verify the mapping of the condition and extent of the different vegetation communities. Much of the ground-truthing occurred by viewing canopy from the street due to the lack of access onto private properties.

The resultant information was synthesised using a Geographic Information System to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the study area.

2.2.2 *Targeted Threatened Flora Surveys*

Targeted threatened flora searches via random meanders were undertaken within accessible suitable habitat of threatened flora species known from the locality. The locations of threatened flora specimens observed during surveys were recorded using a hand-held Global Positioning System.

2.3 Fauna Survey

2.3.1 *Habitat Assessment*

The survey consisted of a fauna habitat assessment and incidental observations. The fauna habitat assessment included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, nests, fallen logs, bush rock and presence of waterbodies. Structural features considered included the nature and extent of the understorey and ground stratum and extent of canopy. The survey also included an assessment of the presence of habitat features suitable for use by threatened fauna species known from the locality.

2.3.2 Incidental Observations

Any incidental fauna species that were observed, heard calling, or otherwise detected on the basis of tracks or signs, were recorded and listed in the total species list for the study area. Species recorded for the previous ecological assessment were also included.

2.4 Limitations

Not all properties could be accessed during surveys and much of the survey was limited to walking public roads adjacent to properties. Nevertheless, vertebrate fauna and vascular flora of the locality are well known based upon a sizeable database of past records and various published reports. The surveys by Cumberland Ecology added to the existing database and helped to provide a clear indication of the likelihood that various species occur, or are likely to occur within the study area. The data obtained from database assessment and surveys of the study area furnished an appropriate level of information to support this assessment.

The weather conditions at the time of the flora surveys were generally favourable for plant growth and production of features required for identification of most species. Shrubs, grasses, herbs and creepers were readily identifiable in most instances. It is expected that not all flora species present would have been recorded during surveys. Despite this, it is considered that sufficient information has been collected to assess issues including conservation significance of the flora, condition and viability of vegetation and likely impact on native vegetation. An assessment of the likelihood of occurrence of threatened flora species recorded within the locality of the study area in the database searches was undertaken to supplement the flora survey.

No targeted fauna surveys were undertaken for this assessment, which relied solely on a database analysis and fauna habitat assessment. In general, opportunistic observations of fauna provide a "snapshot" of some of the fauna present on a site that were active during the time of the survey. The data produced by the survey is intended to be indicative of the types of species that could occur and not an absolute census of all vertebrate fauna species occurring within the study area. Therefore not all fauna utilising the study area are likely to have been recorded during surveys. An assessment of the likelihood of occurrence of threatened and migratory fauna species listed for the locality in the database searches was undertaken to supplement the fauna surveys. The combination of these techniques is considered appropriate for assessing the habitat values of the site for threatened fauna within the study area.

Results

3.1 Vegetation Communities

The vegetation of the study area exists primarily within landscaped areas of numerous private residential dwellings. Landscaped areas of the study area have been planted with a mixture of exotic and native plant species. Native non-planted vegetation is present within the study area in the form of mature remnant eucalypt trees endemic to the area.

Previous vegetation mapping conducted for the Sydney Metropolitan Catchment Management Authority (SMCMA) Vegetation Mapping project (OEH, 2013) indicated the presence of the following two communities within the study area:

- Blue Gum High Forest; and
- Urban Exotic/Native.

Based on the findings of the surveys and a previously undertaken ecological assessment, both of these communities are present within the study area and are described below. **Figure 3.1** identifies the extent of these communities within the study area and **Appendix A** contains a list of all flora species recorded during surveys.

3.1.1 Blue Gum High Forest

TSC Act Status: Critically Endangered Ecological Community (CEEC)

EPBC Act Status: Not listed

This community is present in two discernible areas within the study area that largely exist as scattered remnant *Eucalyptus saligna* (Sydney Blue Gum) trees with an exotic dominated understorey. Area 1 is located within the southern end of 264-268 Pennant Hills Road and the adjoining properties to the south, and Area 2 is located along the western and eastern boundary of 8 Azile Court and 10 Tintern Avenue, respectively (see **Figure 3.1**). Both areas are present within landscaped areas and have little to no connectivity to other patches of Blue Gum High Forest as they are bounded by residential development. A description of each area of Blue Gum High Forest within the study area is provided in subsequent sections.

Under the TSC Act, Blue Gum High Forest CEEC is dominated by a canopy of *Eucalyptus pilularis* (Blackbutt) or *Eucalyptus saligna* (Sydney Blue Gum). The community is typically comprised of a midstorey and understorey of characteristic species, however due to past

disturbances, highly modified relics of the community exist as small clumps of trees without a native understorey (NSW Scientific Committee, 2011). Areas of the study area contain characteristic canopy species in the form of *Eucalyptus saligna* (Sydney Blue Gum), but lack a native understorey. These areas represent highly modified Blue Gum High Forest relics and conform to TSC Act CEEC.

Blue Gum High Forest listed CEEC under the EPBC Act is characterised by similar species as outlined in the TSC Act's final determination for the community, including the presence of *Eucalyptus saligna* (Sydney Blue Gum). Under the EPBC Act, Blue Gum High Forest also needs to be greater than one hectare in size and have a canopy cover greater than 10%; or have a canopy cover less than 10% and occur in area of native vegetation in excess of five hectares (DoE, 2014). Due to the small extent of this community within the study area, being less than one hectare, the remnant *Eucalyptus saligna* (Sydney Blue Gum) trees present do not conform to the description of Blue Gum High Forest listed under the EPBC Act.

i. **Area 1**

Blue Gum High Forest within Area 1 is approximately 0.45 ha in size and consists of mature *Eucalyptus saligna* trees (see **Photograph 3.1**); however additional canopy trees are present in small numbers and include *Eucalyptus globoidea* (White Stringybark), *Eucalyptus resinifera* (Red Mahogany) and *Eucalyptus crebra* (Narrow-leaved Ironbark). The understorey of this area has been previously cleared and is highly modified. Native shrub species present consist of *Pittosporum revolutum* (Rough Fruit Pittosporum) and *Callistemon citrinus* (Crimson Bottlebrush), however all individuals appear to be planted due to their uniform height and locations. Common exotic planted shrubs include: *Ligustrum lucidum* (Large-leaved Privet), *Olea europaea* subsp. *cuspidata* (African Olive), *Plumbago auriculata* (Blue Plumbago), and *Cotoneaster* sp..

The ground layer of the area is made up of landscaped gardens, and mulched and paved areas. Weeds and planted species make up the entire ground layer with no naturally occurring native species present. Commonly occurring ground cover species include: *Sida rhombifolia*, *Pennisetum clandestinum* (Kikuyu), *Cyclosporum leptophyllum* (Slender Celery) and *Lomandra longifolia* (Spiny-headed Mat-rush). *Lomandra longifolia* (Spiny-headed Mat-rush) is a native plant species characteristic of Blue Gum High Forest; however all individuals within this area are planted as part of landscaped gardens and do not occur naturally.



Photograph 3.1 Mature *Eucalyptus saligna* trees (Blue Gum High Forest) within Area 1

ii. Area 2

Blue Gum High Forest within Area 2 is approximately 0.01 ha in size and contains mature *Eucalyptus saligna* trees, which were observed from adjacent properties. The midstorey and understorey of this area could not be identified due to a lack of site access.

3.1.2 Urban Exotic/Native Vegetation

TSC Act Status: Not listed

EPBC Act Status: Not listed

Urban exotic/native vegetation is present throughout the study area. This community does not conform to any naturally occurring vegetation community as the majority of the species have been planted as part of a streetscape or garden. Examples of this community within the study area are shown in **Photograph 3.2** and **Photograph 3.3**.

Canopy species within this vegetation community are predominantly planted exotic and non-endemic native species. Non-endemic native species include *Corymbia citriodora* (Lemon-scented Gum), *Eucalyptus microcorys* (Tallowood), *Araucaria heterophylla* (Norfolk Island Pine), *Grevillea robusta* (Silky Oak) and *Ficus microcarpa hillii* (Weeping Fig). Planted exotic tree species include *Liquidambar styraciflua* (American Sweetgum), *Jacaranda mimosifolia* (Jacaranda), *Cupressus sp.* (Cypress), *Cinnamomum camphora* (Camphor Laurel) and *Ulmus parvifolia* (Chinese Elm). *Eucalyptus elata* (River Peppermint) and *Eucalyptus*

haemastoma (Scribbly Gum) are native species that occur in areas of the study area; however they are likely planted and not part of a naturally occurring vegetation community.

The understorey vegetation of this community exists in a mixture of landscaped areas including lawns, mulched areas and garden beds. Areas of lawn are present along walkways and car parks (see **Photograph 3.6**). Common exotic grasses comprising these lawn areas include *Aristida ramosa* (Three-awned Grass), *Axonopus fissifolius* (Narrow-leaved Carpet Grass), *Cynodon dactylon* (Couch Grass), *Paspalum dilatatum* (Paspalum), *Pennisetum clandestinum* (Kikuyu), and *Stenotaphrum secundatum* (Buffalo Grass). Garden beds containing planted ornamental exotic species occur in all areas of the study area with commonly planted exotic shrubs being *Olea europaea* subsp. *cuspidata* (African Olive), *Ligustrum lucidum* (Large-leaved Privet), *Ligustrum sinense* (Small-leaved Privet), *Hibiscus* sp. (Pink Hibiscus), *Cotoneaster glaucophyllus* (Cotoneaster) and *Trachelospermum jasminoides* (Star Jasmine). Planted native ornamentals include *Lomandra longifolia* (Spiny-headed Mat-rush), *Banksia serrata* (Old-man Banksia), *Banksia integrifolia* (Coast Banksia), *Pittosporum revolutum* (Wild Yellow Jasmine), *Callistemon citrinus* (Crimson Bottlebrush) and *Melaleuca quinquenervia* (Broad-leaved Paperbark). Most garden beds contain little to no remnant ground cover species and are dominated by variety of exotic herbs, grasses and vines including: *Pennisetum clandestinum*, *Modiola caroliniana* (Red-flowered Mallow), *Sida rhombifolia* (Paddy's Lucerne), *Oxalis corniculata*, and *Araujia sericifera* (Moth Vine).

Asparagus aethiopicus is classified as a Class 4 noxious weed and *Oxalis corniculata* is classified as a Class 5 noxious weed within the Parramatta City Council control area.



Photograph 3.2 Planted exotic vegetation within mulched garden beds typical in areas mapped as Urban Exotic/Native Vegetation

3.2 Flora

A suite of native and exotic flora species were observed during surveys of the study area. The list of species recorded during the site inspection is provided in **Appendix A**. A number of the native flora species recorded within the project area were assessed as planted vegetation.

No naturally occurring threatened flora species were recorded during surveys or were previously recorded on the study area (based on desktop assessment results). Two individuals of *Eucalyptus nicholii* (Narrow-leaved Black Peppermint) were recorded at 264-268 Pennant Hills Road and an individual *Wollemia nobilis* (Wollemia Pine) at 8 Tintern Avenue (see **Photograph 3.3**). *Eucalyptus nicholii* is listed as Vulnerable under the TSC Act and EPBC Act, and *Wollemia nobilis* is listed as Critically Endangered under the TSC Act and Endangered under the EPBC Act. Neither of these species is considered to be locally indigenous to the locality and therefore their conservation significance is reduced. Furthermore, *Eucalyptus nicholii* is commonly planted as a streetscape tree and *Wollemia nobilis* is often planted as an ornamental tree in gardens in the Sydney region.

No other threatened flora species have been recorded within the study area. An analysis of the likelihood of occurrence within the study area for each threatened flora species recorded within the locality is provided in **Appendix B**. This assessment concluded that none of threatened flora species known from the locality are likely to occur within the study area.



Photograph 3.3 Planted *Wollemia debilis* (circled in red) present within 8 Tintern Avenue

3.3 Fauna

3.3.1 Fauna Habitat

The vegetation of the study area provides some potential habitat for native fauna known to occur in the locality, including threatened species. Microhabitats present within the study area include a total of eight trees containing 11 hollows, one tree containing two nest boxes (see **Photograph 3.4**) and a patch of fig trees that have the potential to contain hollows (see **Photograph 3.5**). The details and location of each microhabitat are detailed in **Table 3.1** and shown on **Figure 3.3**. In addition to the microhabitats, many planted native and exotic flora species are present within the study area that provide potential foraging resources for nectivorous mammals and birds that may use the study area on occasion as part of a larger foraging range.

Table 3.1 Location of habitat features within the study area

Habitat					
ID	Type	Easting	Northing	Species	Description of Habitat
H1	Habitat tree	318681	6259697	Eucalyptus saligna	1 large hollow
H2	Habitat tree	318644	6259701	Eucalyptus saligna	1 small hollow
H3	Habitat tree	318629	6259702	Eucalyptus saligna	2 nest boxes (lorikeet size)
H4	Habitat tree	318600	6259708	Eucalyptus saligna	2 small hollows
H5	Habitat tree	318695	6259764	Eucalyptus saligna	1 medium hollow
H6	Habitat tree	318670	6259767	Eucalyptus saligna	1 large hollow
H7	Habitat tree	318577	6259883	Cinnamomum camphora	1 medium hollow
H8	Habitat tree	318681	6259810	Corymbia citriodora	3 small hollows
H9	Habitat tree	318689	6259742	Eucalyptus saligna	1 medium hollow
H10	Potential Habitat tree	318468	6259798	Ficus microcarpa hillii	Potential tree hollows



Photograph 3.4 *Eucalyptus saligna* with two nest boxes (circled in red)



Photograph 3.5 *Ficus microcarpa hillii* with potential tree hollows

3.3.2 Species

Eleven (11) vertebrate fauna species were recorded within the study area through incidental observations during habitat assessments. All 11 species were common urban adapted bird species (see **Table 3.2**). The common Rainbow Lorikeet (*Trichoglossus haematodus*) was present in high abundances throughout the study area, especially in *Cinnamomum camphora* (Camphor Laurel) and *Erythrina crista-galli* (Cockspur Coral) trees located in the north-west corner and western boundary of the study area, and in all areas of Blue Gum High Forest.

Table 3.2 Incidental observations of fauna species within study area

Common Name	Scientific Name
Common Myna	<i>Acridotheres tristis</i>
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>
Australian Raven	<i>Corvus coronoides</i>
Australian Magpie	<i>Cracticus tibicen</i>
Laughing Kookaburra	<i>Dacelo novaeguineae</i>
Galah	<i>Eolophus roseicapillus</i>
Magpie-lark	<i>Grallina cyanoleuca</i>
Welcome Swallow	<i>Hirundo neoxena</i>
Noisy Miner	<i>Manorina melanocephala</i>
Common Starling	<i>Sturnus vulgaris</i>
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>

No threatened fauna species were recorded within the study area during surveys. Various threatened fauna species would likely utilise the study area periodically for foraging as part of a much larger foraging range. This includes species such as the Powerful Owl (*Ninox strenua*) and Grey-headed Flying-fox (*Pteropus poliocephalus*). Potential roosting habitat is present in the form of hollow-bearing trees, which may be suitable for species such as the Eastern Freetail-bat (*Mormopterus norfolkensis*) and Yellow-bellied Shearwater (*Saccolaimus flaviventris*). An analysis of the likelihood of occurrence within the study area for each threatened fauna species recorded within the locality is provided in **Appendix C**. This assessment concluded that ten threatened vertebrate fauna species and two migratory species have the potential to occur within the study area. **Table 3.3** lists the threatened fauna species considered to have the potential to occur.

Table 3.3 Threatened fauna species with potential to utilise the study area

Common Name	Scientific Name	TSC Act Status	EPBC Act Status
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	V	
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	V	
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	V	
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	V	
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V	
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	V
Little Lorikeet	<i>Glossopsitta pusilla</i>	V	
Powerful Owl	<i>Ninox strenua</i>	V	
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V	
Migratory			
Fork-tailed Swift	<i>Apus pacificus</i>		M
White-throated Needletail	<i>Hirundapus caudacutus</i>		M

TSC Act / EPBC Act Status: V = Vulnerable, M = Migratory



- Legend**
- Study Area
 - Lot Boundaries
- Vegetation Community**
- Blue Gum High Forest (CEEC TSC Act)
- Habitat Items**
- Potential Habitat Tree
 - Habitat tree
- Threatened Flora Records**
- Eucalyptus nicholli*
 - Wollemia nobilis*

Image Source:
Image © 2016 Google
(dated 16-10-2015)



Figure 3.1. Vegetation Communities, Threatened Species and Habitat Features within the Study Area



Ecological Constraints Analysis

4.1 Introduction

The following ecological constraints have been identified within the study area:

- Presence of intact native forest vegetation types that comprise CEEC; and
- Presence of fauna habitat, such as hollow-bearing trees suitable for use by native species, including threatened fauna species.

This ecological constraints analysis has identified three levels of ecological constraint: high, moderate and low. A rationale for why an area has been given its allocated level of constraint is provided below and **Figure 4.1** indicates where they occur within the study area.

- **'High' Constraint** - Areas containing vegetation conforming to the definition of Blue Gum High Forest under the TSC Act. Impacting these areas has the greatest potential to significantly impact the biodiversity of the study area and locality.
- **'Moderate' Constraint** - Areas containing microhabitats suitable for native fauna, including threatened species. Impacting these areas has the potential to negatively impact on the biodiversity values of the study area; however such impacts are unlikely to be significant if mitigation measures are implemented during clearing activities.
- **'Low' Constraint** - Areas that do not conform to a threatened ecological community and do not provide preferred habitat for threatened fauna known to occur in the locality. Impacting these areas is unlikely to significantly impact the biodiversity values of the study area.

The following sections discuss the potential impacts of future development on each level of constraint and describe what may be required at the development application (DA) stage. **Table 4.1** provides a summary of what may be required at the DA stage for properties within the study area.

Table 4.1 Summary of Ecological Requirements at the DA Stage

Level of Constraint to be Impacted	Ecological Assessment Likely to be Required	Offsetting Likely to be Required	Offsetting Type Likely to be Required
High	FFA or SIS, depending on quantum of impact	Yes	replanting on-site and/or purchasing of BGHF off-site
Moderate	FFA	Yes	replanting on-site and/or installation of nest boxes
Low	FFA or none	No	None

4.2 Potential Impacts on ‘High’ Constraint Areas

Assuming that future development is maximised in the study area, approximately 0.46 ha of TSC Act listed Blue Gum High Forest CEEC could be cleared.

Blue Gum High Forest is a CEEC that is considered to be of high conservation significance and is identified as being at extremely high risk of extinction in the immediate future. The Blue Gum High Forest within the study area exists as scattered canopy trees with a highly modified understorey and has moderate conservation significance. Nonetheless, the community is critically endangered, and is at great risk from development in general. Presently though, the remnant trees within the study area do not greatly contribute to the long-term survival of the community in the locality. Assuming the Planning Proposals would facilitate the removal of all Blue Gum High Forest within the study area, the result would have a significant impact on the community within the study area, but not necessarily in the locality as the community is conserved in nearby parks and reserves. Larger, more intact patches of this community are conserved within Herbert Rumsey Reserve, Calangara Park and Allan Cunningham Reserve to the east of the study area.

Appendix D contains a precautionary Assessment of Significance for Blue Gum High Forest in accordance with Section 5A of the EP&A Act. The Assessment of Significance determined that the potential removal of all or large patches of TSC listed Blue Gum High Forest within the study area could be considered as significant given that the community is listed as critically endangered and is considered to be an over-cleared vegetation community. Therefore, any future DA within the study area that impacts on areas of Blue Gum High Forest (see areas of ‘High’ constraint in **Figure 4.1**) would require a Flora and Fauna Assessment (FFA), and may require a Species Impact Statement (SIS) depending on the proposed impacts to the community. An SIS is more substantial assessment than a FFA that requires both approval from Council and OEH. Additionally, any impacts on Blue Gum High Forest will likely require offsetting measures in the form of plantings on-site or purchasing off-site areas of Blue Gum High Forest. Furthermore, ‘High’ constraint areas to be removed containing habitat items (e.g. nest box, hollows) will likely need to be offset by the installation of nest boxes.

4.3 Potential Impacts on 'Moderate' Constraint Areas

Assuming that future development is maximised in the study area, approximately 0.22 ha of 'Moderate' constraint vegetation that provides suitable habitat for native fauna, including threatened species, could potentially be cleared.

The habitat to be potentially removed is unlikely to be important to the long-term survival of any of the threatened species considered to have potential to occur within the study area; therefore the potential removal of all 'Moderate' constraint areas would unlikely have a significant impact on any threatened species long-term survival in the locality.

Nevertheless, all areas of 'Moderate' constraint that are removed in the future as part of a DA would likely require a FFA. Additionally, any habitat features removed would likely need to be offset by either plantings or the installation of nest boxes within retained trees, or a combination of the two.

4.4 Potential Impacts on 'Low' Constraint Areas

Assuming that future development is maximised in the study area, approximately 6.47 ha of 'Low' constraint vegetation and existing structures could potentially be cleared. The vegetation present is suitable foraging habitat for native fauna, including threatened species. Although all 'Low' constraint areas could be removed as a result of future development, this scenario is unlikely in the short-term as not all residents are likely to re-develop their property. Land containing only areas of 'Low' constraint may not require a FFA at the development stage and are unlikely to require offsetting.



Legend

- Study Area
- Lot Boundaries

Constraints

- High
- Moderate
- Low

Image Source:
Image © 2016 Google
(dated 16-10-2015)



Figure 4.1. Areas of Constraint within the Study Area



Conclusion

All future development within areas identified as either 'High' or 'Moderate' constraint in the study area (see **Figure 4.1**) would likely require a FFA at a minimum at the DA stage, and offsetting measures due to potential impacts on the TSC Act listed CEEC Blue Gum High Forest and fauna habitat.

Areas of 'High' constraint are present within patches of Blue Gum High Forest located at 264-268 Pennant Hills Road, and 10 Tintern Avenue and 8 Azile Court. The presence of Blue Gum High Forest at these two locations constrains future development in that all areas of Blue Gum High Forest cleared will likely require offsetting by either replanting vegetation on-site post construction, or purchasing areas of Blue Gum High Forest off-site. The purchasing of such land can be difficult due to the limited area of Blue Gum High Forest remaining. Also, planting may not be considered as an adequate offset dependant on the area of Blue Gum High Forest to be cleared and replanted. Additionally, depending on the proposed impact to Blue Gum High Forest, a more substantial assessment may be required in the form of an SIS.

Areas of 'Moderate' constraint are present within 264-268 Pennant Hills Road and lots to the north, west and south of 20 Azile Court. These areas consist of mature vegetation containing tree hollows, or large trees potentially containing hollows. The constraints placed on land identified as 'Moderate' would likely require offsetting in the form of replanting and/or the installation of nest boxes to ensure suitable habitat features (i.e. hollows) remain within the area. Both of these options are less costly than offsetting 'High' constraint areas.

Areas of 'Low' constraint are present throughout the study area and offer little constraint to future development. Properties containing only 'Low' constraint areas are unlikely to require a Flora and Fauna Assessment at the DA stage and no offsetting will likely be required. Restricting future development to 'Low' constraint areas would have the least impact on the biodiversity values of the study area.

To minimise impacts on the biodiversity values of the study area as a result of future development, it is recommended that all areas of 'High' and 'Moderate' constraint be avoided where possible. Avoiding all areas of 'High' and 'Moderate' constraint will result reduced impacts on biodiversity, and costs, as a SIS and offsetting would unlikely be required. The removal of such areas may be possible; however it will likely warrant additional costs in the form of ecological assessments, such as a SIS, and offsetting measures, depending on what areas are to be impacted and the quantum of impact.

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Appendix A

Flora Species List

Table A.1 Flora species recorded within the study area

Form	Family	Status	Scientific Name	Common Name
Tree	Altingiaceae	exotic	<i>Liquidambar styraciflua</i>	American Sweetgum, Sweetgum
Tree	Apocynaceae	exotic	<i>Plumeria sp.</i>	Frangipani
Tree	Araliaceae	exotic	<i>Schefflera actinophylla</i>	Umbrella Tree
Tree	Araucariaceae	native, not local to area	<i>Araucaria heterophylla</i>	Norfolk Island Pine
Tree	Arecaceae	exotic	<i>Archontophoenix cunninghamiana</i>	Bangalow Palm
Tree	Arecaceae	exotic	<i>Syagrus romanzoffiana</i>	Cocos Palm, Queen Palm
Tree	Bignoniaceae	exotic	<i>Jacaranda mimosifolia</i>	Jacaranda
Tree	Cupressaceae	exotic	<i>Cupressus sp.</i>	Cypress
Tree	Cupressaceae	exotic	<i>Cupressocyparis leylandii</i>	Leightons Green
Tree	Euphorbiaceae	exotic	<i>Triadica sebifera</i>	Chinese Tallow Tree
Tree	Fabaceae-Caesalpinioideae	exotic	<i>Bauhinia sp.</i>	-
Tree	Fabaceae-Caesalpinioideae	exotic	<i>Gleditsia triacanthos</i>	Honey Locust
Tree	Fabaceae-Faboideae	exotic	<i>Erythrina crista-galli</i>	Cockspur Coral Tree
Tree	Fagaceae	exotic	<i>Quercus robur</i>	English Oak, German Oak
Tree	Lauraceae	exotic	<i>Cinnamomum camphora</i>	Camphor Laurel
Tree	Moraceae	exotic	<i>Ficus microcarpa hillii</i>	Weeping Fig
Tree	Myrtaceae	native, not local to area	<i>Corymbia citriodora</i>	Lemon-scented Gum
Tree	Myrtaceae	native	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark
Tree	Myrtaceae	native	<i>Eucalyptus elata</i>	River Peppermint
Tree	Myrtaceae	native	<i>Eucalyptus haemastoma</i>	Scribbly Gum
Tree	Myrtaceae	native	<i>Eucalyptus microcorys</i>	Tallowwood
Tree	Myrtaceae	native, not local to area	<i>Eucalyptus nicholii*</i>	Narrow-leaved Black Peppermint
Tree	Myrtaceae	native	<i>Eucalyptus resinifera</i>	Red Mahogany
Tree	Myrtaceae	native	<i>Eucalyptus saligna**</i>	Sydney Blue Gum
Tree	Pinaceae	exotic	<i>Cedrus deodara</i>	Himalayan Cedar
Tree	Pinaceae	exotic	<i>Pinus radiata</i>	Monterey Pine, Radiata Pine
Tree	Proteaceae	native, not	<i>Grevillea robusta</i>	Silky Oak

Table A.1 Flora species recorded within the study area

Form	Family	Status	Scientific Name	Common Name
		local to area		
Tree	Salicaceae	exotic	<i>Populus sp.</i>	Poplar
Tree	Ulmaceae	exotic	<i>Ulmus ?parvifolia</i>	Chinese Elm
Shrub	Apocynaceae	exotic	<i>Nerium oleander</i>	Oleander
Shrub	Apocynaceae	exotic	<i>Trachelospermum jasminoides</i>	Star Jasmine
Shrub	Araucariaceae	native, not local to area	<i>Wollemia nobilis*</i>	Wollemi Pine
Shrub	Asteliaceae	exotic	<i>Cordyline sp. (red cultivar)</i>	Cabbage Tree, Cabbage-palm
Shrub	Asteraceae	exotic	<i>Euryops chrysanthemoides</i>	Bush Daisy
Shrub	Fabaceae- Faboideae	exotic	<i>Genista sp.</i>	
Shrub	Hydrangeaceae	exotic	<i>Hydrangea sp. (cultivar)</i>	Hydrangea
Shrub	Malaceae	exotic	<i>Cotoneaster ?glaucophyllus</i>	Cotoneaster
Shrub	Malaceae	exotic	<i>Raphiolepis indica</i>	Indian Hawthorn
Shrub	Malvaceae	exotic	<i>Hibiscus sp.</i>	Pink Hibiscus
Shrub	Melastomataceae	exotic	<i>Tibouchina sp. (cultivar)</i>	Glory Bush
Shrub	Myrtaceae	native	<i>Callistemon citrinus</i>	Crimson Bottlebrush
Shrub	Myrtaceae	native	<i>Kunzea ambigua</i>	Tick Bush
Shrub	Myrtaceae	native	<i>Leptospermum polygalifolium</i>	Tantoon
Shrub	Myrtaceae	native	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark
Shrub	Nandinaceae	exotic	<i>Nandina domestica</i>	Heavenly Bamboo, Nandina
Shrub	Oleaceae	exotic	<i>Ligustrum lucidum***</i>	Large-leaved Privet
Shrub	Oleaceae	exotic	<i>Ligustrum sinense***</i>	Small-leaved Privet
Shrub	Oleaceae	exotic	<i>Olea europaea ssp. Cuspidata</i>	African Olive
Shrub	Pittosporum	native	<i>Pittosporum revolutum**</i>	Wild Yellow Jasmine
Shrub	Pittosporum	native	<i>Pittosporum undulatum**</i>	Native Daphne
Shrub	Plumbaginaceae	exotic	<i>Plumbago auriculata</i>	Blue Plumbago
Shrub	Portulacaceae	exotic	<i>Portulacaria afra</i>	Money Bush, Elephant Bush
Shrub	Proteaceae	native	<i>Banksia ?serrata</i>	Old-man Banksia
Shrub	Proteaceae	native	<i>Banksia integrifolia</i>	Coast Banksia
Shrub	Theaceae	exotic	<i>Camellia japonica</i>	Japanese Camellia
Other	Alliaceae	exotic	<i>Agapanthus sp.</i>	African Lily

Table A.1 Flora species recorded within the study area

Form	Family	Status	Scientific Name	Common Name
Other	Apiaceae	native	<i>Centella asiatica</i>	Indian Pennywort
Other	Apiaceae	exotic	<i>Cyclospermum leptophyllum</i>	Slender Celery
Other	Apocynaceae	exotic	<i>Araujia sericifera</i>	Moth Vine
Other	Araceae	exotic	<i>Colocasia ?esculenta</i>	Gabi, Elephant Ears
Other	Araceae	exotic	<i>Monstera deliciosa</i>	Fruit Salad Plant
Other	Araliaceae	exotic	<i>Hedera helix</i>	English Ivy
Other	Asparagaceae	exotic	<i>Asparagus aethiopicus</i> ***	Springer Fern
Other	Asteraceae	exotic	<i>Bidens pilosa</i>	Cobbler's Pegs
Other	Asteraceae	exotic	<i>Gazania sp.</i>	Gazania
Other	Asteraceae	exotic	<i>Gnaphalium sp.</i>	Cudweed
Other	Asteraceae	exotic	<i>Hypochaeris radicata</i>	Catsear, Flatweed
Other	Asteraceae	exotic	<i>Soliva sessilis</i>	Bindyi
Other	Asteraceae	exotic	<i>Sonchus asper</i>	Prickly Sowthistle
Other	Asteraceae	exotic	<i>Taraxacum officinale</i>	Dandelion
Other	Bromeliaceae	exotic	<i>Bromelia sp.</i>	Bromelia
Other	Caryophyllaceae	exotic	<i>Paronychia sp.</i>	Whitlow Wort
Other	Commelinaceae	exotic	<i>Tradescantia fluminensis</i>	Wandering Jew
Other	Convolvulaceae	native	<i>Dichondra repens</i>	Kidney Weed
Other	Convolvulaceae	exotic	<i>Ipomoea spp.</i>	Morning Glory
Other	Cyatheaceae	native, not local to area	<i>Cyathea? sp.</i>	Tree Fern
Other	Cyperaceae	native	<i>Carex inversa</i>	-
Other	Cyperaceae	native	<i>Cyperus gracilis</i>	Slender Flat-sedge
Other	Doryanthaceae	native, not local to area	<i>Doryanthes excelsa</i>	Gynea Lily
Other	Euphorbiaceae	exotic	<i>Euphorbia peplus</i>	Petty Spurge
Other	Fabaceae-Faboideae	native	<i>Glycine tabacina</i>	-
Other	Geraniaceae	exotic	<i>Pelargonium sp.</i>	Geranium
Other	Iridaceae	exotic	<i>Dietes sp.</i>	Iris
Other	Lomandraceae	native	<i>Lomandra longifolia</i> **	Spiny-headed Mat-rush
Other	Lomandraceae	native	<i>Lomandra sp.</i>	Mat-rush
Other	Lomariopsidaceae	exotic	<i>Nephrolepis cordifolia</i>	Fishbone Fern, Herringbone Fern

Table A.1 Flora species recorded within the study area

Form	Family	Status	Scientific Name	Common Name
Other	Malvaceae	exotic	<i>Modiola caroliniana</i>	Red-flowered Mallow
Other	Malvaceae	exotic	<i>Sida rhombifolia</i>	Paddy's Lucerne
Other	Oleaceae	exotic	<i>Jasminum polyanthum</i>	White Jasmine
Other	Oxalidaceae	exotic	<i>Oxalis corniculata</i> ***	-
Other	Oxalidaceae	exotic	<i>Oxalis pes-caprae</i>	-
Other	Plantaginaceae	exotic	<i>Plantago lanceolata</i>	Lamb's Tongue
Other	Plantaginaceae	native	<i>Veronica plebeia</i>	Trailing Speedwell
Other	Poaceae	native	<i>Aristida ramosa</i>	Three-awned grass
Other	Poaceae	exotic	<i>Axonopus fissifolius</i>	Narrow-leaved Carpet Grass

Key:

*Threatened species

**Characteristic Blue Gum High Forest Species (NSW Scientific Committee, 2011)

***Noxious Weed

Appendix B

Threatened Flora Likelihood of Occurrence

Table B.1 Threatened flora likelihood of occurrence

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Count	Habitat Requirements	Likelihood of Occurrence
<i>Acacia pubescens</i>	Downy Wattle	V	V	5	Occurs on alluviums, shales and at the intergrade between shales and sandstones. Occur in open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.	Unlikely to occur. Limited suitable habitat present.
<i>Epacris purpurascens</i> <i>var. purpurascens</i>		V		56	Found in a range of habitat types, in sclerophyll forest, scrubs and swamps on sandstone, on strong shale soil influence.	Unlikely to occur. No suitable habitat present.
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	V	V	1	Grows in dry grassy woodland on shallow and infertile soils, mainly on granite.	Present
<i>Hibbertia superans</i>		E		43	Occurs in both open woodland and heathland on sandstone ridgetops, and appears to prefer open disturbed areas, such as track sides.	Unlikely to occur. No suitable habitat present.
<i>Leptospermum deanei</i>		V	V	3	Woodland on lower hill slopes or near creeks. Sandy alluvial soil or sand over sandstone	Unlikely to occur. No suitable habitat present.
<i>Pimelea curviflora</i> <i>var. curviflora</i>		V	V	6	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands	Unlikely to occur. No suitable habitat present.
<i>Pomaderris prunifolia</i>	P. prunifolia in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas	E		3	Only known locations are at Rydalmer, within Rookwood Cemetery and at The Crest of Bankstown.	Unlikely to occur. Not within a known location.
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	V	1	On south coast of NSW occurs on grey soils over sandstone,	Unlikely to occur. No suitable

Table B.1 Threatened flora likelihood of occurrence

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Count	Habitat Requirements	Likelihood of Occurrence
					restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	habitat present.
<i>Tetratheca glandulosa</i>		V		1	Found in various communities from heaths and scrub to woodlands/open woodlands, and open forest. Common woodland tree species include: <i>Corymbia gummifera</i> , <i>C. eximia</i> , <i>Eucalyptus haemastoma</i> , <i>E. punctata</i> , <i>E. racemosa</i> , and/or <i>E. sparsifolia</i> . Soils are generally shallow, consisting of a yellow, clayey/sandy loam.	Unlikely to occur. No suitable habitat present and associated canopy species absent.
<i>Wilsonia backhousei</i>	Narrow-leafed <i>Wilsonia</i>	V		43	Found in the margins of salt marshes and lakes.	Unlikely to occur. No suitable habitat present.

TSC Act / EPBC Act Status: V = Vulnerable, E = Endangered

Appendix C

Threatened Fauna Likelihood of Occurrence

Table C.1 Threatened fauna likelihood of occurrence

Class	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Count	Habitat Requirements	Likelihood of Occurrence
Amphibia	<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	62	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.).	Unlikely to occur. No suitable habitat present.
Amphibia	<i>Pseudophryne australis</i>	Red-crowned Toadlet	V		1	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters.	Unlikely to occur. No suitable habitat present.
Aves	<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	1	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha</i> spp.) and spikerushes (<i>Eleocharis</i> spp.).	Unlikely to occur. No suitable habitat present.
Aves	<i>Calidris ferruginea</i>	Curlew Sandpiper	E	C	14	Occurs in littoral and estuarine habitats, primarily in mudflats of sheltered coasts.	Unlikely to occur. No suitable habitat present.
Aves	<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		7	Occurs in tall mountain forests and woodlands in summer and drier more open eucalypt forests and woodlands in winter, and often found in urban areas. Require old growth attributes for nesting and roosting.	Potential to occur. Old growth attributes for nesting and roosting are present, but limited suitable foraging habitat is present.
Aves	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V		1	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-	Unlikely to occur. Limited suitable foraging habitat

Table C.1 Threatened fauna likelihood of occurrence

Class	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Count	Habitat Requirements	Likelihood of Occurrence
						oak species, particularly Black She-oak (<i>Allocasuarina littoralis</i>), Forest She-oak (<i>A. torulosa</i>) or Drooping She-oak (<i>A. verticillata</i>) occur. Feeds almost exclusively on the seeds of several species of she-oak (<i>Casuarina</i> and <i>Allocasuarina</i> species). Dependent on large hollow-bearing eucalypts for nest sites.	present. No breeding habitat.
Aves	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		1	Eucalypt forest and woodlands, especially with rough barked species, smooth-barks with dead branches, mallee and acacia. Nests in living trees and feeds off insects in dead trees.	Unlikely to occur. No suitable habitat present.
Aves	<i>Epthianura albifrons</i>	White-fronted Chat	V		172	Found on grassy ground in wetland areas and in low isolated mangroves.	Unlikely to occur. No suitable habitat present.
Aves	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		3	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	Potential to occur. Eucalypt hollows are present and the species is highly mobile and may pass over the study area as part of a larger foraging range.
Aves	<i>Glossopsitta pusilla</i>	Little Lorikeet	V		5	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Also utilises isolated flowering trees in open	Potential to occur. Suitable foraging trees present and the species is highly mobile and may pass over the study area as part of a larger foraging

Table C.1 Threatened fauna likelihood of occurrence

Class	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Count	Habitat Requirements	Likelihood of Occurrence
						country, e.g. paddocks, roadside remnants and urban trees. Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts.	range.
Aves	<i>Lathamus discolor</i>	Swift Parrot	E	E	8	Occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.	Unlikely to occur. Limited suitable foraging habitat present.
Aves	<i>Limosa limosa</i>	Black-tailed Godwit	V	C	1	A coastal species primarily found in estuaries and lagoons of sheltered bays. Inland in can be found around muddy lakes and swamps.	Unlikely to occur. No suitable habitat present.
Aves	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		17	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Potential to occur. Culvert is present and the species is highly mobile and may pass over the study area as part of a larger foraging range.
Aves	<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V		3	Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	Potential to occur. Tree hollows are present and the species is highly mobile and may pass over the study area as part of a larger foraging range.
Aves	<i>Ninox connivens</i>	Barking Owl	V		3	Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Denser vegetation is used occasionally for roosting. During	Unlikely to occur. No suitable habitat present.

Table C.1 Threatened fauna likelihood of occurrence

Class	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Count	Habitat Requirements	Likelihood of Occurrence
						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. Nests in hollows of large, old eucalypts.	
Aves	<i>Ninox strenua</i>	Powerful Owl	V		93	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Also occurs in fragmented habitats.	Potential to occur. Known to utilise fragmented landscapes, may utilise the study area as part of a larger foraging area.
Aves	<i>Petroica phoenicea</i>	Flame Robin	V		1	Occurs in upland tall moist eucalypt forests and woodlands, often on ridges and slopes for breeding. Prefers clearings or areas with open understoreys.	Unlikely to occur. No suitable habitat present.
Aves	<i>Ptilinopus superbis</i>	Superb Fruit-Dove	V		2	Found in rainforest and closed forests, and feeds on the fruit of figs and palms.	Unlikely to occur. No suitable habitat present.
Mammalia	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	1	Recorded 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. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares; usually traverse their ranges along densely vegetated creeklines.	Unlikely to occur. Marginal suitable habitat present but not a common occurrence within the locality.
Mammalia	<i>Myotis macropus</i>	Southern Myotis	V		3	Roosts close to water in caves, mines, tree hollows, storm water channels, bridges, buildings or in dense foliage.	Unlikely to occur. Marginal suitable habitat present but

Table C.1 Threatened fauna likelihood of occurrence

Class	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Count	Habitat Requirements	Likelihood of Occurrence
						Forages over streams and pools catching insects and fish.	study area is located too far from water bodies...
Mammalia	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	55	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Potential to occur. Suitable foraging habitat present. No known roost camp present on study area.
Mammalia	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		3	Found in a large variety of habitats including treed and treeless areas. Inhabits tree hollows or mammal burrows in treeless areas.	Potential to occur. Hollows are present and the species is highly mobile and may pass over the study area as part of a larger foraging range.
Mammalia	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		3	More commonly found in tall wet forest but also occurs in dry eucalypt forest. Roosts in tree hollows and buildings. Forages along creek and river corridors.	Potential to occur. Tree hollows are present and the species is highly mobile and may pass over the study area as part of a larger foraging range.
Migratory Terrestrial							
Aves	<i>Monarcha melanopsis</i>	Black-faced Monarch		M		Wetter, denser forest, often at high elevations.	Unlikely to occur. No suitable habitat present.
Aves	<i>Apus pacificus</i>	Fork-tailed Swift		M		Forages aerially over a variety of habitats usually over coastal and mountain areas with a preference for wooded areas.	Potential to occur. Highly mobile, aerial species that may

Table C.1 Threatened fauna likelihood of occurrence

Class	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Count	Habitat Requirements	Likelihood of Occurrence
							pass over the study area but unlikely to utilise it directly.
Aves	<i>Rhipidura rufifrons</i>	Rufous Fantail		M		Occurs in open country, chiefly at suitable breeding places in areas of sandy or loamy soil: sand-ridges, riverbanks, sand-pits, occasionally coastal cliffs.	Unlikely to occur. No suitable habitat present.
Aves	<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M		Found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation.	Unlikely to occur. No suitable habitat present.
Aves	<i>Monarcha trivirgatus</i>	Spectacled Monarch		M		Prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	Unlikely to occur. No suitable habitat present.
Aves	<i>Hirundapus caudacutus</i>	White-throated Needletail		M		Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Occur over most types of habitat, particularly above wooded areas including open forest and rainforest, between trees or in clearings and below the canopy.	Potential to occur. Highly mobile, aerial species that may pass over the study area but unlikely to utilise it directly.

TSC Act / EPBC Act Status: E = Endangered, V = Vulnerable, M = Migratory

Appendix D

Assessments of Significance

D.1 Blue Gum High Forest

Blue Gum High Forest is a tall eucalypt forest community that typically occurs on areas with shale ridge soils of the Hornsby plateau. Dominant canopy trees are *Eucalyptus saligna* (Sydney Blue Gum), *E. pilularis* (Blackbutt), *E. paniculata* (Grey Ironbark), *Syncarpia glomulifera* (Turpentine) and *Angophora costata* (Smooth-barked Apple). Common understorey shrubs include *Pittosporum undulatum* (Native Daphne), *Polyscias sambucifolia* (Elderberry Panax), *Breynia oblongifolia* (Coffee Bush), and *Leucopogon juniperinus* (Prickly Beard-heath). Groundcover species include *Microlaena stipoides* var. *stipoides* (Weeping Grass), *Dianella caerulea* (Blue Flax-lily), *Pratia purpurascens* (White Root), *Entolasia marginata* (Bordered Panic) and *Entolasia stricta* (Wiry Panic).

Blue Gum High Forest exists within the study area as scattered patches of remnant *E. saligna* trees which conform to the TSC Act listing for Blue Gum High Forest. However, these scattered trees consisting of 0.46 ha does not conform to the EPBC Act listing for the critically endangered ecological community.

- (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.

- (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

The community is found as a mosaic amongst lawns and planted garden beds. Canopy trees characteristic of Blue Gum High Forest are located at 264-268 Pennant Hills Road and 7 Curtis Court. Characteristic understorey species are largely absent in all areas. Assuming that a proposed future development would remove all Blue Gum High Forest present within the study area, a total of 0.46 ha of the community would be removed. The clearance of all Blue Gum High Forest associated with future development would have an adverse effect on the ecological community's extent within the study area. Larger, more intact patches of this

community are conserved within Herbert Rumsey Reserve, Calangara Park and Allan Cunningham Reserve to the east of the study area.

The community within the study area is dominated by exotic species and it is probable that the soil seed bank for locally indigenous species is largely depleted according to the variable soil disturbance and time since native seed was deposited in the soil seed bank in different parts of the study area. Nevertheless, if it is assumed that proposed future development would remove all Blue Gum High Forest within the study area, a substantial modification to the community would occur and its local occurrence would be placed 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

(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

(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.

Assuming that future proposed development would remove all (0.46ha) Blue Gum High Forest within the study area.

The Blue Gum High Forest present within the study area exists as fragmented patches of vegetation with little to no connectivity to off-site Blue Gum High Forest habitat. Future development removing all Blue Gum High Forest within the study area is unlikely to cause significant fragmentation or isolation from other occurrences in the locality.

The Blue Gum High Forest occurring within the study area is highly modified and largely comprises remnant trees over garden beds and lawn. Despite the condition of the understorey, the Blue Gum High Forest within the study area could be considered important due to the highly restricted nature of the community and highly modified forms being included within the TSC Act definition of the community. However, other areas of Blue Gum High Forest are under conservation in nearby parks and reserves.

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

There is no critical habitat for Blue Gum High Forest currently listed by the Director-General of the OEH.

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

The recovery of this ecological community is being addressed as part of the Cumberland Plain Endangered Ecological Communities Recovery Plan. Conservation mechanisms proposed in the Recovery Plan that are relevant to the study area include:

- Development control processes;
- Plans of management; and
- Voluntary conservation agreements.

Future development within the study area would be undertaken in accordance with the Development Control Plan prepared for the Parramatta LGA. A Vegetation Management Plan could be developed as a mitigation measure for any future development. The Blue Gum High Forest within the study area is not currently proposed to be conserved within an appropriate zoning.

- (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.*

Assuming that any proposed future development would remove all BGHF within the study area, this hypothetical action would constitute the key threatening processes of 'Clearing of native vegetation'.

Conclusion

The Blue Gum High Forest within the study area exists as scattered patches of canopy trees over mulched ground, paved areas and planted garden beds, and has moderate conservation significance. Despite the condition of the understorey, the Blue Gum High Forest within the study area could be considered important due to the highly restricted nature of the community and highly modified forms being included within the TSC Act definition of the community. This community is at great risk from development in general. Assuming proposed future development would remove all Blue Gum High Forest, the result would have a significant impact on the community within the study area.

D.2 Potentially Occurring Threatened Fauna Species

This Assessment of Significance covers the following threatened fauna species, which are considered to have potential to occur within the study area:

- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Little Lorikeet (*Glossopsitta pusilla*);
- Powerful Owl (*Ninox strenua*);

- Grey-headed Flying-fox (*Pteropus poliocephalus*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*);
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*);
- Fork-tailed Swift (*Apus pacificus*); and
- White-throated Needletail (*Hirundapus caudacutus*).

- (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 study area represents a small area of habitat available to these potentially occurring fauna species in the locality. These species are highly mobile and potentially utilise the study area as a much wider range. Assuming the proposed zoning will facilitate the development of the entire area to be rezoned as R4, there would not be an adverse effect on the life cycle of the species such that a viable local population of the species would be placed at risk of extinction. Areas of suitable habitat are conserved in the wider locality within nearby parks and reserves.

- (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

(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

(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.

Assuming the proposed zoning will facilitate the development of the entire area to be rezoned as R4, approximately 7.15 ha of land could be cleared, including 0.46 ha of Blue Gum High Forest and 6.5 ha of planted vegetation and existing structures.

The proposed project is not likely to fragment or isolate any areas of habitat for these species. The study area exists within a developed urban environment and is already isolated from other areas of habitat. The potentially occurring species are highly mobile and are expected to utilise other areas of habitat within the locality. Additionally, areas of suitable habitat are conserved in the wider locality within the nearby reserves and parks.

The habitat that will potentially be removed as a result of future development within the R4 zoned land is not considered to be important for these species. Larger areas of suitable habitat will remain in the locality within reserves and parks. The removal of vegetation within the study area is not likely to have an adverse effect on the long-term 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).*

No critical habitat for these species has currently been identified by the Director-General of OEH.

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

A national recovery plan has been prepared for large forest owls. Its relevant objectives are:

- Ensure the impacts on large forest owls and their habitats are adequately assessed during planning and environmental assessment processes; and
- Minimise further loss and fragmentation of habitat by protection and more informed management of significant owl habitat (including protection of individual nest sites).

Future development of the study area would not involve the removal of significant owl habitat. The actions area considered to be consistent with the recovery plan objectives for this species in that it will not decrease or fragment the extent of any significant habitat.

- (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 following KTPs are relevant to the proposed project:

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

The KTPs of 'Clearing of native vegetation' and 'Loss of hollow-bearing trees' may potentially impact habitat for these species further than current conditions. However, the vegetation on the study area is not considered to constitute significant habitat for these species. Potential habitat will remain in the locality and the clearing of native vegetation is not likely to significantly impact habitat for potentially occurring threatened species.

Conclusion

Assuming the proposed zoning will facilitate the development of the entire area to be rezoned as R4, there will be a loss of 0.46 ha of Blue Gum High Forest and 6.5 ha of planted vegetation and existing structures providing potential habitat for these species. There is currently no DA lodged for the study area and the assumed quantum of impact represents a maximum value. Future development applications are not likely to involve the clearance of the entire study area. Areas of suitable habitat are conserved in the wider locality within the nearby reserves and parks.

Future development of the study area is not likely to have a significant detrimental impact upon any of the potentially occurring threatened fauna species.