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**FLORA & FAUNA REPORT  
REVISED**

## Flora and Fauna Report

### Heathcote Hall Residential Development

Prepared for  
**Fuzortinn Pty Ltd**

8 March 2018



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## Abbreviations

Abbreviation	Description
DoE	Former Commonwealth Department of the Environment, now Department of Environment & Energy
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environmental Protection and Biodiversity Conservation Act 1999</i>
FM Act	NSW <i>Fisheries Management Act 1994</i>
LGA	Local Government Area
NW Act	NSW <i>Noxious Weeds Act 1993</i>
OEH	NSW Office of Environment and Heritage
STIF	Sydney Turpentine Ironbark Forest
SSC	Sutherland Shire Council
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>
WM Act	NSW <i>Water Management Act 2000</i>

# Limitations statement 1

The following table identifies matters raised by Sutherland Shire Council in relation to a previous version of the report (dated 27 April 2017). Other aspects of the report remain essentially unchanged from the previous version.

Ref	Matter raised by Council regarding the v1 report	Where matter is addressed in this report v2
i.	The 'study area' must be limited to the boundaries of the subject site and must not include any Council owned land, such as the nature strip.	<p>Maps in this report have been updated to show the study area boundary does not include the surrounding nature strips</p> <p>Section 1.1 provides an updated description of the study area</p> <p>Table 4 distinguishes the areas of impact within the study area vs the nature strip</p>
ii.	Further detail and justification for the vegetation "condition" as determined by the ecologist i.e. moderate, poor and urban native & exotic vegetation, must be provided.	Section 3.2 defines vegetation condition classifications applied during field survey
iii.	<p>In accordance with the requirements of Chapter 38 "Natural Resource Management" of SSDCP 2015, trees that contain hollows or nesting habitat for fauna are deemed to be of significance and must be retained.</p> <p>Tree hollows are considered to be critical habitat for native fauna and are important for the breeding of numerous native species. Specific information regarding the condition and location of hollow-bearing trees must also be documented in the Flora and Fauna report.</p> <p>Further to this, specific details of the recommended habitat boxes e.g. number and location must also be provided for Council's further assessment. Nest boxes must be provided wholly within the subject site.</p>	<p>The number and location of hollow bearing trees, and proposed nest box installation sites, are mapped in Figure 8</p> <p>A hollow replacement plan is provided in Appendix F</p>
iv.	Specific details of the recommended habitat boxes e.g. type, number and location must also be provided.	Refer to comments above

## Limitations statement 2

The following table identifies matters raised by Sutherland Shire Council email dated 1 March 2017 in relation version 2 of this Flora and Fauna Assessment Report (dated 7 December 2017). The report below remains essentially unchanged from the previous version 2 apart from the issues discussed below.

Issue #	Matter raised by Council regarding the v2 report	Where matter is addressed in this report v3
1	Based on a review of this report, it is considered that the proposal fails the test of significance in accordance with <i>Section 5A of the EP&amp;A Act 1979</i>	This issue is discussed below in issue 3. The Section 5A test is not a pass or fail, but lists factors to consider in determining whether a significant impact is likely to result. ELA have concluded a non-significant impact based on the <i>Threatened Species Assessment Guidelines – the assessment of significance (DECC 2007)</i> . Further explanation is given below.
2	Council requested an amended report that addressed the reliance on retention of trees and STIF beyond the site. The amendment between the April 2017 report and the December 2017 report is a paragraph explaining why STIF and trees external to the site were included and a table that shows on site removal vs external removal. This totally fails to address Council's concerns.	Table 4 in this report demonstrates that within the nature strip, 0.04 ha of STIF would be impacted (total loss) and a further 0.10 ha of STIF would be impacted by a partial loss. We included impacts within the nature strip to account for impacts to STIF from proposed footpaths and driveways that are shown on the development plans, even though they are outside of the study area. The total impact of the development should be considered regardless of land tenure.
3	The conclusion of acceptability of the impact of the proposal relies on the retention of 0.51 ha of STIF. The majority of this is not on the subject site, but on the adjoining Council road reserve, and is therefore cannot be relied on. Reliance on this is similar to including adjoining neighbours land within the "study area" and concluding impacts are acceptable because trees and STIF are retained on neighbour's properties. While an assessment of all vegetation removed, including that external to the site is essential, the applicant cannot rely on retention of vegetation that is outside the development site to balance loss on site and conclude impacts are acceptable.	<p>We have included an additional table in this report (<b>Table 5</b>) which quantifies the area of retained STIF that occurs within the study area (0.25 ha) and the nature strip (0.26 ha).</p> <p>In terms of reliance on retained vegetation within the nature strip for concluding a non-significant impact, this is an acceptable approach based on the definition of a "local occurrence". Page 7 of the DECC 2007 guidelines states:</p> <p><i>Local occurrence: the ecological community that occurs within the study area. However the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.</i></p> <p>Please see Section 5.1 for further discussion on this. In summary, excluding the STIF within the nature strip from the local occurrence does not</p>



Issue #	Matter raised by Council regarding the v2 report	Where matter is addressed in this report v3
		<p>comply with the industry guidelines. Our test of significance has concluded that the local occurrence of STIF will not become extinct as a result of the proposed development and that no significant impact is likely to result. We consider this a conservative approach, as the local occurrence of STIF is likely to be much larger than the 1.18 ha we have used as shown in the OEH mapping in <b>Figure 3</b>.</p>
4	<p>In addition, the conclusion of acceptability in the report relies on the provision of a 0.25 ha “regeneration area” in the southern boundary of the study area. A check of the landscape plan for this area notes the “regeneration area” but further notes “low planting to maintain views”. Further to this, general terms of approval from the Heritage Office require “controlling shrub heights” and “removing new tree seedlings in most of the southern fringe”. Therefore this regeneration area will be ineffective in offsetting loss of STIF on the site in particular tree canopy and larger shrub species, and cannot be relied upon for offset.</p> <p>While Council has no formal policy, offsets to compensate for the loss of endangered vegetation are generally required at a ratio of 2:1 in area. Here the proposal is to remove 0.52 ha of moderate condition Sydney Turpentine Ironbark Forest. The only offset provision appears to be 0.25 ha of regeneration area that has significant constraints associated with it in terms of height, density of vegetation and Heritage.</p> <p>Council has an offsets policy for trees removed as a consequence of the development of a site. For medium density development such as this, the policy requires offsets a ratio of 8:1. There are a significant number of trees to be removed as part of this development (80 trees removed, excluding exempt species). There are no details of where or how the required 640 trees required as offsets will be accommodated within the development. You should note that the required trees to be planted at the 8:1 ratio can be incorporated into 2:1 offset area as per above, again detail of this is required to be submitted to Council.</p>	<p>The offset ratios suggested by SSC have been used to modify the planting plan as shown in <b>Figure 7</b> and <b>Figure 8</b> of this report. This will result in the replanting of 1.01 ha of STIF including 438 STIF canopy trees. This will meet 75% of the suggested offset for STIF vegetation and 68% for canopy species. The breakdown of these planting areas in terms of STIF revegetation and number of canopy species is shown in <b>Table 6</b>.</p> <p>This planting plan has considered the requirements for asset protection zones, heritage issues and 3 m setback from buildings.</p> <p>See <b>Section 5.1</b> for further information on offsets.</p>

Issue #	Matter raised by Council regarding the v2 report	Where matter is addressed in this report v3
	<p>Significant constraints also exist in terms of bushfire management that restrict the nature and density of trees and shrubs that may be planted on the site.</p> <p>Due to the significant constraints of the site it may be beneficial to consider offsets separately in terms of trees and shrubs. Shrubs may be planted in some areas such as the regeneration area, but not in others. Similarly, trees may be planted in some areas on the periphery of the site, but not dense shrubs for bushfire reasons.</p> <p>What is required is an offsets package - indicating how it is proposed to offset and compensate for the loss of STIF vegetation and trees on the site. Due to the significant constraints of the site and often competing priorities of bushfire protection, heritage conservation and conservation of endangered communities, such issues cannot be left as conditions of consent.</p>	

# Executive summary

Fuzortinn Pty Ltd are proposing a residential development at 1-21 Dillwynia Grove (Lot 1 and Lot 2 in DP725184), Heathcote East in the Local Government Area of Sutherland Shire. The development includes 40 townhouses and 21 apartments in two separate three-storey buildings, underground car parking and the restoration of the State Heritage listed Heathcote Hall, which was constructed in 1887.

Eco Logical Australia was engaged to prepare a Flora and Fauna Assessment with the overall objective to assess the impacts of the proposed development on flora and fauna and specifically on any threatened species, populations or ecological communities listed under relevant Commonwealth, state and local government legislation.

A site inspection confirmed that native vegetation across the study area formed part of the Sydney Turpentine Ironbark Forest (STIF), a critically endangered ecological community listed under the *Threatened Species Conservation Act 1995* (TSC Act). A total of 1.18 ha of STIF was identified across the study area, with 0.63 ha in moderate condition and a further 0.55 ha in poor condition. STIF is also listed as a critically endangered ecological community under the Commonwealth's *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), although vegetation within the study area did not meet the condition criteria for the community as listed under this Act.

No threatened species of flora were observed within the study area and none were considered likely to occur. No threatened fauna species were recorded within the study area although potential habitat within the study area was identified for six species including:

- *Callocephalon fimbriatum* (Gang-gang Cockatoo)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Falsistrellus tasmaniensis* (Eastern False Pipestrelle)
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Ninox strenua* (Powerful Owl).

Of the 1.18 ha of STIF identified within the study area, the proposed development would result in impacts to approximately 0.67 ha (57%) of the STIF, which also represents habitat for threatened fauna species. Of the 0.67 ha of STIF which would be impacted by the proposed works, 0.57 ha would constitute a total loss of the ecological community, while 0.1 ha would have impacts limited to midstorey and understorey species (including the soil profile and any native seedbank), with canopy trees retained. The impacts to STIF would include removal of four hollow bearing trees. Approximately 0.51 ha (43%) of the STIF identified within the local occurrence would be retained as part of the proposed development (0.25 ha) and within the nature strip (0.26 ha). Approximately 1.01 ha of STIF will be replanted onsite including groundcovers, shrubs and 438 canopy species.

Assessments of the significance for potential impacts to STIF and threatened fauna listed under the TSC Act were conducted and it was concluded that no significant impact is likely to occur as a result of the proposed development. Therefore, no species impact statement is required. Additionally, a significant impact assessment for threatened fauna species listed under the EPBC Act (Large-eared Pied Bat and Grey-headed Flying-fox) concluded that no significant impact on these species is likely to result and no referral to the Commonwealth is required.

An assessment against the objectives of Clause 6.5 of Sutherland Shire Council *Local Environment Plan 2015* (LEP), which applies to areas mapped as "Environmentally Sensitive Land" including the study area,

was undertaken. It was determined the condition and ecological value of the STIF and flora and fauna habitat within study area has been heavily degraded by previous land uses with selective clearing and invasion of exotic species having occurred across the study area. Previous disturbance within the study area, associated with past land uses, has reduced the habitat value or importance of the study area for fauna species. The fauna species identified within, or considered likely to occur within, the study area are generally those species which are disturbance tolerant and highly mobile species. Further, the native vegetation and fauna habitat within the study area is not currently interconnected with any large areas of predominately native vegetation. The existing habitat within the study area is likely to form a 'stepping stone' or island of habitat within disturbed urban areas which would allow for the movement of highly mobile fauna groups throughout the locality. Through the retention of approximately 0.51 ha of STIF and replanting of 1.01 ha of STIF including 438 canopy species, the local occurrence of STIF would be expected to continue to function as a stepping stone for highly mobile fauna species to move across the locality.

A number of recommendations have been made to further minimise impacts on flora and fauna species and their habitats, including: protecting individual trees and areas of vegetation to be retained; preclearance surveys for microbats; ecologist supervision of vegetation removal and installation of nest boxes to replace loss of hollow bearing trees.

# 1. Introduction

Eco Logical Australia (ELA) has been commissioned by Fuzortinn Pty Ltd to prepare a Flora and Fauna Assessment as part of the Development Application for a residential development at 1-21 Dillwynnia Grove (Lot 1 and Lot 2 in DP725184), Heathcote East within the Local Government Area (LGA) of Sutherland Shire (**Figure 1**). This Flora and Fauna Assessment has been prepared to:

- describe the natural environment for the study area
- validate existing mapping of vegetation communities for the study area
- identify potential impacts of the proposed development on flora and fauna and specifically on any threatened species, populations, ecological communities or their habitats
- consider the likely significance of impacts of the proposed development on threatened species, populations or ecological communities listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- Identify and recommend mitigation measures to minimise the scale of potential impacts.

## 1.1 Study area

For the purposes of this report the “study area” has been defined as all areas which have potential to be directly and indirectly impacted by the proposed works. The study area is located at 1-21 Dillwynnia Grove (Lot 1 and Lot 2 in DP725184) East Heathcote and is approximately 2.07 ha. The study area is zoned E4 Environmental Living under the Sutherland Shire LEP 2015.

The study area is bounded by Dillwynnia Grove to the south, Tecoma Street to the east and Boronia Grove to the north. The western boundary adjoins a residential area. The surrounding land use includes low density residential areas with Royal National Park beyond this to the south and east. The study area includes private land only and does not include the Council owned nature strip.

## 1.2 Description of project

Fuzortinn Pty Ltd is proposing to develop the site for a residential development including 40 townhouses and 21 apartments in two separate three-storey buildings, underground car parking and the restoration of the State Heritage listed Heathcote Hall, which was constructed in 1887. **Figure 2** shows the proposed works.

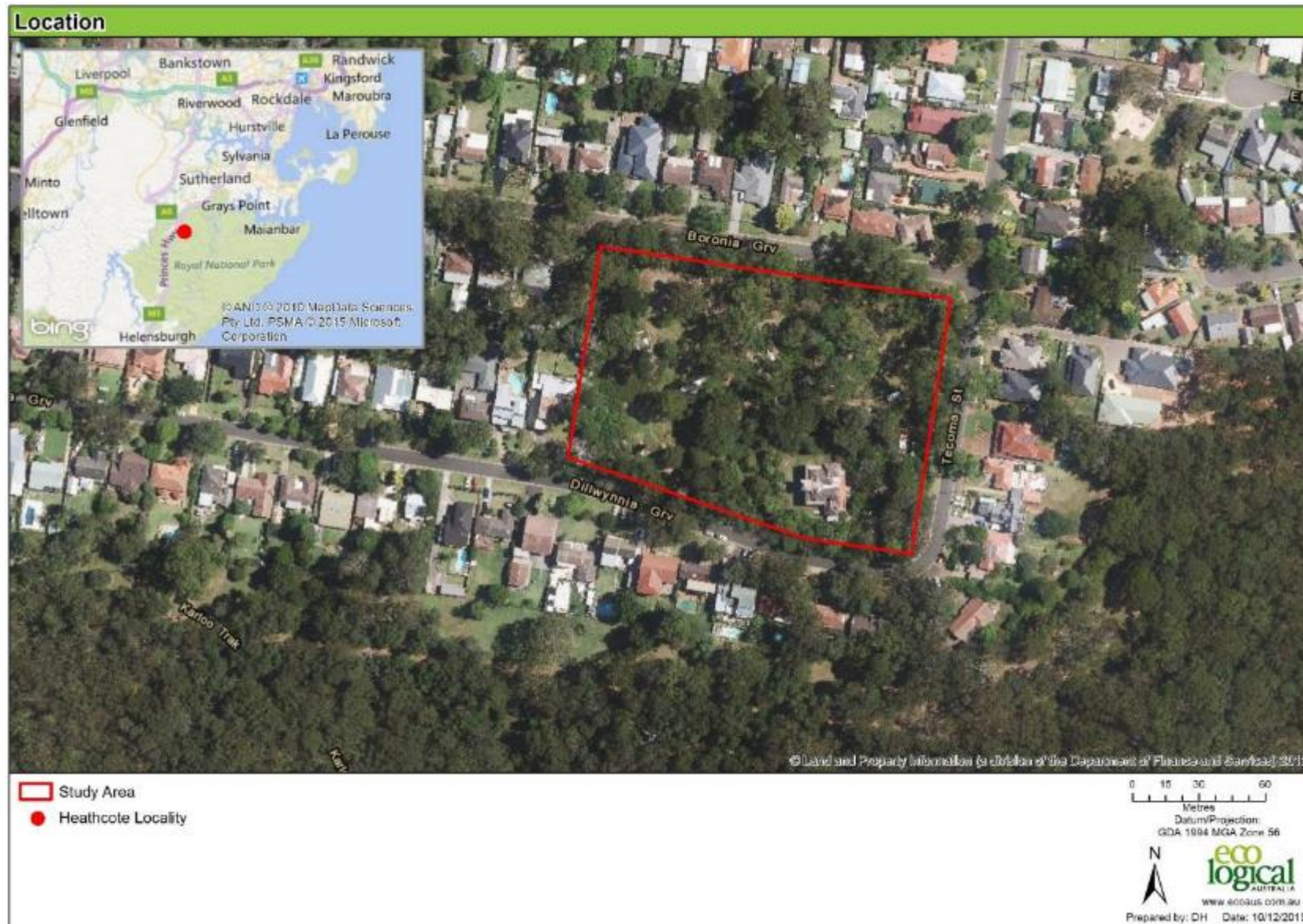


Figure 1: Locality map of the study area



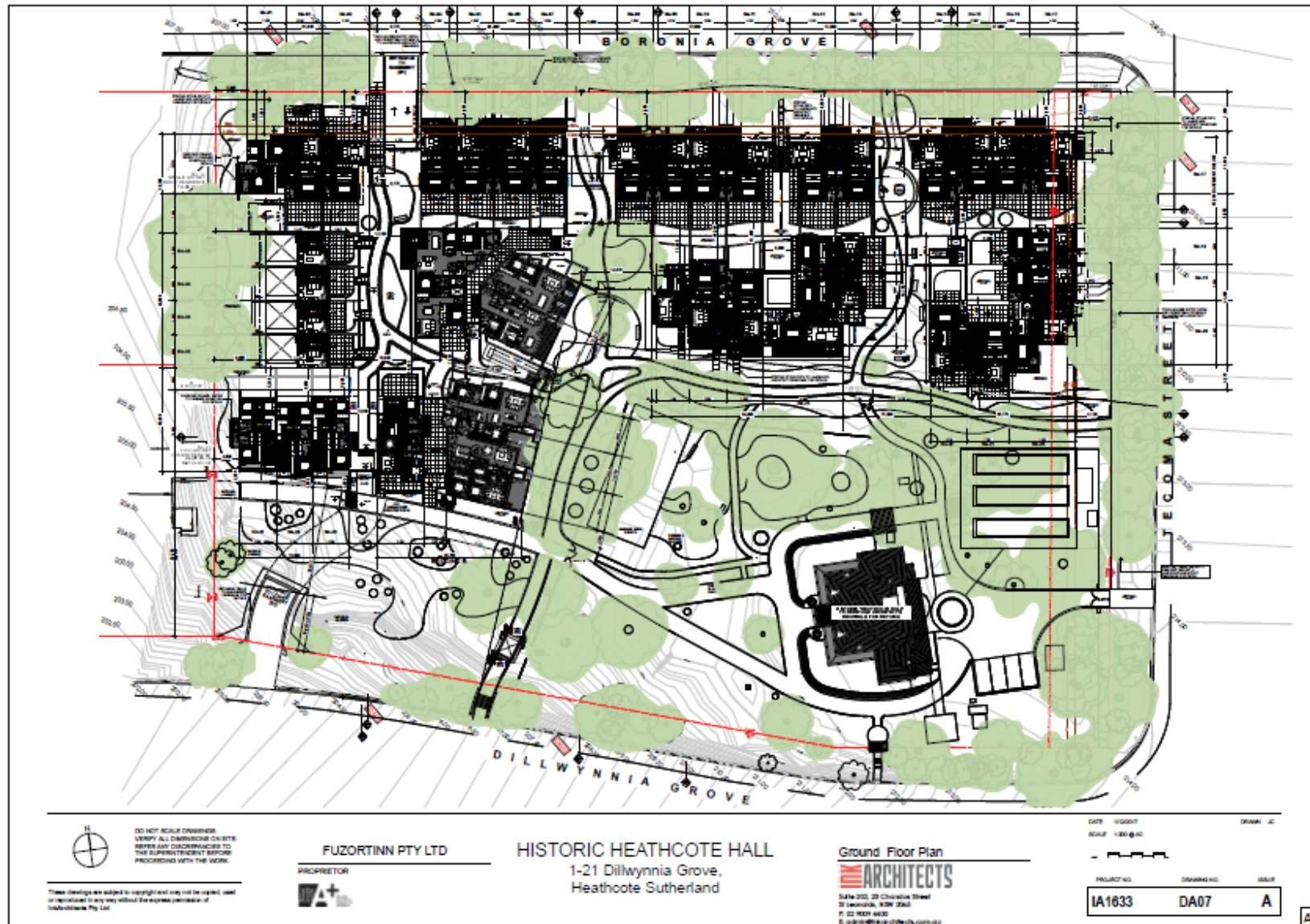


Figure 2: Proposed development of the study area (Ink Architects 1 December 2017)

## 2 Legislative context

Name	Relevance to the project
Commonwealth	
<i>Environmental Protection and Biodiversity Conservation Act 1999</i>	<p>Matters of National Environmental Significance previously recorded within a 5 km radius of the study area were identified via a search of the Protected Matters Search Tool (PMST). These results are shown in <b>Appendix A</b>.</p> <p>This report considers potential impacts associated with the proposed development on NMES and impact assessments for these species are contained in <b>Appendix E</b>.</p>
State	
<i>Environmental Planning and Assessment Act 1979</i>	The proposed development requires consent from Sutherland Shire Council under Part 4 of the EP&A Act. This report addresses the assessment of significance for impacts to threatened species and endangered ecological communities in accordance with s5A of the Act. Six assessments were completed and are shown in <b>Appendix D</b> .
<i>Threatened Species Conservation Act 1995</i>	The land on which the development is proposed is not biodiversity certified under s126 of the TSC Act and therefore impacts to threatened species and endangered ecological communities listed under the TSC Act are required in accordance with s5A of the EP&A Act.
<i>Fisheries Management Act 1994</i>	The development does not involve harm to mangroves or other protected marine vegetation (or dredging and reclamation or blocking of fish passage) and therefore a permit under the FM Act is not required. No threatened species listed under the FM Act occur on the site.
<i>Noxious Weeds Act 1993</i>	The site contains eight Class 4 weeds listed under the NW Act. For Class 4 weeds <i>The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed.</i>
<i>Water Management Act 2000</i>	The project does not involve works on waterfront land as the drain is not a natural waterway, but a stormwater drainage channel. A Controlled Activity Approval under s91 of the WM Act is not required.
Planning Instruments	
Sutherland Shire Council LEP 2015	<p>The study area is zoned as E4 - Environmental Living under the Sutherland Shire Council LEP 2015.</p> <p>The study area is mapped as "Environmentally Sensitive Land" on the Terrestrial Biodiversity Map. Clause 6.5 of the LEP discusses the objectives of this clause and issues Council must consider in their decision to grant consent. These include:</p> <p><i>(3) In deciding whether to grant development consent for development on land to which this clause applies, the consent authority must consider:</i></p> <p><i>(a) whether the development is likely to have:</i></p>



Name	Relevance to the project
	<p>(i) any adverse impact on the condition, ecological value and significance of the fauna and flora on the land, and</p> <p>(ii) any adverse impact on the importance of the vegetation on the land to the habitat and survival of native fauna, and</p> <p>(iii) any potential to fragment, disturb or diminish the biodiversity structure, function and composition of the land, and</p> <p>(iv) any adverse impact on the habitat elements providing connectivity on the land, and</p> <p>(b) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.</p> <p>(4) Development consent must not be granted for development on land to which this clause applies unless the consent authority is satisfied that:</p> <p>(a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or</p> <p>(b) if that impact cannot be reasonably avoided by adopting feasible alternatives—the development is designed, sited and will be managed to minimise that impact, or</p> <p>(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.</p> <p>These issues are addressed in <b>section 5.4</b> Environmentally Sensitive Land (SSC LEP 2015).</p>
Sutherland Shire Council DCP 2015	<p>The SCC Draft DCP 2015 maps the site as “Core” on the Greenweb mapping. “Core” refers to areas containing key habitat areas, key linkages and threatened species, or endangered ecological communities (usually greater than 3.5 ha) and is discussed in Chapter 38 of the Draft DCP. The implications are that any landscaping will need to comply with the endemic species of the area.</p> <p>The entire site is mapped as “Threatened Species” or “Threatened Species - Buffer” on Sutherland Shire Council’s (SSC) Protected Species and Communities of High Conservation Significance Map. This is most likely due the presence of the Threatened Ecological Community Sydney Turpentine Ironbark Forest (STIF) that is mapped under SSC vegetation mapping.</p>

## 3 Methods

### 3.1 Literature review

#### 3.1.1 Database searches

A desktop literature review was undertaken to identify threatened species, populations and ecological communities listed under the TSC Act and the EPBC Act that could potentially occur within the study area. The following documentation and mapping was reviewed:

1. topographic maps
2. aerial photography of the study area.
3. a search of the NSW Office of Environment & Heritage (OEH) BioNet database (<http://www.bionet.nsw.gov.au/>)
4. a 5 km radius search of the Protected Matters Search Tool (PMST) (EPBC Act) (<http://www.environment.gov.au/epbc/pmst/>)
5. Sydney Metropolitan Catchment Management Authority (SMCMA) vegetation mapping (OEH 2013)
6. Sutherland Shire Council vegetation mapping
7. other relevant projects previously undertaken by ELA in the locality
8. Jackson Nature Works 2015, Aboricultural Impact Assessment Report for Heathcote Hall
9. soil landscape mapping (Hazelton and Tille 1990).

#### 3.1.2 Likelihood of occurrence

**Appendix A** identifies the threatened species returned by the Atlas of NSW Wildlife (5 x 5 km area centred on the study area) and the PMST together with an assessment of the likelihood of occurrence for each species, population or community. Each species' likely occurrence was determined by records in the area, habitat availability based on the field survey and knowledge of the species ecology. Five terms for the likelihood of occurrence of species are used in this report. The terms for likelihood of occurrence are defined below:

10. "yes" = the species was or has been observed on the site.
11. "likely" = a medium to high probability that a species uses the site.
12. "potential" = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur.
13. "unlikely" = a very low to low probability that a species uses the site.
14. "no" = habitat on site and in the vicinity is unsuitable for the species.

### 3.2 Field survey

A field survey was conducted on 4 December 2015 by ELA Ecologists Karen Spicer and Paul Price over six person hours. The weather during the field survey was fine and sunny with light winds and a temperature of 24 degrees.

The field survey involved validating existing vegetation mapping including a condition assessment, targeted searches for threatened flora and compilation of a flora list, and recording incidental observations of flora species within the study area. Validation of existing vegetation mapping was undertaken using aerial photography and ground-truthing of the SMCMA vegetation map (OEH 2013). The accuracy of the mapped boundaries by OEH 2013 was determined and validated along with consideration of conservation or listing advice for threatened ecological communities listed under the TSC and EPBC Acts.

A description of the vegetation communities including species present and condition were recorded for each mapped polygon. The condition class assigned to each polygon was based on the level of disturbance and weed invasion. The following condition classes were applied to the native vegetation communities:

- Moderate – native species were present within each vegetative layer (canopy, mid-storey, shrub and ground cover), however past disturbance and weed invasion has degraded the condition of the community
- Poor – native species were present within the canopy and/or mid-storey, but the understorey was heavily disturbed or cleared and dominated by exotic species

Non-native vegetation communities were either mapped as 'Cleared' or "Urban Native and Exotic". The latter included areas lacking a native canopy / mid-storey that have been planted with non-endemic native species or exotic species.

A fauna habitat assessment, including mapping of hollow-bearing trees (HBTs), was undertaken within the study area and opportunistic fauna sightings were noted.

No targeted threatened fauna surveys were conducted. Potential fauna habitat resources associated with threatened species were recorded when present. These include:

- foraging resources (i.e. sap feed trees, flowering trees and shrubs)
- connectivity with other vegetation
- presence of hollow bearing trees, dead standing timbers (i.e. stags) and/or coarse bark
- accumulation of leaf litter
- large woody debris
- presence of standing or flowing water bodies
- rocks and rocky outcrops.

### 3.4 Limitations

The *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004) provides standard survey methods for surveying flora and fauna using a variety of survey methodologies and climatic and seasonal conditions to produce an extensive census of fauna and flora species within the subject area. A comprehensive flora and fauna survey was not conducted due the existing degraded condition of the site. The level of field survey undertaken was considered to be adequate for the site and the purposes of this report.

The flora and fauna species recorded within the study area (**Appendix B** and **Appendix C**) is not considered to be an exhaustive list of species present within the study area. Some species may not have been present in the aboveground flora or were difficult to detect due to lack of suitable reproductive material. However, the methodologies used in this study were considered adequate given the relatively small study area, disturbance history and size of the proposed development.

## 4. Existing environment

### 4.1 Database and literature review

#### 4.1.1 Landscape context

The study area occurs within the low density residential area of East Heathcote. The site contains Heathcote Hall, which is a State Heritage item (State Heritage Register No. 00191). The heritage listing notes that:

*Heathcote Hall is an imposing two-storey building designed in the Victorian Italianate style and is one of the oldest and grandest buildings in the Sutherland Shire. Built in 1887 by Issac Harber a wealthy Sydney brick maker...it is a particularly striking building whose tower is a prominent landmark in Heathcote.*

Historic photos from 1943 (<https://maps.six.nsw.gov.au/>) shows that the study area contains cleared areas particularly along Boronia Grove and the western half of the site. It appears that most of the site has been cleared at some stage with the exception of trees to the north of Heathcote Hall and along Tecoma Street. The vegetation on the site therefore contains a mix of remnant trees, regrowth native vegetation, cleared areas and planted gardens.

#### 4.1.2 Threatened ecological communities

Broad-scale vegetation mapping (OEH 2013) showed that the study area was mapped as Sydney Turpentine Ironbark Forest (STIF) (**Figure 3**). The surrounding vegetation was also mapped as STIF. This mapping was also generally consistent with Sutherland Shire Council's (SSC) vegetation mapping (SSC 2017).



**Figure 3: SMCMA vegetation mapping of the site and surrounding area (OEH 2013)**

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#### 4.1.3 Threatened flora

The desktop literature review identified a total of 19 threatened flora species listed under the TSC and/or EPBC Acts, which have been recorded within a 5 km radius of the study area (see **Appendix A**).

No threatened flora species have been previously recorded within the study area. The closest records of threatened flora species include:

- *Melaleuca deanei* – 600 m north of the study area in Heathcote (recorded in 1963)
- *Eucalyptus camfieldii* – 1.5 km south west near the train line (recorded in 2001)
- *Genoplesium baueri* – 2 km south west (recorded in 1956).

#### 4.1.4 Threatened fauna

The desktop literature review identified 41 bird species, 11 mammals, 6 amphibians and 2 reptiles listed under the TSC and/or EPBC Acts, which have been recorded within a 5 km radius of the study area. One threatened species of fish listed under the *Fisheries Management Act 1994* was also recorded (see **Appendix A**).

No threatened fauna species have been previously recorded within the study area. The closest records were:

- Red-crowned Toadlet – three records 250 – 450 m to the south in Royal National Park (recorded between 1987 and 2009)
- Giant Burrowing Frog – 250 m south in Royal National Park (recorded in 1987).

### 4.2 Field survey results

#### 4.2.1 Vegetation communities

The vegetation survey confirmed the presence of Sydney Turpentine Ironbark Forest (STIF) vegetation community within the study area as identified by OEH (2013) and SSC (2017). However, the extent of this community within the study area was identified as being less than shown in the OEH mapping, with the OEH mapping including areas identified during field surveys as planted gardens, weed infestations and cleared areas. The revised vegetation community mapping is shown in **Figure 4**.

The condition of the STIF was also mapped as either moderate or poor condition. Areas of good condition STIF are not present within the study area (see Section 3.2 for further explanation of condition classes).

STIF (moderate condition) was identified around the periphery of the study area. Canopy species included *Angophora costata* (Sydney Red Gum), *Eucalyptus saligna* x *E. botryoides*, *Eucalyptus paniculata* (Grey Ironbark), and *Eucalyptus pilularis* (Blackbutt). A mid-stratum was present in some locations and included *Acacia parramattensis* (Parramatta Wattle), *Allocasuarina torulosa* (Forest Oak), *Clerodendrum tomentosum* (Hairy Clerodendrum), *Exocarpos cupressiformis* (Cherry Ballarat), *Glochidion ferdinandi* (Cheese Tree), *Pittosporum undulatum* (Sweet Pittosporum), *Polyscias sambucifolia* (Elderberry Panax) and *Myrsine variabilis*.

Understorey species consisted of *Breynia oblongifolia* (Coffee Bush), *Hardenbergia violacea* (Purple Coral Pea), *Leucopogon juniperinus* (Prickly Beard-heath), *Lomandra longifolia* (Spiny-headed Mat-rush), *Notelaea longifolia* (Large Mock-olive), *Pandorea pandorana* (Wonga wonga vine), *Smilax glyciphylla* (Sweet Sarsaparilla) and *Stephania japonica* (Snake Vine). Groundcovers included *Dianella caerulea* (Blue Flax-lily), *Entolasia stricta* (Wiry panic), *Microlaena stipoides* (Weeping grass), *Oplismenus aemulus* (Australian Basket Grass) and *Panicum simile* (Two-coloured Panic).



Areas mapped as poor condition STIF generally included canopy or mid-stratum trees (as identified within moderate condition STIF) but with no native understorey species present, or an understorey heavily infested with exotic species.

Areas mapped as Urban Native and Exotic includes planted trees and shrubs and areas overgrown with weeds. The site contains many planted trees including *Acmena smithii* (Lily Pilly), *Jacaranda mimosifolia* (Jacaranda), *Grevillea robusta* (Silky Oak) and *Ficus microcarpa* var. *hillii*.

Weeds species were common throughout the study area and included *Ageratina adenophora* (Crofton Weed), *Anredera cordifolia* (Madeira Vine), *Asparagus aethiopicus* (Ground Asparagus), *Delairea odorata* (Cape Ivy), *Ehrharta erecta* (Panic Veldtgrass), *Ligustrum lucidum* (Large-leaved Privet), *Ligustrum sinense* (Small-leaved Privet), *Lonicera japonica* (Japanese Honeysuckle), *Nephrolepis cordifolia* (Fishbone Fern), *Ochna serrulata* (Mickey Mouse Plant), and *Tradescantia fluminensis* (Trad).

The definition of STIF, as listed under the TSC Act, includes highly degraded patches of vegetation including single trees characteristic of a community. However, under the EPBC Act the definition of STIF (listed as Turpentine-Ironbark Forest of the Sydney Basin Bioregion) is more restrictive and includes (Threatened Species Scientific Committee 2005):

*only high quality remnant patches which contain some characteristic native plant species present in all structural layers and that have the following characteristics are part of the Turpentine-Ironbark Forest ecological community listed under the EPBC Act 1999 (Commonwealth)*

- *tree canopy cover > 10%, patch area > 1 ha, or*
- *tree canopy cover < 10%, patch area > 1 ha and patch is located within native vegetation with an area > 5 ha.*

The areas mapped as 'STIF-moderate condition' have some species characteristic of the STIF community within each structural layer and the canopy cover is >10%, but the patch size is approximately 0.63 ha. All STIF within the study area was identified as forming part of the listed ecological community under the TSC Act but none of the vegetation within the study area was identified as meeting the community as listed under the EPBC Act.



**Figure 4: Ecological constraints showing validated vegetation mapping and location of hollow-bearing trees (HBTs)**

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#### 4.2.2 Flora species

The field survey undertaken within the subject site identified 110 flora species, comprised of 49 native species, 39 exotic species, 18 planted exotic species and 4 planted non-endemic native species. A flora list for the study area is presented in **Appendix B**.

A list of threatened flora species known to occur within a 5 km radius of the study area has been collated (**Appendix A**). No threatened flora species were observed during the field survey and given the current survey effort and the highly degraded condition of the site, none are expected to occur.

Eight plant species recorded within the study area are listed as noxious weeds within Sutherland Council LGA. The noxious weeds present, their management class and whether they are a Weed of National Significance (WoNS) is presented in **Table 1** below.

**Table 1: Noxious weeds and WoNS present in the study area**

Noxious Weed Species	Noxious Weed Class	WoNS
<i>Anredera cordifolia</i> (Madeira Vine)	4	Y
<i>Asparagus aethiopicus</i> (Asparagus Fern)	4	Y
<i>Asparagus</i> species	4	Y
<i>Cytissus scoparius</i> subsp. <i>scoparius</i>	4	
<i>Hypericum perforatum</i> (St Johns Wort)	4	
<i>Ligustrum lucidum</i> (Large-leaf Privet)	4	N
<i>Ligustrum sinense</i> (Small-leaf Privet)	4	N
<i>Olea europaea</i> subsp. <i>cuspidata</i> (African Olive)	4	N

Class 4 – Locally Controlled Weeds; That pose a threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.

#### 4.2.3 Fauna species

A total of 11 bird species were identified during the survey (**Appendix C**), one of which was an introduced species. However, a much greater number of fauna species are likely to use the site, particularly birds.

The study area contained some large remnant trees, but was heavily disturbed and overgrown with weeds. This provided fauna habitat for a number of threatened (listed above) and common peri-urban species such as Brush-tailed Possum and Sugar Glider and abundant habitat for birds and reptiles. The habitat features relevant to each fauna group are identified in **Table 2**.

No threatened species were recorded during the survey. A list of threatened fauna species known to occur within a 5 km radius of the study area was collated (**Appendix A**). Following this database search and a consideration of the habitat features identified within the study area (**Table 2**), six threatened species were considered to potentially occur within the study area, namely:

- *Callocephalon fimbriatum* (Gang-gang Cockatoo) – foraging habitat
- *Chalinolobus dwyeri* (Large-eared Pied Bat) – foraging habitat
- *Falsistrellus tasmaniensis* (Eastern False Pipestrelle) – breeding, roosting and foraging habitat
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat) – roosting and foraging habitat
- *Pteropus poliocephalus* (Grey-headed Flying-fox) – foraging habitat
- *Ninox strenua* (Powerful Owl) – foraging habitat.

**Table 2: Habitat features and associated fauna groups (guilds) recorded within the subject site**

Habitat Features	Guild	Presence in study area
Remnant vegetation	Birds, microchiropteran bats (microbats), megachiropteran bats (fruit bats), arboreal mammals, reptiles	A number of large remnant trees are present within the study area. Other trees appear to have regrown since the site was cleared in the 1880s. Seven trees are likely to contain tree hollows as observed from the ground.
Winter flowering species	Winter migratory birds, arboreal mammals and megachiropteran bats (fruit bats).	Most canopy species present on the site tend to flower in during the warmer months from October to March. <i>Eucalyptus paniculata</i> may flower from late autumn to summer (May-January). The arborist report identified 28 <i>E. paniculata</i> trees within the study area (Jackson Nature Works 2015).
Hollow-bearing trees	Birds and arboreal mammals (gliders and microbats)	Seven potential hollow-bearing trees were recorded within the study area, mostly around the periphery of the site. No obvious large hollows suitable for gliders and owls were observed on the site. The hollows present on the site may be used as a roosting habitat for microbats.
Stags	Birds, particularly birds of prey, reptiles, amphibians, micro bats	A number of dead standing trees (stags) are present in the study area. Jackson Nature Works (2015) recorded approximately 21 dead trees some of which are planted <i>Pinus</i> sp. The stags did not contained obvious hollows but may provide roosting habitat for microbats.
Leaf litter	Reptiles, amphibians, invertebrates	Leaf litter is present across the site, particularly within the areas mapped as moderate condition STIF.
Coarse woody debris	Terrestrial mammals, reptiles, invertebrates	Present throughout the site, particularly in the moderate condition STIF.
Watercourse	Amphibians, water birds	No natural watercourses or drainage lines occur on the site.
Vegetative corridor	Birds, reptiles, arboreal and small mammals	The study area is mapped within Sutherland Shire Councils greenweb mapping as "Core". The vegetation within the study area provides connectivity with other native trees throughout Heathcote East, particularly within back yards and along Boronia Grove to vast areas of native vegetation within Royal National Park. This vegetative corridor would be used by non-cover dependent species and highly mobile species such as birds and bats, given that the understorey is absent or highly disturbed.
Mistletoe	Birds	None observed.
Native/ Exotic grassland	Migratory birds and predator species	There are cleared areas supporting exotic and native grasses.

## 5 Impact assessment

### 5.1 Summary of impacts

The areas of impact to native vegetation and fauna habitat from the proposed development have been determined by overlaying the development footprint with areas identified as supporting native vegetation (**Table 3**). A total of 1.18 ha of STIF was identified within the study area. The proposed development would result in impacts to approximately 0.67 ha (57%) of the STIF identified within the study area with approximately 0.51 ha (43%) retained. Of the 0.67 ha of STIF that would be impacted by the proposed works, 0.57 ha would constitute a total loss of the ecological community while 0.10 ha would have impacts limited to midstorey and understorey species (including the soil profile and any native seedbank), with canopy trees retained. The location of retained canopy trees within the proposed development is shown in **Figure 6**.

The majority of the STIF which would be impacted by the proposed works (approximately 0.39 ha or 58%) would be within areas identified as poor condition. The impacts to STIF would be offset based on SSC recommendations of providing a 2:1 replacement ratio for STIF and an 8:1 replacement ratio for canopy trees. A planting plan is shown in Figure 7 and Figure 8 and includes densities for STIF groundcovers, shrubs and trees within different planting areas across the site. This plan has been developed with consideration for bushfire, heritage issues and building setbacks. In total, this planting plan will result in the replanting of 1.01 ha of STIF, including 438 STIF canopy species. A breakdown of the planting areas is provided in Table 6.

If the offset ratios suggested by SSC were to be implemented, 1.34 ha of STIF including 640 canopy species would need to be planted. Given that this requirement to offset is an informal council policy and not a legal obligation of the developer, meeting 68-75% of these offset requirements within the study area will result in a good environmental outcome for the local occurrence of STIF. In the long-term, if the study area was left in its current state, the current high levels of weed invasion would continue to degrade the areas of native vegetation within the site.

Indirect impacts, including potential disturbance to the soil, elevated nutrient levels, changes in light and plant composition and establishment of weeds are not considered to be issues at this site, given the existing highly urbanised land use and lack of vegetation connectivity.

**Table 3: Summary of impacts to vegetation types**

Vegetation type	Existing area within the study area (ha)	Total impact area (ha)	Retained (ha)
STIF moderation condition	0.63	0.28 (44%)	0.35 (56%)
STIF poor condition	0.55	0.39 (71%)	0.16 (29%)
Total	1.18	0.67 (57%)	0.51 (43%)

Number in brackets represent the proportion, as a percentage, of the total area of each condition class of STIF.

Seven hollow-bearing trees have been mapped on the site (Figure 5), with small potential hollows observed in these trees from ground level. The proposed development of the site would involve the removal of four of these potential hollow bearing trees. If hollows are present in these trees, they are most likely to be used by common peri-urban birds or microbats. Threatened microbats that may use these tree hollows for roosting include Eastern False Pipistrelle and Eastern Bentwing-bat.

Clearing of native vegetation may result in this loss of potential foraging habitat for Large-eared Pied Bat, Gang-gang Cockatoo, Grey-headed Flying-fox and Powerful Owl.

SSC in their review of this report (version 1) requested that the 'study area' must be limited to the boundaries of the subject site and must not include any Council owned land, such as the nature strip. The impact assessment in this report has included impacts to vegetation in the nature strip given that it would be impacted by the development through creation of driveways and footpaths. To satisfy SSC, the impacts to STIF vegetation have been divided between those in the study area (internal) and those in the nature strip (external) as shown below in **Table 4**.

**Table 4: Impact assessment within the study area (internal) verses nature strip (external)**

	Location	Total Loss (ha)	Partial loss (ha)
STIF – Low condition	Internal	0.25	<0.01
	External	0.03	0.10
STIF - Moderate	Internal	0.27	<0.01
	External	0.01	<0.01

Further review by SCC of this report (version 2) has stated that, in determining the significance of impacts to STIF, the STIF external to the study area (ie. the council nature strip) cannot be relied upon. ELA have concluded a non-significant impact based on the industry guidelines *Threatened Species Assessment Guidelines – the assessment of significance* (DECC 2007). In this guideline, the assessment of significance is based on whether a "local occurrence" of the community will be at risk of extinction. The "local occurrence" is defined as: *the ecological community that occurs within the study area. However the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.*

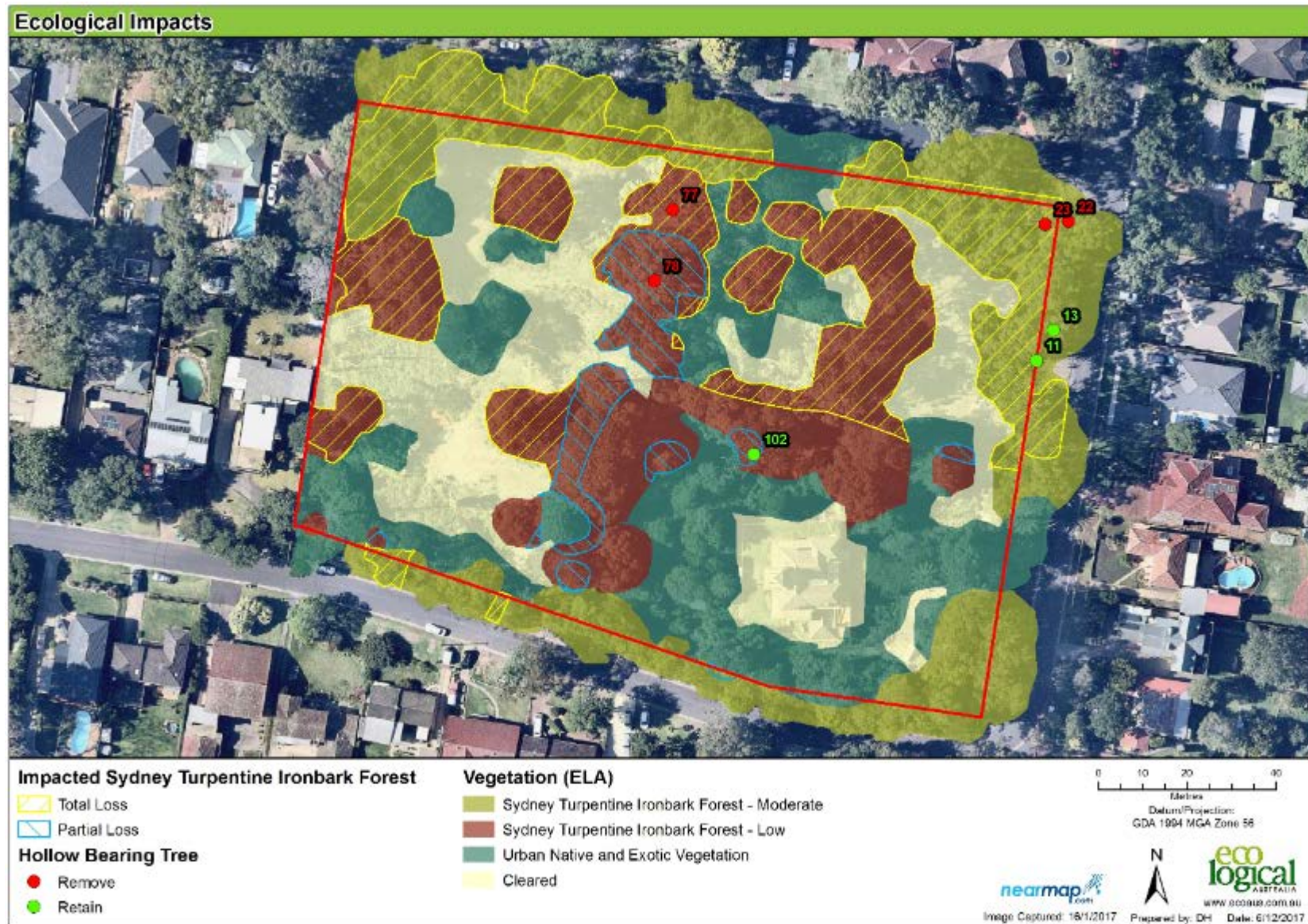
In this case STIF extends outside of the study area onto the adjacent nature strip which is part of the local occurrence of this community and can therefore be relied upon for determining the impacts to STIF. Table 5 demonstrates that of the 0.51 ha of the local occurrence of STIF to be retained, 0.26 ha of STIF will be retained within the nature strip and 0.25 ha will be retained within the study area.

**Table 5: Retained STIF within the study area (internal) verses nature strip (external)**

	Location	Retained STIF (ha)
STIF – Low condition	Internal	0.17
	External	0.00
STIF - Moderate	Internal	0.08
	External	0.26

We consider our assessment of impacts to STIF to be a conservative approach. Figure 3 suggests that STIF occurs in all directions around the study area and therefore, the STIF within the study area is likely to be part of a much bigger local occurrence of STIF.

Therefore, the impact assessment, which includes the STIF within the nature strip, is a conservative approach. If the surrounding vegetation was validated, the local occurrence is likely to be much larger than the 1.18 ha assumed for the impact assessment and therefore, the impact to the local occurrence would be reduced. Either way, the test of significance has concluded that the local occurrence of STIF would not become extinct as a result of the proposed development and that no significant impact is likely to result.



**Figure 5: Proposed ecological impacts resulting from the proposed development**





Figure 6: Landscape masterplan (prepared by SiteDesign 17 November 2017)

**Table 6: Summary of offsets according to the planting plan by Site Design**

Area name on planting plan	Number of STIF TREES planted	Area of STIF SHRUBS and GROUNDCOVERS planted (ha)	Total area of STIF community planted (ha)
Tree planting areas outside of heritage and outside of a 3m setback from any built form	368		0.18
Mass planted area		0.24	0.25
Podium planting area		0.07	0.073
Common open space turf area	55		0.20
Bushfire interface area	15	0.03	0.31
<b>TOTAL</b>	<b>438</b>	<b>0.35</b>	<b>1.01</b>



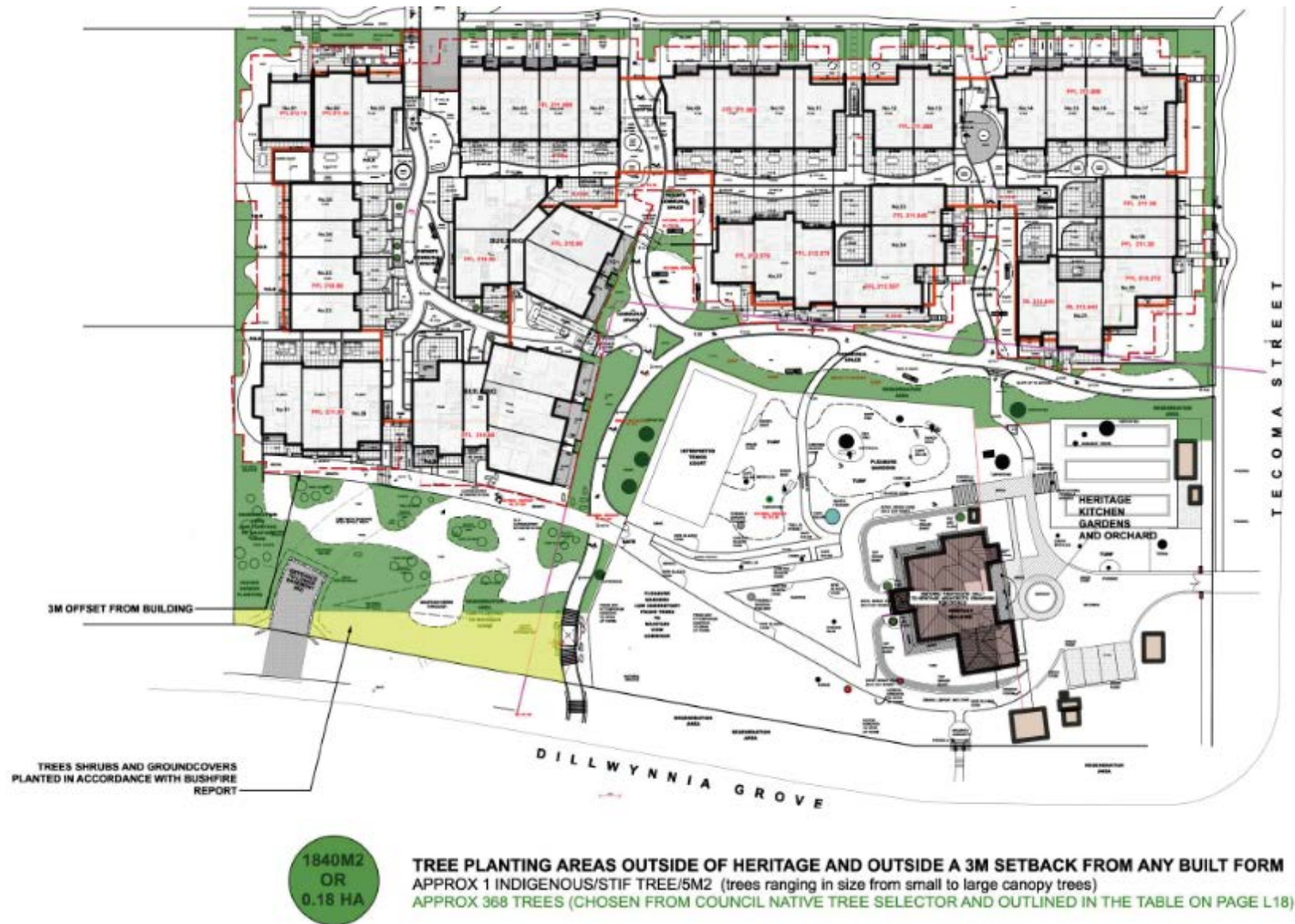


Figure 7: Planting areas plan (Site Design 6/3/18) for trees to be planted outside the heritage and 3 m setback from buildings.



Figure 8: Planting areas plan (Site Design 6/3/18)

## 5.2 Impact assessment – EP&A Act

Section 5A of the EP&A Act sets out seven factors that must be addressed as part of an Assessment of Significance (7 part test). This enables a decision to be made as to whether there is likely to be a significant effect on the species and, hence, if a Species Impact Statement (SIS) is required.

Assessments of significance for STIF and the threatened fauna species considered to have potential to occur within the study area (**Appendix A** and **section 4.1.4**) are included in **Appendix D**.

For STIF it was concluded that while the proposed development would have impacts to up to 0.67 ha of the ecological community, the proposed development is unlikely to have a significant impact upon the ecological community given that:

- The STIF which would be impacted by the proposed works was in moderate to poor condition with a long history of disturbance.
- The STIF within the study area is likely to be part of a much larger local occurrence of STIF that occurs throughout Heathcote East, as shown in Figure 3.
- A total of 0.51 ha of STIF would be retained as part of the proposed development, with approximately half of this retained STIF within the nature strip and half within the study area.
- A planting plan for the site includes revegetation of 1 ha of STIF including 438 canopy species.

For the threatened fauna species considered to have potential to occur within the study area, it was concluded that the proposed development would not have a significant impact upon these species as the proposed development would:

- Only impact upon a small area of foraging habitat, or only impact upon a small area of potential breeding and roosting habitat.
- Impact upon a relatively small area of foraging habitat, with large areas of foraging habitat available in the locality to these highly mobile species.
- Not isolate or fragment any currently interconnected areas of habitat for these highly mobile fauna species.

## 5.3 Impact assessment – EPBC Act

The EPBC Act establishes a process for assessing the environmental impact of activities and developments where 'Matters of National Environmental Significance' may be affected. Under the Act any action which "has, will have, or is likely to have a significant impact on a matter of national environmental significance" is defined as a "controlled action", and requires approval from the Commonwealth Department of Environment (DoE) which is responsible for administering the EPBC Act.

STIF within the study area does not conform to the condition criteria of this community as listed under the EPBC Act (Threatened Species Scientific Committee 2005). Therefore, no assessment under the EPBC Act is required.

The Large-eared Pied Bat and Grey-headed Flying-fox may forage at the site and are both listed as vulnerable under the EPBC Act. Impact assessments for these species are contained in **Appendix E**. These impact assessments concluded that the proposed development would be unlikely to have a significant impact on either of these species as the proposed development would:

- Only impact upon a small area of foraging habitat, with no breeding habitat to be impacted.
- Impact upon a relatively small area of foraging habitat, with large area of foraging habitat available in the locality to these highly mobile species.

- Not isolate or fragment any currently interconnected areas of habitat for these highly mobile fauna species.

#### 5.4 Environmentally Sensitive Land (SSC LEP 2015)

The study area is mapped as “Environmentally Sensitive Land” on the Terrestrial Biodiversity Map under the SSC LEP 2015. Clause 6.5 of the LEP discusses the objectives of this clause and issues Council must consider in their decision to grant consent. These are discussed below.

*(3) In deciding whether to grant development consent for development on land to which this clause applies, the consent authority must consider:*

*(a) whether the development is likely to have:*

*(i) any adverse impact on the condition, ecological value and significance of the fauna and flora on the land, and*

*(ii) any adverse impact on the importance of the vegetation on the land to the habitat and survival of native fauna, and*

*(iii) any potential to fragment, disturb or diminish the biodiversity structure, function and composition of the land, and*

*(iv) any adverse impact on the habitat elements providing connectivity on the land, and*

*(b) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.*

*(4) Development consent must not be granted for development on land to which this clause applies unless the consent authority is satisfied that:*

*(a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or*

*(b) if that impact cannot be reasonably avoided by adopting feasible alternatives—the development is designed, sited and will be managed to minimise that impact, or*

*(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.*

The proposed development would result in a loss of approximately 0.57 ha, with partial impacts to a further 0.1 ha, of native vegetation comprising the STIF ecological community and representing flora and fauna habitat, as discussed in **section 4.2**. Approximately 0.51 ha of the local occurrence of STIF would be retained (0.25 ha within the study area and 0.26 ha within the nature strip). A replanting plan within the study area will result in the revegetation of 1.01 ha of STIF including groundcovers, shrubs and 438 canopy species.

The condition and ecological value of the STIF and flora and fauna habitat within study area has been heavily degraded by previous land uses with selective clearing and invasion of exotic species having occurred across the study area. Previous disturbance within the study area, associated with past land uses, has reduced the habitat value or importance of the study area for fauna species and the fauna species identified within, or considered likely to occur within, the study area are generally those species which are disturbance tolerant and highly mobile species.

The study area is likely to form a 'stepping stone' or island of habitat which would allow for the movement of highly mobile fauna groups throughout the locality. Through the retention of approximately 0.51 ha of STIF and replanting of 1.01 ha of STIF including 438 canopy trees, the study area would be expected to continue to function as a stepping stone for highly mobile fauna species to move across the locality.

In the long-term, the condition of STIF within the study area is expected to improve through weed removal and revegetation 1.01 ha of STIF groundcovers, shrubs and canopy species.

### **5.5 Natural Resource Management (SSC DCP 2015)**

Chapter 39 of the SSC DCP discusses the retention of hollow-bearing trees, noting that tree hollows are a critical but scarce habitat element for native fauna and are essential for breeding of a large number of species.

Seven hollow-bearing trees (HBTs) have been identified within the study area with four requiring removal. Based on these impacts, it is recommended that eight microbat habitat boxes be installed within retained trees to compensate for the loss of tree hollows within the study area. A hollow-replacement plan has been prepared in Appendix E, which describes the existing condition of the HBT's, their location and whether they are to be retained or removed. Prior to tree removal, the four HBTs proposed to be removed will be surveyed over two consecutive nights using Anabat detectors to ensure they are not occupied by threatened microbat species. 'Softfall techniques' are recommended for removal of habitat trees to ensure the welfare of fauna species that may be present.

## 6 Recommendations

The following recommendations are made to further minimise the impacts to native vegetation communities and fauna habitat:

- During construction, areas of retained vegetation should be fenced and clearly marked as no-go zones.
- Prior to tree removal, the four HBTs proposed to be removed will be surveyed over two consecutive nights using Anabat detectors to ensure they are not occupied by threatened microbat species.
- Prior to vegetation removal, all trees to be retained are clearly marked and protected using fencing of the drip zone to protect the root system.
- An ecologist should be present on site during vegetation clearing to ensure that any fauna present are captured and released into appropriate habitat nearby and to manage any fauna that are inadvertently injured (details provided in Appendix F).
- A minimum of eight microbat nest boxes should be installed within the retained vegetation to provide nesting opportunities for microbats and compensate for the loss of four hollow bearing trees (see Appendix F for details).
- Landscape planning should use locally sourced seed of species native to the STIF vegetation.



## 7 Conclusion

This flora and fauna report was prepared for Fuzortinn Pty Ltd to assess the impact of the proposed residential development at 1-21 Dillwynia Grove, Heathcote.

A site inspection confirmed that native vegetation across the study area formed part of the STIF ecological community, which is listed as critically endangered under the TSC Act. A total of 1.18 ha of STIF was identified across the study area, with 0.63 ha in moderate condition and a further 0.55 ha in poor condition. STIF is also listed as a critically endangered ecological community under the EPBC Act, although vegetation within the study area did not meet the condition criteria for the community as listed under this Act.

No threatened species of flora were observed within the study area and given the survey effort and disturbed condition of habitat within the study area, none are considered likely to occur. No threatened fauna species were recorded within the study area although potential habitat within the study area was identified for six threatened species including:

- *Callocephalon fimbriatum* (Gang-gang Cockatoo)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Falsistrellus tasmaniensis* (Eastern False Pipestrelle)
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Ninox strenua* (Powerful Owl).

Of the 1.18 ha of STIF identified within the study area, the proposed development would result in impacts to approximately 0.67 ha (57%) of the STIF, which also represents habitat for threatened fauna species. Of the 0.67 ha of STIF which would be impacted by the proposed works, 0.57 ha would constitute a total loss of the ecological community, while 0.1 ha would have impacts limited to midstorey and understorey species (including the soil profile and any native seedbank), with canopy trees retained. The impacts to STIF would also include removal of four potential hollow bearing trees. Approximately 0.51 ha (43%) of the STIF identified within the local occurrence would be retained including 0.25 ha within the study area and 0.26 ha within the nature strip. A replanting plan has been developed to offset the impacts to STIF through revegetation of 1.01 ha of STIF including 438 canopy species.

Assessments of the significance for potential impacts to STIF and threatened fauna listed under the TSC Act were conducted and it was concluded that no significant impact is likely to occur as a result of the proposed development. Therefore, no species impact statement is required. Additionally, a significant impact assessment for threatened fauna species listed under the EPBC Act (Large-eared Pied Bat and Grey-headed Flying-fox) concluded that no significant impact on these species is likely to result and no referral to the Commonwealth is required.

An assessment against the objectives of Clause 6.5 of Sutherland Shire Council *Local Environment Plan 2015* (LEP), which applies to areas mapped as “Environmentally Sensitive Land” including the study area, was undertaken. It was determined the condition and ecological value of the STIF and flora and fauna habitat within study area has been heavily degraded by previous land uses with selective clearing and invasion of exotic species having occurred across the study area. Previous disturbance within the study area, associated with past land uses, has reduced the habitat value or importance of the study area for fauna species. The fauna species identified within, or considered likely to occur within, the study area are generally those species which are disturbance tolerant and highly mobile species. Further, the native

vegetation and fauna habitat within the study area is not currently interconnected with any large areas of predominately native vegetation. The existing habitat within the study area is likely to form a 'stepping stone' or island of habitat within disturbed urban areas which would allow for the movement of highly mobile fauna groups throughout the locality. Through the retention of approximately 0.51 ha of STIF and revegetation of 1.01 ha of STIF including groundcovers, shrubs and 438 canopy species, the study area would be expected to continue to function as a stepping stone for highly mobile fauna species to move across the locality.

A number of recommendations have been made in order to further minimise impacts to flora and fauna species including their habitats, including: protecting individual trees and areas of vegetation to be retained; ecologist supervision of vegetation removal and installation of nest boxes to replace loss of potential hollow bearing trees.



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## Appendix A Likelihood of occurrence

Searches of the Atlas of NSW Wildlife and EPBC Act Protected Matters search tool were performed for the study area including a radius of 5 km around the study area.

The results from both searches were compiled into a list of potentially occurring species and populations that may possibly occur within the study area. An assessment of likelihood of occurrence was made for threatened and migratory species identified from the database search. This assessment applies to the entire study area. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the field survey and professional judgement. The terms for likelihood of occurrence are defined below:

- “known” = the species was or has been observed on the site
- “likely” = a medium to high probability that a species uses the site
- “potential” = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- “unlikely” = a very low to low probability that a species uses the site
- “no” = habitat on site and in the vicinity is unsuitable for the species.

# FLORA

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat or species directly/ indirectly impacted	Impact Assessment Required
<i>Acacia bynoeana</i>	Bynoe's Wattle	E1	V	Found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains.	Heath or dry sclerophyll forest on sandy soils.	No	No	No
<i>Acacia pubescens</i>	Downy Wattle	V	V	Restricted to the Sydney region around the Bankstown-Fairfield-Rookwood and Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon.	Open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones.	Unlikely	No	No
<i>Allocasuarina diminuta</i> subsp. <i>mimica</i>	<i>Allocasuarina diminuta</i> subsp. <i>mimica</i> L.A.S.Johnson population in the Sutherland and Liverpool local government areas	E2	-	The endangered population occurs along sandstone ridges and upper hillsides in the region northwest from Heathcote, towards Menai and Holsworthy, in heathy and low open woodland communities. It is restricted to the Local Government Areas listed in this instance (Sutherland and Liverpool). Other occurrences in the Blue Mountains and Southern Highlands (Blackheath to Bundanoon and Taralga), and also in the coastal communities from Kingsford to Little Bay) are not included in the Endangered population listing.	Heathy woodland, heathlands and low open woodlands.	Unlikely	No	No
<i>Allocasuarina glareicola</i>		E1	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool.	Castlereagh woodland on lateritic soil. Found in open woodland with <i>Eucalyptus parramattensis</i> , <i>Eucalyptus fibrosa</i> , <i>Angophora bakeri</i> , <i>Eucalyptus sclerophylla</i> and <i>Melaleuca decora</i> .	No	No	No
<i>Astrotricha crassifolia</i>	Thick-leaf Star-hair	V	V	Near Patonga, and in Royal NP and on the Woronora Plateau. There is also a record from near Glen Davis.	Dry sclerophyll woodland on sandstone.	No	No	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat or species directly/ indirectly impacted	Impact Assessment Required
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	E1	V	Currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast.	Grassy sclerophyll woodland on clay loam or sandy soils, or low woodland with stony soil.	Unlikely	No	No
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V	V	In NSW, recorded mainly on coastal and near coastal ranges north from Victoria to near Forster, with two isolated occurrences inland north-west of Grafton.	Coastal heathlands margins of coastal swamps and sedgeland, coastal forest, dry woodland, and lowland forest.	Unlikely	No	No
<i>Darwinia biflora</i>		V	V	Recorded in Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas, in an area bounded by Maroota, North Ryde, Cowan and Kellyville.	Woodland, open forest or scrub-heath on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	Unlikely	No	No
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V	Narrow band from the Raymond Terrace area south to Waterfall.	Coastal heath on shallow sandy soils overlying Hawkesbury sandstone, mostly on exposed sandy ridges.	No	No	No
<i>Genoplesium baueri</i>	Bauer's Midge Orchid	E1	E	Has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens.	Dry sclerophyll forest and moss gardens over sandstone.	No	No	No
<i>Leucopogon exolasius</i>	Woronora Beard-heath	V	V	Upper Georges River area and in Heathcote National Park.	Woodland on sandstone.	No	No	No
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	Only found in NSW, populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.	Damp places, often near streams or low-lying areas on alluvial soils.	No	No	No
<i>Melaleuca deanei</i>	Deane's Paperbark	V	V	Ku-ring-gai/Berowra area, Holsworthy/Wedderburn area, Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas.	Heath on sandstone.	No	No	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat or species directly/ indirectly impacted	Impact Assessment Required
<i>Pimelea curviflora</i> var. <i>curviflora</i>		V	V	Confined to the coastal area of the Sydney and Illawarra regions between northern Sydney and Maroota in the north-west and Croom Reserve near Albion Park in the south.	Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	Unlikely	No	No
<i>Prostanthera marifolia</i>	Seaforth Mintbush	E4A	CE	Only known from the northern Sydney suburb of Seaforth.	In or in close proximity to the endangered Duffys Forest ecological community, on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses.	No	No	No
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	E1	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south.	Small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines, adjacent to sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	Unlikely	No	No
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E1	V	Only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest.	Subtropical and littoral rainforest on gravels, sands, silts and clays.	No	No	No
<i>Thelymitra kangaloonica</i>	Kangaloon Sun Orchid	E4A	CE	Only known to occur on the southern tablelands of NSW in the Moss Vale / Kangaloon / Fitzroy Falls area at 550-700 m above sea level.	Swamps in sedgeland over grey silty grey loam soils.	No	No	No
<i>Thesium australe</i>	Austral Toadflax	V	V	In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands.	Grassland on coastal headlands or grassland and grassy woodland away from the coast.	Unlikely	No	No



**AQUATIC FAUNA**

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat or species directly/indirectly impacted	Impact Assessment Required
<i>Macquaria australasica</i>	Macquarie Perch	E1	E	Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven catchments.	River and lake habitats, especially the upper reaches of rivers and their tributaries.	No	No	No

**REPTILES AND AMPHIBIANS**

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat or species directly/indirectly impacted	Impact Assessment Required
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	South eastern NSW and Victoria, in two distinct populations: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria.	Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	No	No	No
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E1	V	Largely confined to Triassic and Permian sandstones within the coast and ranges in an area within approximately 250 km of Sydney.	Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.	No	No	No
<i>Litoria aurea</i>	Green and Golden Bell Frog	E1	V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region.	Marshes, dams and stream-sides, particularly those containing <i>Typha</i> spp. (35ulrushes) or <i>Eleocharis</i> spp. (spikerushes). Some populations occur in highly disturbed areas.	No	No	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat or species directly/indirectly impacted	Impact Assessment Required
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	V	Plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest south to Buchan in Victoria. The species has not been recorded in southern NSW within the last decade.	Breeding habitat is the upper reaches of permanent streams and perched swamps. Non-breeding habitat is heath-based forests and woodlands	Unlikely	No	No
<i>Litoria raniformis</i>	Southern Bell Frog	E1	V	In NSW, only known to exist in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A few recent unconfirmed records have also been made in the Murray Irrigation Area.	Permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. Also found in irrigated rice crops.	No	No	No
<i>Mixophyes balbus</i>	Stuttering Frog	E1	V	Along the east coast of Australia from southern Qld to north-eastern Victoria.	Rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	No	No	No
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	-	Confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains.	Open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.	Unlikely	No	No
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V	-	In NSW, found on the Sydney Sandstone in Wollemi National Park, in the Goulburn and ACT regions and near Cooma in the south. Also recorded from the South West Slopes near Khancoban and Tooma River.	Heath, open forest and woodland.	Unlikely	No	No

**BIRDS**

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat or species directly/indirectly impacted	Impact Assessment Required
<i>Actitis hypoleucos</i>	Common Sandpiper	P	C,J,K	Summer migrant. In NSW, widespread along coastline and also occurs in many areas inland.	Coastal wetlands and some inland wetlands, especially muddy margins or rocky shores. Also estuaries and deltas, lakes, pools, billabongs, reservoirs, dams and claypans, mangroves.	Unlikely	No	No
<i>Anous stolidus</i>	Common Noddy	P	C,J	Casual visitor to coastal NSW.	Marine.	No	No	No
<i>Anthochaera phrygia</i>	Regent Honeyeater	E4A	E	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions.	Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of <i>Casuarina cunninghamiana</i> (River Oak).	Unlikely	No	No
<i>Apus pacificus</i>	Fork-tailed Swift	P	C,J,K, Mar	Recorded in all regions of NSW.	Riparian woodland., swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes.	Unlikely	No	No
<i>Ardea alba</i>	Great Egret	P	C, J, Mar	Widespread, occurring across all states/territories. Also a vagrant on Lord Howe and Norfolk Island.	Swamps and marshes, grasslands, margins of rivers and lakes, salt pans, estuarine mudflats and other wetland habitats.	Unlikely	No	No
<i>Ardea ibis</i>	Cattle Egret	P	C,J, Mar	Widespread and common across NSW.	Grasslands, wooded lands and terrestrial wetlands.	Unlikely	No	No
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1	E	Found over most of NSW except for the far north-west.	Permanent freshwater wetlands with tall, dense vegetation, particularly <i>Typha</i> spp. (37ulrushes) and <i>Eleocharis</i> spp. (spikerushes).	Unlikely	No	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat or species directly/indirectly impacted	Impact Assessment Required
<i>Calidris ferruginea</i>	Curlew Sandpiper	E1	C,J,K	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin.	Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	No	No	No
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas	E2,V	-	The population is believed to be largely confined to an area bounded by Thornleigh and Wahroonga in the north, Epping and North Epping in the south, Beecroft and Cheltenham in the west and Turramurra/South Turramurra to the east.	Forest and woodland, urban fringes.	Not in correct LGA	No	No
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	-	In NSW, distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. Isolated records known from as far north as Coffs Harbour and as far west as Mudgee.	Tall mountain forests and woodlands in summer; in winter, may occur at lower altitudes in open eucalypt forests and woodlands, and urban areas.	Likely	Yes	Yes
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V	-	In NSW, widespread along coast and inland to the southern tablelands and central western plains, with a small population in the Riverina.	Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	Unlikely	No	No
<i>Chthonicola sagittata</i>	Speckled Warbler	V	-	From south-eastern Qld, the eastern half of NSW and into Victoria, as far west as the Grampians, mostly on hills and tablelands of the Great Dividing Range and rarely on coast.	<i>Eucalyptus</i> -dominated communities with a grassy understorey and sparse shrub layer, often on rocky ridges or in gullies.	Unlikely	No	No
<i>Circus assimilis</i>	Spotted Harrier	V	-	Found throughout the Australian mainland, except in densely forested or wooded habitats, and rarely in Tasmania.	Grassy open woodland, inland riparian woodland, grassland, shrub steppe, agricultural land and edges of inland wetlands.	Unlikely	No	No
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	Distribution in NSW is nearly continuous from the coast to the far west.	Inhabits eucalypt forests and woodlands, mallee and <i>Acacia</i> woodland.	Unlikely	No	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat or species directly/indirectly impacted	Impact Assessment Required
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E1	E	There are three main populations: Northern – southern Qld/northern NSW, Central – Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern – Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border.	Central and southern populations inhabit heath and open woodland with a heathy understorey. In northern NSW, habitat comprises open forest with dense tussocky grass understorey.	Unlikely	No	No
<i>Epthianura albifrons</i>	White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	E2	-	Two isolated sub-populations known from the Sydney Metropolitan Catchment Management Authority area; one at Newington Nature Reserve on the Parramatta River and one at Towra Point Nature Reserve in Botany Bay	Saltmarsh of Newington Nature Reserve and in grassland on the northern bank of the Parramatta River. Saltmarsh and on the sandy shoreline of a small island of Towra Point Nature Reserve.	No	No	No
<i>Epthianura albifrons</i>	White-fronted Chat	V	-	Occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state.	Saltmarsh vegetation, open grasslands and sometimes low shrubs bordering wetland areas.	No	No	No
<i>Gallinago hardwickii</i>	Latham's Snipe	P	C,J,R, Mi, Mar	Migrant to east coast of Australia, extending inland west of the Great Dividing Range in NSW.	Freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually freshwater swamps, flooded grasslands or heathlands.	No	No	No
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	In NSW, found from the coast westward as far as Dubbo and Albury.	Dry, open eucalypt forests and woodlands, including remnant woodland patches and roadside vegetation.	Unlikely	No	No
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V	-	Distributed along the entire NSW coast.	Rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	No	No	No
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	P	C	Distributed along the coastline of mainland Australia and Tasmania, extending inland along some of the larger waterways, especially in eastern Australia.	Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	Flyover	No	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat or species directly/indirectly impacted	Impact Assessment Required
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	Throughout the Australian mainland, with the exception of the most densely-forested parts of the Dividing Range escarpment.	Open eucalypt forest, woodland or open woodland, including sheoak or <i>Acacia</i> woodlands and riparian woodlands of interior NSW.	Unlikely	No	No
<i>Lathamus discolor</i>	Swift Parrot	E1	E	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes.	Box-ironbark forests and woodlands.	Unlikely	No	No
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	V	C,J,K	Occur occasionally on the southern Australian coast. In NSW, mainly recorded in Hunter River estuary, with birds occasionally reaching the Shoalhaven estuary. There are few records for inland NSW.	Sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs.	No	No	No
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	In NSW, it is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast.	Timbered habitats including dry woodlands and open forests, particularly timbered watercourses.	Unlikely	No	No
<i>Monarcha melanopsis</i>	Black-faced Monarch	P	Bonn, Mar	In NSW, occurs around the eastern slopes and tablelands of the Great Divide, inland to Coutts Crossing, Armidale, Widden Valley, Wollemi National Park and Wombeyan Caves. It is rarely recorded farther inland.	Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	Unlikely	No	No
<i>Monarcha trivirgatus</i>	Spectacled Monarch	P	Bonn, Mar	Coastal eastern Australia south to Port Stephens in NSW.	Mountain/lowland rainforest, wooded gullies, riparian vegetation including mangroves.	Unlikely	No	No
<i>Motacilla flava</i>	Yellow Wagtail	P	C,J,K	Regular summer migrant to mostly coastal Australia. In NSW recorded Sydney to Newcastle, the Hawkesbury and inland in the Bogan LGA.	Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns.	No	No	No



Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat or species directly/indirectly impacted	Impact Assessment Required
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	P	Bonn, Mar	In NSW, widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains.	Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies.	Unlikely	No	No
<i>Ninox strenua</i>	Powerful Owl	V	-	In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains.	Woodland, open sclerophyll forest, tall open wet forest and rainforest.	Potential	Yes	Yes
<i>Numenius madagascariensis</i>	Eastern Curlew	P	C,J,K	Summer migrant to Australia. Primarily coastal distribution in NSW, with some scattered inland records.	Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	No	No	No
<i>Pandion cristatus</i>	Eastern Osprey	V	-	Common around the northern NSW coast, and uncommon to rare from coast further south. Some records from inland areas.	Rocky shorelines, islands, reefs, mouths of large rivers, lagoons and lakes.	Unlikely	No	No
<i>Ptilinopus regina</i>	Rose-crowned Fruit-Dove	V	-	In NSW, found on coast and ranges north from Newcastle. Vagrants are occasionally found further south to Victoria.	Sub-tropical and dry rainforest, moist eucalypt forest and swamp forest, where fruit is plentiful.	Unlikely	No	No
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	V	-	Principally from north-eastern Qld to north-eastern NSW. Further south, it is confined to pockets of suitable habitat, and occurs as far south as Moruya.	Rainforest and closed forests. May also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	Unlikely	No	No
<i>Puffinus assimilis</i>	Little Shearwater	V	-	Recorded off NSW coast. Breeds on Lord Howe Island.	Marine.	No	No	No
<i>Rhipidura rufifrons</i>	Rufous Fantail	P	Bonn, Mar	Coastal and near coastal districts of northern and eastern Australia, including on and east of the Great Divide in NSW.	Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands.	Unlikely	No	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat or species directly/indirectly impacted	Impact Assessment Required
<i>Rostratula australis</i>	Australian Painted Snipe	E1	E, Mar	In NSW most records are from the Murray-Darling Basin. Other recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys.	Swamps, dams and nearby marshy areas.	No	No	No
<i>Tringa nebularia</i>	Common Greenshank	P	C,J,K	Summer migrant to Australia. Recorded in most coastal regions of NSW; also widespread west of the Great Dividing Range, especially between the Lachlan and Murray Rivers and the Darling River drainage basin, including the Macquarie Marshes, and north-west regions.	Terrestrial wetlands (swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans, saltflats, sewage farms and saltworks dams, inundated rice crops and bores) and sheltered coastal habitats (mudflats, saltmarsh, mangroves, embayments, harbours, river estuaries, deltas, lagoons, tidal pools, rock-flats and rock platforms).	No	No	No
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	Recorded over approximately 90% of NSW, excluding the most arid north-western corner. Most abundant on the coast but extends to the western plains.	Dry eucalypt forests and woodlands from sea level to 1100 m.	Flyover	No	No
<i>Tyto tenebricosa</i>	Sooty Owl	V	-	Occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands.	Dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	Flyover	No	No
<i>Xenus cinereus</i>	Terek Sandpiper	V	C,J,K	A rare migrant to the eastern and southern Australian coasts. The two main sites in NSW are the Richmond River estuary and the Hunter River estuary.	Mudbanks and sandbanks near mangroves, rocky pools and reefs, and occasionally up to 10 km inland around brackish pools.	No	No	No

**MAMMALS**

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat or species directly/ indirectly impacted	Impact Assessment Required
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes.	Rainforest, sclerophyll forest (including Box-Ironbark), woodland and heath.	Unlikely	No	No
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes.	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	Potential	Yes	Yes
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Qld.	Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Unlikely	No	No
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	South-east coast and ranges of Australia, from southern Qld to Victoria and Tasmania. In NSW, records extend to the western slopes of the Great Dividing Range.	Tall (greater than 20m) moist habitats. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	Likely	Yes	Yes
<i>Isodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)	E1	E	Found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River.	Heath or open forest with a heathy understorey on sandy or friable soils.	No	No	No
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	-	In NSW it occurs on both sides of the Great Dividing Range, from the coast inland to Moree, Dubbo and Wagga Wagga.	Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	Likely	Yes	Yes
<i>Myotis macropus</i>	Southern Myotis	V	-	In NSW, found in the coastal band. It is rarely found more than 100 km inland, except along major rivers.	Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20m.	Unlikely	No	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence	Habitat or species directly/ indirectly impacted	Impact Assessment Required
<i>Petauroides volans</i>	Greater Glider	P	V	Restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level.	Eucalypt forest and woodland.	Unlikely	No	No
<i>Phascolarctos cinereus</i>	Koala, Hawks Nest and Tea Gardens population	E2,V	V	Known from, and in the immediate vicinity of, the towns of Hawks Nest and Tea Gardens in the Great Lakes Local Government Area.	Eucalypt forest and woodland communities, including coastal forests, rainforest, riparian areas, swamp sclerophyll forests, heathland and shrubland.	No – Not in correct LGA	No	No
<i>Phascolarctos cinereus</i>	Koala in the Pittwater Local Government Area	E2,V	V	The endangered population occurs within the Pittwater Local Government Area, with most recent records occurring on the Barrenjoey Peninsula.	Eucalypt forests and woodlands. Key likely habitats within Pittwater Council are: Swamp Mahogany Forest, ecotone between Spotted Gum Forest & Hawkesbury Sandstone Open-Forest, Northern form of Coastal Sandstone Woodland at Whale Beach, Red Bloodwood - Scribbly Gum Woodland, Bilgola Plateau Forest and the Grey Ironbark - Grey Gum form of the Newport Bangalay Woodland.	No – not in correct LGA	No	No
<i>Phascolarctos cinereus</i>	Koala	V	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands.	Eucalypt woodlands and forests.	Unlikely	No	No
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	P	V	Fragmented distribution across eastern NSW.	Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	Unlikely	No	No
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria.	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Likely	Yes	Yes

# Appendix B Flora list

Scientific Name	Common Name	Native / Exotic / Planted	Noxious Weeds	WoNS
<i>Acacia floribunda</i>	White Sally Wattle	N		
<i>Acacia parramattensis</i>	Parramatta Wattle	N		
<i>Acer negundo</i>	Boxelder Maple	P/E		
<i>Acmena smithii</i>	Lillypilly	P/N		
<i>Ageratina adenophora</i>	Crofton Weed	E		
<i>Allocasuarina littoralis</i>	Black Sheoak	N		
<i>Allocasuarina torulosa</i>	Forest Sheoak	N		
<i>Alocasia</i> sp.		P/E		
<i>Angophora costata</i>	Smooth-barked Apple	N		
<i>Anredera cordifolia</i>	Madeira Vine	E	Class 4	Y
<i>Araujia sericifera</i>	Moth Vine	E		
<i>Asparagus aethiopicus</i>	Asparagus Fern	E	Class 4	Y
<i>Asparagus officinalis</i>	Asparagus	E	Class 4	Y
<i>Banksia integrifolia</i>	Coastal Banksia	N		
<i>Breynia oblongifolia</i>	Coffee Bush	N		
<i>Buddleja davidii</i>	Summer Lilac	P/E		
<i>Callistemon salignus</i>	Bottlebrush	N		
<i>Camellia sasanqua</i>	Camellia	P/E		
<i>Canna</i> sp.	Canna Lily	P/E		
<i>Cassytha pubescens</i>		N		
<i>Cayratia clematidea</i>	Native Grape	N		
<i>Centaurea</i> sp.	Cornflower	E		
<i>Chlorophytum</i> sp.	Spider Plant	P/E		
<i>Cinnamomum camphora</i>	Camphor Laurel	E		
<i>Cirsium vulgare</i>	Spear Thistle	E		
<i>Clerodendrum tomentosum</i>	Hairy Clerodendrum	N		
<i>Clivia miniata</i>		P/E		
<i>Cotoneaster glaucophyllus</i>	Cotoneaster	E		
<i>Cynodon dactylon</i>	Couch	E		

Scientific Name	Common Name	Native / Exotic / Planted	Noxious Weeds	WoNS
<i>Cyperus brevifolius</i>	Mullumbimby Couch	E		
<i>Cyperus eragrostis</i>	Umbrella Sedge	E		
<i>Cytisus scoparius</i>	Scotch Broom	E	4	
<i>Delairea odorata</i>	Cape Ivy	E		
<i>Dianella caerulea</i>	Blue Flax-lily	N		
<i>Dodonaea viscosa</i> subsp. <i>purpurea</i>	Purple Hop Bush	P/E		
<i>Doodia aspera</i>	Prickly Rasp Fern	N		
<i>Ehrharta erecta</i>	Panic Veldtgrass	E		
<i>Entolasia stricta</i>	Wiry Panic	N		
<i>Eragrostis curvula</i>	African Lovegrass	E		
<i>Eucalyptus microcorys</i>	Tallowwood	P/N		
<i>Eucalyptus paniculata</i>	Grey Ironbark	N		
<i>Eucalyptus pilularis</i>	Blackbutt	N		
<i>Eucalyptus saligna</i>	Blue Gum	N		
<i>Eucalyptus saligna</i> x <i>botryoides</i>	Blue Gum x Bangalay	N		
<i>Eustrephus latifolius</i>	Wombat Berry	N		
<i>Exocarpos cupressiformis</i>	Native Cherry	N		
<i>Ficus microcarpa</i> var. <i>hilli</i>	Chinese Banyan	P/E		
<i>Ficus rubiginosa</i>	Rusty Fig	N		
<i>Geitonoplesium cymosum</i>	Scrambling Lily	N		
<i>Geranium homeanum</i>		N		
<i>Glochidion ferdinandi</i>	Cheese Tree	N		
<i>Glycine microphylla</i>	Small-leaf Glycine	N		
<i>Grevillea robusta</i>	Silky Oak	P/N		
<i>Hakea dactyloides</i>	Finger Hakea	N		
<i>Hardenbergia violacea</i>	Purple Coral Pea	N		
<i>Hedera canariensis</i>	Canary Island Ivy	E		
<i>Hypericum perforatum</i>	St John's Wort	E	Class 4	
<i>Howe asp.</i>	Kentia Palm	E		
<i>Ipomoea indica</i>	Morning Glory	E		
<i>Lagerstroemia indica</i>	Crepe Myrtle	P/E		



Scientific Name	Common Name	Native / Exotic / Planted	Noxious Weeds	WoNS
<i>Lepidosperma</i> sp.		N		
<i>Leonotis leonurus</i>	Lion's Tail	P/E		
<i>Leucopogon juniperinus</i>	Prickly Beard-heath	N		
<i>Ligustrum lucidum</i>	Large-leaved Privet	E	Class 4	
<i>Ligustrum sinense</i>	Small-leaved Privet	E	Class 4	
<i>Lomandra longifolia</i>	Spiky-headed mat-rush	N		
<i>Lonicera japonica</i>	Japanese Honeysuckle	E		
<i>Jacaranda mimosifolia</i>	Jacaranda	P/E		
<i>Jasminum</i> sp.	Jasmin	P/E		
<i>Juncus usitatus</i>	Common Rush	N		
<i>Macadamia tetraphylla</i>	Macadamia	P/N		
<i>Melaleuca linariifolia</i>	Flax-leaved Paperbark	N		
<i>Microlaena stipoides</i>	Weeping Grass	N		
<i>Monstera deliciosa</i>		P/E		
<i>Morus nigra</i>	Mulberry	E		
<i>Myrsine variabilis</i>		N		
<i>Nandina domestica</i>	Sacred Bamboo	E		
<i>Nephrolepis cordifolia</i>	Fishbone Fern	E		
<i>Notelaea longifolia</i>	Large Mock-olive	N		
<i>Notelaea venosa</i>	Veined Mock-olive	N		
<i>Ochna serrulata</i>	Mickey Mouse Plant	E		
<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive	E	Class 4	
<i>Oplismenus aemulus</i>	Basket Grass	N		
<i>Pandorea pandorana</i>	Wonga Wonga Vine	N		
<i>Panicum simile</i>	Two-colour Panic	N		
<i>Passiflora suberosa</i>	Cork Passionflower	E		
<i>Phoenix canariensis</i>	Phoenix Palm	E		
<i>Philodendron</i> sp.		P/E		
<i>Phytolacca octandra</i>	Inkweed	E		
<i>Pinus radiata</i>	Pine	E		
<i>Pittosporum undulatum</i>	Sweet Pittosporum	N		

Scientific Name	Common Name	Native / Exotic / Planted	Noxious Weeds	WoNS
<i>Pittosporum revolutum</i>	Rough Fruit Pittosporum	N		
<i>Plumbago auriculata</i>	Plumbago	P/E		
<i>Podocarpus elatus</i>	Plum Pine	N		
<i>Polyscias sambucifolia</i>	Elderberry Panax	N		
<i>Pteridium esculentum</i>	Bracken	N		
<i>Quercus robur</i>	Oak	P/E		
<i>Ricinus communis</i>	Castor Oil Plant	E		
<i>Rubus</i> sp.	Blackberry	E		
<i>Senna pendula</i> var. <i>glabrata</i>	Senna	E		
<i>Schinus molle</i>	Peruvian Pepper Tree	E		
<i>Smilax glycyphylla</i>	Sweet Sarsaparilla	N		
<i>Spiraea cantoniensis</i>	May Bush	P/E		
<i>Stephania japonica</i>	Snake Vine	N		
<i>Syncarpia glomulifera</i>	Turpentine	N		
<i>Tecoma capensis</i>	Cape Honeysuckle	P/E		
<i>Toona ciliata</i>	Red Cedar	N		
<i>Tradescantia fluminensis</i>	Wandering Jew	E		
<i>Vinca major</i>	Periwinkle	E		
<i>Viola</i> sp.		E		

#### Key

N = Native species

E = Exotic species

P/E = Planted exotic species

P/N = Planted native species (not locally endemic)

## Appendix C Incidental fauna observations

Scientific Name	Common Name	Observation Type
Aves		
<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill	O
* <i>Acridotheres tristis</i>	Common Myna	O
<i>Anthochaera chrysoptera</i>	Little Wattlebird	O
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	O
<i>Geopelia placida</i>	Peaceful Dove	O
<i>Grallina cyanoleuca</i>	Magpie Lark	O
<i>Gymnorhina tibicen</i>	Australian Magpie	O
<i>Ocyphaps lophotes</i>	Crested Pigeon	O
<i>Platycercus elegans</i>	Crimson Rosella	O
<i>Ptilonorhynchus violaceus</i>	Satin Bowerbird	O
<i>Trichoglossus moluccanus</i>	Rainbow Lorikeet	O

Observation Types:

O = Observed

W = heard

\*Introduced species

## Appendix D Assessments of Significance

### Sydney Turpentine Ironbark Forest (STIF)

Sydney Turpentine- Ironbark Forest (STIF) is a critically endangered ecological community listed under the TSC Act. The community occurs in the Sydney region and across its natural range is heavily fragmented, with only 0.5 percent its original extent remaining intact. The community originally existed as a forest but disturbance and clearing means that the community now exists as woodland or remnant trees. Remnants mostly occur in the Baulkham Hills, Hawkesbury, Hornsby, Ku-ring-gai, Parramatta, Ryde, Sutherland and Wollondilly LGA.

The community is described as an open forest with dominant canopy trees including *Angophora costata* (Smooth-barked Apple), *Syncarpia glomulifera* (Turpentine), *Eucalyptus punctata* (Grey Gum), *E. paniculata* (Grey Ironbark), *E. globoidea* (White Stringybark) and *E. eugenioides* (Thin-leaved Stringybark). In areas of high rainfall (over 1050 mm per annum) Sydney Blue Gum *E. saligna* is more dominant. The shrub stratum is usually sparse and may contain mesic species such as *Pittosporum undulatum* (Sweet Pittosporum) and *Polyscias sambucifolia* (Elderberry Panax).

- 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 the risk of extinction.**

This question is 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**

This question is 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**

The local occurrence of STIF refers to the occurrence of the community within the study area or may include adjacent areas where the STIF forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated. As no validation of the occurrence of STIF outside the study area has been undertaken and no exchange of genetic material can be clearly demonstrated, for the purposes of this assessment the local occurrence of STIF is considered to occurrence of the ecological community within the study area.

A total of 1.18 ha of STIF was identified as the local occurrence, including STIF within the study area and the nature strip. The proposed development would result in impacts to approximately 0.67 ha (57%) of the STIF with approximately 0.51 ha (43%) to be retained. Of the 0.67 ha of impacts, 0.57 ha would represent a total loss of the community while 0.1 ha would include only impact to the understorey with the canopy layer retained. A further 0.51 ha of the local occurrence of STIF would be retained (0.25 ha within the study area and 0.26 ha within the nature strip. A replanting plan proposes replanting 1.01 has of STIF community within the study area, including groundcovers, shrubs and 438 canopy species.

While the proposed development would reduce the extent of the local occurrence of STIF, through retention of approximately 0.51 ha (43%) of STIF and appropriate management of these areas, the local occurrence is unlikely to be placed 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 STIF within the study area was identified as being in poor to moderate condition. The species composition has been changed through a long disturbance history. While the proposal will impact approximately 0.67 ha of STIF (including total loss of 0.57 ha and partial impacts to 0.1 ha), 0.51 ha will be retained and 1.01 ha of STIF will be replanted within the study area. The proposal is unlikely to substantially and adversely modify the composition of the local occurrence of STIF. The condition of the retained STIF within the study area will be improved or maintained, particularly through revegetation.

**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**

A total of 1.18 ha of STIF was identified within the study area. The proposed development would result in impacts to approximately 0.67 ha (57%) of the STIF identified within the study area with approximately 0.51 ha (43%) to be retained. Of the 0.67 ha of impacts, 0.57 ha would represent a total loss of the community while 0.1 ha would include only impact to the understorey with the canopy layer retained.

- 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 local occurrence of STIF is fragmented and consists of isolated patches within an urban context. The STIF within the study area is not currently interconnected with any large areas of predominately native vegetation. The proposed development will reduce the extent of STIF within the study area but will largely maintain the existing fragmented and isolated nature of the STIF within the study area and adjacent areas.

- 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,**

Given the relatively small area (0.67 ha) of STIF to be impacted, its highly-disturbed condition and the isolated and fragmented distribution of the STIF which is proposed to be removed, this area is not considered important to the long-term survival of STIF in the locality. The proposed works would not impact areas of STIF mapped (OEH 2013) to the east of the study area within the Royal National Park (Figure 3).

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

No critical habitat of this community has been identified by the Office of Environment and Heritage 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 plan,**

There is currently no Recovery Plan or Threat Abatement Plan for STIF.

- 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 key threatening process 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*”. One threatening process listed under Schedule 3 of the TSC Act, “Clearing of Native Vegetation”, is relevant to the current proposal and poses a threat to the continued survival of STIF. While the proposed development would involve clearing of approximately 0.57 ha of STIF, with partial clearing/impacts to a further 0.1 ha, approximately 0.51 ha of the local occurrence would be retained and a further 1.01 ha of STIF will be replanted within the study area.

### **Conclusion**

Based on the above factors, the proposal is unlikely to result in a significant impact to the local occurrence of STIF. Therefore, a Species Impact Statement (SIS) is not required.



***Callocephalon fimbriatum* Gang-gang Cockatoo**

*Callocephalon fimbriatum* (Gang-gang Cockatoo) is listed as a vulnerable species under Schedule 2 of the TSC Act. The Gang-gang Cockatoo is distributed from Southern Victoria through south- and central-eastern New South Wales. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the Australian Capital Territory. It is rare at the extremities of range, with isolated records known as far north as Coffs Harbour and as far west as Mudgee (OEH 2017).

The Gang-gang Cockatoo is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests during the summer months. During winter this species moves to lower altitudes to drier, more open eucalypt forests and woodland, particularly in box-ironbark assemblages or in dry forest in coastal areas. It may also occur in sub-alpine *Eucalyptus pauciflora* (Snow Gum) woodland and occasionally in temperate rainforests. This species prefers old growth attributes for nesting and roosting making nests in hollows with a diameter >10cm in tall eucalypts 12-27 m high

Gang-gang Cockatoo have not been recorded on the site but is known from database records within 5 km of the site. The species may forage throughout the study area but is unlikely to breed as no large hollows were observed.

- 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 Gang-gang Cockatoo would include clearing or degradation of large areas of habitat and clearing of nesting trees (individual pairs show high fidelity to selected nesting hollows due to particular shape, position and structure).

The proposed development would result in a loss of approximately 0.57 ha, with partial impacts to a further 0.1 ha, of native vegetation representing foraging habitat for this species. Approximately 0.51 ha of foraging habitat would be retained and a further 1.01 ha of STIF will be replanted including 438 canopy species.

As the proposed development would only impact upon a small area of potential foraging habitat and would not impact upon any known nesting trees, the proposed development is unlikely to have an adverse effect on the species to the extent that a 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**

This question is 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**

This question is 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**

A total of 1.18 ha of native vegetation, representing foraging habitat for this species was identified within the study area. The proposed development would result in impacts to approximately 0.67 ha (57%) of the foraging habitat identified within the study area with approximately 0.51 ha (43%) to be retained. Of the 0.67 ha of impacts, 0.57 ha would represent a total loss of the foraging habitat, while 0.1 ha would include only impacts to the understorey with the canopy layer retained.

**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**

Gang-gang Cockatoo is a highly mobile species and the removal of vegetation within the study area will not fragment or isolate areas of habitat for this species.

**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 study area includes only a relatively small area of highly modified foraging habitat for this species and does not include any known nesting trees. The potential foraging habitat for this species within the study area is not considered to be important to the long-term survival of the species.

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

No critical habitat has been declared for the Gang-gang Cockatoo.

**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 Gang-gang Cockatoo, although four actions have been identified to help recover this species. The current proposal is not in conflict with any of the 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 Key Threatening Processes (KTP) are relevant to this proposal with respect to the Gang-gang Cockatoo. These include:

- Clearing of native vegetation / Land clearance.
- Removal of dead wood and dead trees.
- Loss of hollow-bearing trees.

However, the potential foraging habitat to be removed is not considered to be important habitat. Tree hollows to be removed are considered to be too small for use by Gang-gang cockatoo. Likewise, dead trees (stags) present on the site did not show any obvious hollows large enough to be occupied by this species.

**Conclusions**

The proposal is unlikely to constitute a significant impact on the Gang-gang Cockatoo given that:

- The proposed works would result in a minor reduction in the extent of foraging habitat within the study area.
- The proposed works would not disturb any known breeding or roosting sites.
- Larger areas of suitable foraging habitat are present within the surrounding landscape.
- The proposal would not isolate or fragment any currently connecting areas of habitat in terms of use by highly mobile species.
- The hollows to be removed within the proposed impact area are likely to be too small to be utilised by this species.

**Microbats: *Chalinolobus dwyeri* (Large-eared Pied Bat), *Falsistrellus tasmaniensis* (Eastern False Pipistrelle) and *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat).**

*Chalinolobus dwyeri* (Large-eared Pied Bat) is listed as Vulnerable on Schedule 2 of the TSC Act. The species occupies a range of forested environments from dry sclerophyll woodlands to rainforest (Churchill 1998), mainly occurring in areas with extensive cliffs and caves, from Rockhampton to Bungonia. The Large-eared Pied Bat is a cave-roosting species, roosting communally during the day near the entrances of caves, crevices in cliffs, mines, tunnels, culverts, and the disused bottle-shaped mud nests of *Hirundo ariel* (Fairy Martin) (OEH 2017). Its flight pattern is relatively slow, and only moderately maneuverable. They forage predominantly below the canopy level and also low along creek beds (Hoye & Dwyer 1995).

*Falsistrellus tasmaniensis* (Eastern False Pipistrelle) is listed as a vulnerable species under Schedule 2 of the TSC Act. The Eastern False Pipistrelle is found on the South-east coast and ranges of Australia, from Southern Queensland to Victoria and Tasmania. It generally roosts in Eucalypts hollows but has also been found under loose bark on trees or in buildings showing preference for moist habitats and trees taller than 20m. The Eastern False Pipistrelle forages above or just below the tree canopy for beetles, moths, weevils and other flying insects (OEH 2017).

*Miniopterus schreibersii oceanensis* (Eastern Bent-wing Bat) 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 through the Northern Territory and Kimberley area (subject to subdivision of this species) (OEH 2017). They have 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 the 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 2017).

These three microbat species have not been detected at the site, but the hollow-bearing trees may provide potential roosting habitat for the Eastern False Pipistrelle and Eastern Bent-wing Bat, while all three species have potential to forage 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.**

Adverse effects on the life cycle of these species are likely to result from the following (OEH 2017):

- Large-eared Pied Bat
  - a substantial loss of roosting habitats such as cliffs, mines and caves
  - loss and/or fragmentation of foraging habitat around these roosting sites
  - pesticide usage and inappropriate fire regimes.
- Eastern False Pipistrelle
  - loss of hollow-bearing eucalypts (roosting habitat)
  - disturbance to winter roosting and breeding sites
  - loss and fragmentation of foraging habitat, in particular extensive areas of continuous forest and areas of high productivity.

- Eastern Bent-wing Bat
  - Disturbance by recreational cavers and public accessing caves and adjacent areas particularly during winter or breeding
  - Loss of high productivity foraging habitat
  - Introduction of exotic pathogens, particularly white-nose fungus
  - Blockages to cave entrances including human barriers and vegetation (particularly blackberries)
  - Hazard reduction and wildfire fires during the breeding season.

A total of 1.18 ha of native vegetation, representing foraging habitat for this species was identified within the study area. The proposed development would result in impacts to approximately 0.67 ha (57%) of the foraging habitat identified within the study area with approximately 0.51 ha (43%) to be retained. Of the 0.67 ha of impacts, 0.57 ha would represent a total loss of the foraging habitat, while 0.1 ha would include only impacts to the understorey with the canopy layer retained. Additionally, four potentially hollow-bearing trees would be impacted by the proposed development.

The proposed development is unlikely to adversely impact the local populations of these species (which is defined as any individuals of the three species which may utilise the study area and adjacent areas), as the loss of a small area of potential foraging habitat and four potential hollow-bearing trees is considered minor in the context of the large areas of habitat within the locality which would be available to the local populations of these highly mobile 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.**

This question is 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,

This question is 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

A total of 1.18 ha of native vegetation, representing foraging habitat for this species was identified within the study area. The proposed development would result in impacts to approximately 0.67 ha (57%) of the foraging habitat identified within the study area with approximately 0.51 ha (43%) to be retained. Of the 0.67 ha of impacts, 0.57 ha would represent a total loss of the foraging habitat, while 0.1 ha would include only impacts to the understorey with the canopy layer retained. Additionally the proposed development would impact on four potential hollow bearing trees providing potential roosting habitat for the Eastern False Pipistrelle and Eastern Bent-wing Bat

**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**

All of these species are highly mobile and the removal of vegetation within the study area will not fragment or isolate areas of habitat for these species.

**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 habitat to be removed is not considered to be important to the long-term survival of the Large-eared Pied Bat, Eastern False Pipistrelle or Eastern Bent-wing Bat. A relatively small area of potential roosting and foraging habitat will be impacted compared to the vast areas of foraging and roosting habitat (hollow bearing trees) within adjacent Royal National Park.

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

No critical habitat has been declared for the Large-eared Pied Bat, Eastern False Pipistrelle or Eastern Bent-wing Bat.

**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 Eastern False Pipistrelle or Eastern Bent-wing Bat. A number of actions have been listed for each species through the Save Our Species program. The proposed development does not conflict with these actions.

Specific recovery actions listed for the Eastern False Pipistrelle include:

- retention of HBTs within suitable habitat,
- undertake revegetation, using a locally appropriate mix of native species, in areas that will develop into tall forest, and
- Ensure roosting bats are not present before removing or disturbing hollow-bearing trees in winter.

Three of the seven HBTs within the study area will be retained. The remaining four HBTs that will be removed will be surveyed prior to tree removal to ensure they are not occupied by threatened microbat species or any other fauna species.

A national recovery plan has been prepared for the Large-eared Pied Bat (DERM 2011). The recovery objectives/actions include:

- 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 and
- Determine the meta-population dynamics throughout the distribution of the Large-eared Pied Bat.

The proposed action is not in conflict with these objectives/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.**

Two key threatening process are relevant to this proposal with respect to the Large-eared Pied Bat, Eastern False Pipistrelle or Eastern Bent-wing Bat:

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

A total of 1.18 ha of native vegetation, representing foraging habitat for this species was identified within the study area. The proposed development would result in impacts to approximately 0.67 ha (57%) of the foraging habitat identified within the study area with approximately 0.51 ha (43%) to be retained. Of the 0.67 ha of impacts, 0.57 ha would represent a total loss of the foraging habitat, while 0.1 ha would include only impacts to the understorey with the canopy layer retained. Additionally, the proposed development would impact on four potential hollow bearing trees providing potential roosting habitat for the Eastern False Pipistrelle and Eastern Bent-wing Bat. This is considered to be a relatively small impact compared to the vast areas of adjacent habitat in Royal National Park. Post construction, the site will be landscaped and areas of STIF vegetation will be enhanced through weeding and revegetation.

### **Conclusions**

The proposal is unlikely to result in a significant impact on Large-eared Pied Bat, Eastern False Pipistrelle or Eastern Bent-wing Bat given that:

- The proposed works would constitute a minor disturbance to an area of foraging habitat within the broader region.
- The proposed works will not disturb any caves or foraging habitat adjacent to caves.
- The proposed works would remove four hollow bearing trees but preclearance surveys will ensure threatened microbats are not present prior to habitat removal.
- Large areas of suitable foraging habitat are present within the surrounding landscape.
- The proposal would not isolate or fragment any currently connecting areas of habitat in terms of use by these highly mobile species.

On the basis of the above considerations, it is unlikely that the proposal will result in a significant impact on the Large-eared Pied Bat, Eastern False Pipistrelle or Eastern Bent-wing Bat.



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

*Pteropus poliocephalus* (Grey-headed Flying-fox, GHFF) utilises a wide variety of habitats (including disturbed areas) for foraging, and are recorded as travelling long distances on feeding forays (Churchill 1998). Fruits and flowering plants of a wide variety of species are the main food source. The species roosts in large 'camps' of up to 200,000 individuals. Camps are usually formed close to water and along gullies however the species has been known to form camps in urban areas (Churchill 1998).

This species was not recorded on site during the survey, but has been recorded within 5 km of the site. GHFF do not use the subject site for roosting, but the trees within the site are potential foraging habitat. The closest camp is located at Kareela, approximately 12 km northeast 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.**

Impacts to GHFF likely to place a local population at risk of extinction would include widespread loss of foraging habitat or disturbance of roosting sites. The proposed development would involve impacts to approximately 0.67 ha of STIF representing foraging habitat for this species. This loss of foraging habitat is considered to be minor compared to the vast areas of foraging habitat in the region (including the adjacent Royal National Park) which would be available to any local population which utilises the study area. As such, the proposal is unlikely to adversely affect GHFF such that a viable local population will be 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 question is 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.**

This question is 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**

A total of 1.18 ha of native vegetation, representing foraging habitat for this species was identified within the study area. The proposed development would result in impacts to approximately 0.67 ha (57%) of the foraging habitat identified within the study area with approximately 0.51 ha (43%) to be retained. Of the 0.67 ha of impacts, 0.57 ha would represent a total loss of the foraging habitat, while 0.1 ha would include only impacts to the understorey with the canopy layer retained.

- 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**

GHFF is a highly mobile species and the removal of vegetation within the study area will not fragment or isolate areas of habitat for this species.

**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 habitat to be impacted within the study area is not considered to be important to the long-term survival of the GHFF in the locality for the following reasons:

- there are no camps located within the study area, the closest camp being 12 km to the northeast
- the amount of vegetation to be impacted (approximately 0.67 ha) is relatively small compared to the vast areas of foraging habitat in the surrounding region.

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

No critical habitat for GHFF has been identified.

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

There is currently a draft National Recovery Plan for the GHFF (DoEE 2017). This recovery plan identifies the following objectives:

- Identify, protect and enhance native foraging habitat critical to the survival of the Grey-headed Flying-fox.
- Identify, protect and enhance roosting habitat of Grey-headed Flying-fox camps.
- Determine population trends in Grey-headed Flying-foxes so as to monitor the species' national distribution and conservation status.
- Build community capacity to coexist with flying-foxes and minimise the impacts on urban settlements from existing camps without resorting to dispersal.
- Increase public awareness and understanding of Grey-headed Flying-foxes and the recovery program, and involve the community in the recovery program where appropriate.
- Improve the management of Grey-headed Flying-fox camps in sensitive areas.
- Promote practical and cost-effective non-lethal measures to protect commercial crops from flying-fox damage (e.g. netting), particularly in newly occupied areas
- Support research activities that will improve the conservation status and management of Grey-headed Flying-foxes.
- Assess and reduce the impact on Grey-headed Flying-foxes of electrocution on power lines, and entanglement in netting and on barbed-wire.

The proposed development is not inconsistent the objectives of this plan.

**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 key threatening processes are relevant to this proposal with respect to the GHFF:

- Clearing of native vegetation.

The proposal involves impacts to 0.67 ha of native vegetation representing potential foraging habitat, which is considered to be a relatively minor loss of habitat compared to the vast areas of foraging habitat in the region. The proposal is unlikely to exacerbate this key threatening process.

## **Conclusions**

The proposal is unlikely to constitute a significant impact on GHFF given that:

- The proposed works would constitute a minor disturbance to an area of foraging habitat compared to larger areas of suitable foraging habitat within the surrounding landscape,
- The proposal would not isolate or fragment any currently connecting areas of habitat in terms of use by highly mobile species,
- GHFF camps will not be disturbed.

On the basis of the above considerations, it is unlikely that the proposal will constitute a significant impact on the GHFF.

***Ninox strenua* (Powerful Owl)**

*Ninox strenua* (Powerful Owl) is listed as a vulnerable species under Schedule 2 of the TSC Act. It is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria and occurs at low densities (OEH 2017). 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 2017).

Powerful Owls occur primarily in densely vegetated gullies of open and tall open forest, but they are also found in a wider range of habitats, including forests and woodlands within the metropolitan regions of cities (Cooke *et al.* 2002). However, optimal habitat requires large tracts of forest or woodland habitat, including a tall shrub layer and abundant hollows supporting high densities of arboreal marsupial prey species (OEH 2017).

This species roosts in dense mid-canopy trees (such as *Syncarpia glomulifera* (Turpentine), She-oaks and rainforest trees), or tall shrubs in sheltered gullies, typically on wide creek flats and at the heads of minor drainage lines (OEH 2017). Nesting occurs from late autumn to mid-winter in large hollows (at least 0.5 m deep) in eucalypts. Nest trees are typically emergent, and are often the largest and oldest in a stand (Debus & 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 400-1400 ha depending on habitat quality (OEH 2017), utilising various portions of this area at different times, depending on the local abundance of arboreal mammals as a food source (Debus & Chafer 1994). Powerful Owls prey particularly on the Greater Glider and Ringtail Possum although the relative importance of prey items appears to vary regionally, with other prey such as *Petaurus breviceps* (Sugar Glider), *Trichosurus vulpecula* (Brushtail Possum), *Pteropus poliocephalus* (Grey-headed Flying-fox), insects and birds also used (Debus & Chafer 1994; OEH 2017).

This species is threatened by a number of processes including loss and fragmentation of suitable forest and woodland habitat from land clearing for residential and agricultural development, which also affects the populations of arboreal prey species (OEH 2017). Other threats include loss of hollow-bearing trees suitable for nesting, disturbance around nest sites (particularly during pre-laying, laying and downy chick stages), high frequency hazard reduction burning (affecting prey availability), secondary poisoning, road kills, and predation of fledglings by foxes, dogs and cats (OEH 2017).

Powerful Owl was not recorded from the study area, but the vegetation on the site would provide habitat for prey species including *Trichosurus vulpecula* (Brushtail Possum). The species is unlikely to breed within the study area, as the size of hollows observed were too small for nesting.

- 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 Powerful Owl would include a substantial loss and/or fragmentation of foraging habitat and loss of suitable nesting and roosting habitat.

The proposed works involve impacts to approximately 0.67 ha of potential foraging habitat, which will also reduce the habitat for prey species including arboreal mammals. This reduction in prey availability is expected to be minimal considering relative to the large home range of individuals of this species and large areas of foraging habitat in adjacent areas.

- 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 question is 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**

This question is 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**

A total of 1.18 ha of native vegetation, representing foraging habitat for this species was identified within the study area. The proposed development would result in impacts to approximately 0.67 ha (57%) of the foraging habitat identified within the study area with approximately 0.51 ha (43%) to be retained. Of the 0.67 ha of impacts, 0.57 ha would represent a total loss of the foraging habitat, while 0.1 ha would include only impacts to the understorey with the canopy layer retained. Four potential hollow bearing trees will also be removed as part of the proposed development, but the size of these hollows would not provide Powerful Owl breeding 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 clearing of vegetation to allow for the residential development will not fragment or isolate areas of potential foraging habitat for the Powerful Owl. Individuals of this species occupy large home ranges and are highly mobile.

- 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 foraging habitat to be removed is not considered to be of high importance to Powerful Owls, given the highly modified nature of the vegetation to be impacted and the small area relative to the large home range of this species and the large areas of habitat in the surrounding landscape available to this highly mobile species.

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

No critical habitat has been declared for the Powerful Owl.

- 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 Large Forest Owls including the Powerful Owl was produced by the former Department of Environment and Conservation (DEC 2006) with the following objectives or actions:

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

The removal of prey habitat to allow for the development of the study area is inconsistent with objective 4. This objective states that impacts on large forest owls and their habitats should be adequately assessed during the environmental assessment process, and that loss and fragmentation of significant owl habitat should be minimised and this habitat should be better protected and managed. The proposal would involve only a minor disturbance to a small area of habitat and would not result in the fragmentation or loss of significant owl habitat.

**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.**

Key threatening processes of relevance to the Powerful Owl include:

- the clearing of native vegetation, and
- loss of hollow bearing trees.

The proposal will result in impacts to 0.67 ha of native vegetation (foraging habitat) and three potential hollow bearing trees will be removed, but the hollow sizes were too small to be utilised by Powerful Owls for breeding.

As discussed above this disturbance is considered minor due to the size of this habitat relative to the large home range of this species and the large areas of habitat in the surrounding landscape available to this highly mobile species.

## Conclusions

The proposal is unlikely to result in a significant impact on the Powerful Owl given that the proposed works:

- would only disturb a small area of foraging habitat relative to the large home ranges of individuals of this species,
- Approximately 0.51 ha (43%) of foraging habitat within the study area would be retained as part of the proposed development,
- would not impact upon breeding habitat for this species.

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

## Appendix E EPBC Act Assessment

### *Chalinolobus dwyeri* (Large-eared Pied Bat) – vulnerable

**An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:**

#### **Criterion a: lead to a long-term decrease in the size of an important population of a species**

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are (DoE 2013):

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

Within NSW, based on available records, the largest concentration of populations appears to be in the sandstone escarpments of the Sydney basin and northwest slopes of NSW (DERM 2011). The species has also been recorded from a few locations in the sandstone escarpments of the Morton National Park at the southern end of its range.

The study area at Heathcote may be used by the Large-eared Pied Bat for foraging, but would not support an important population, because:

- the study area does not contain caves and no known breeding caves are located close to the study area,
- the species is not at the limit of its distribution at the site, with the species recorded as far north as Shoalwater Bay in Queensland and Morton National Park in NSW.

As such, the proposed action will not lead to the long-term decrease in the size of an important population of Large-eared Pied Bat.

#### **Criterion b: reduce the area of occupancy of an important population;**

No important population of the Large-eared Pied Bat is expected to utilise the study area.

#### **Criterion c: fragment an existing important population into two or more populations;**

No important population of the Large-eared Pied Bat is expected to utilise the study area. Nonetheless, the Large-eared Pied Bat is a highly mobile species. Impacts to 0.67 ha of potential foraging habitat associated with the proposed development will not fragment an existing population into two or more populations. There will be no disturbance to breeding sites resulting from the proposed development.

#### **Criterion d: adversely affect habitat critical to the survival of a species;**

Habitat critical to the survival of this species is discussed in the national recovery plan for the species (DERM 2011) and includes maternity roosts. The species is dependent on the presence of diurnal roosts for shelter. Such roosts are also used during the night when feeding and for the raising of young. Roosts include:

- disused mine shafts



- caves
- overhangs
- abandoned *Hirundo ariel* (Fairy Martin) nests.

These roosts were absent from the study area at Heathcote Hall. Therefore, the proposed action is unlikely to adversely affect habitat critical to the survival of the species.

**Criterion e: disrupt the breeding cycle of an important population;**

No important population of the Large-eared Pied Bat is expected to utilise the study area. Furthermore, the species breeds in maternity roosts which are very specific and require arch caves with a domed roof featuring indentations and enough space and depth to allow juveniles to safely practice flying (DERM 2011). No caves are located within the study area and none are known to occur in proximity to the site. As such, the proposed action will not disrupt the breeding cycle of any population of Large-eared Pied Bat.

**Criterion f: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;**

The species has specific habitat requirements for roosts and breeding which are not present within the study areas. Potential foraging habitat is present at the site and approximately 0.67 ha will be impacted. This small scale of impact relative to the species high mobility will not modify, destroy, remove or isolate or decrease the availability of quality of habitat for the Large-eared Pied Bat.

**Criterion g: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;**

The proposed action will not result in the establishment of invasive species that are harmful to Large-eared Pied Bat.

**Criterion h: introduce disease that may cause the species to decline; or**

The proposed action will not introduce disease that may cause the Large-eared Pied Bat to decline.

**Criterion i: interfere substantially with the recovery of the species**

A national recovery plan has been prepared for the Large-eared Pied Bat (DERM 2011). The recovery objectives/actions include:

- 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 bat to augment biological and ecological data to enable conservation management and
- Determine the meta-population dynamics throughout the distribution of the Large-eared Pied Bat.

The proposed action is not in conflict with these objectives/actions.

**Conclusion**

The proposed development will result in impacts to 0.67 ha of native vegetation which is potential foraging habitat for the Large-eared Pied Bat. No roosting habitat occurs within the study area.

Based on the information provided above, the proposed action is unlikely to result in a significant impact on the Large-eared Pied Bat and a referral to the Commonwealth is not required.

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

A known maternity camp for the GHFF is located at Kareela approximately 12 km northeast of the study area. This species is known to utilise the same camp site for consecutive years with some camps being used for over a century (OEH 2017). The vegetation within the study area provides potential foraging habitat for the species.

**An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:**

**Criterion a: lead to a long-term decrease in the size of an important population of a species**

An important population is defined as a population that is necessary for a species' long-term survival and recovery (DoE 2013). The GHFF is considered to be one population that intermixes up and down the east coast, therefore any bat population is a meta-population of this one "important population".

Under the proposed action 0.67 ha of native vegetation representing foraging habitat will be impacted. The amount of habitat to be affected is relatively small given the amount of foraging habitat available in the region, including Royal National Park. The removal of this potential foraging habitat would not lead to the long-term decrease in the size of an important population of GHFF.

**Criterion b: reduce the area of occupancy of an important population;**

The distribution of the GHFF extends from Bundaberg in Queensland to Melbourne, Victoria and from the coast inland to the western slopes of New South Wales. The removal of potential foraging habitat from the study area would not reduce the area of occupancy of an important population of GHFF.

**Criterion c: fragment an existing important population into two or more populations;**

The GHFF is a highly mobile species and forms one large intermixing population along the east Australian coast. No roosting habitat will be impacted and large areas of foraging habitat are present in the region. The proposed action will not fragment an existing important population into two or more populations.

**Criterion d: adversely affect habitat critical to the survival of a species;**

The draft recovery plan for GHFF (DECCW 2009) identifies foraging habitat that is critical to the survival of GHFF as follows:

*Foraging habitat that meets at least one of the following criteria can be explicitly identified as habitat critical to survival, or essential habitat, for GHFF. Natural foraging habitat that is:*

- 1. productive during winter and spring, when food bottlenecks have been identified*
- 2. known to support populations of > 30 000 individuals within an area of 50 km radius (the maximum foraging distance of an adult)*
- 3. productive during the final weeks of gestation, and during the weeks of birth, lactation and conception (September to May)*
- 4. productive during the final stages of fruit development and ripening in commercial crops affected by Grey-headed Flying-foxes (months vary between regions)*
- 5. known to support a continuously occupied camp.*

There are several GHFF camps within 50 km of study area (DoE 2017). While populations fluctuate between the camps, the Centennial Parklands bat camp (30 km northeast of Heathcote) has been known to have a population greater than 30,000 individuals. The closest bat camp is at Kareela has an estimated population at up to 15,000 individuals (Armistead R. pers.comm.2017).

The tree species within the study area include do not include native winter-flowering Eucalypts, with most species flowering from October to March. While the vegetation on the site may form part of “critical to survival, or essential habitat” based on the above criteria, the impact to 0.67 ha foraging habitat is unlikely to lead to a decline in the species.

**Criterion e: disrupt the breeding cycle of an important population;**

The proposed works will not disrupt the breeding cycle of the GHFF. The closest camp is located 12 northeast of the study area.

**Criterion f: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;**

No campsites would be removed or disturbed, and extensive foraging habitat exists in the region within large conservation areas. As such, the proposed works would be unlikely to modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

**Criterion g: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species’ habitat;**

The site is already highly disturbed and modified and the proposed works will not result in the establishment of an invasive species that is harmful to the GHFF.

**Criterion h: introduce disease that may cause the species to decline; or**

Grey-headed Flying-fox are reservoirs for the Australian bat lyssavirus and can cause clinical disease and mortality in GHFF (DECCW 2009). The proposed action would not increase the incidence of this disease.

**Criterion i: interfere substantially with the recovery of the species**

A Draft National Recovery Plan for the GHFF was developed in 2009. The relatively small amount of foraging habitat to be removed is unlikely to substantially interfere with the recovery of this species.

**Conclusion**

The proposed will result in impacts to 0.67 ha of native vegetation representing potential foraging habitat for this species. The proposed action are unlikely to impact the lifecycle of the GHFF or lead to a decline in the population of GHFF.

Based on the information provided above, the proposed works is unlikely to result in a significant impact for the Grey-headed Flying-fox. Therefore, a referral to the Commonwealth is not required.

# Appendix F Tree hollow replacement plan

## Introduction



This tree hollow replacement plan aims to provide the following information, as requested by Sutherland Shire Council (SSC):


- condition and location of hollow-bearing trees
- recommended habitat boxes including their number and location.

SSC requested that all habitat boxes be located within the subject site.



Six hollow-bearing trees (HBTs) were recorded by ELA during the original field survey (December 2015). A recent inspection (December 2017) recorded an additional HBT. Details of each HBT is provided below in Table 7. Tree numbering, condition and ULE (useful life expectancy) is consistent with Jackson Nature Works (2017). Green rows indicate trees to be retained and red rows are trees to be removed to allow for the development. The locations of HBTs and proposed habitat boxes are shown in Figure 10.


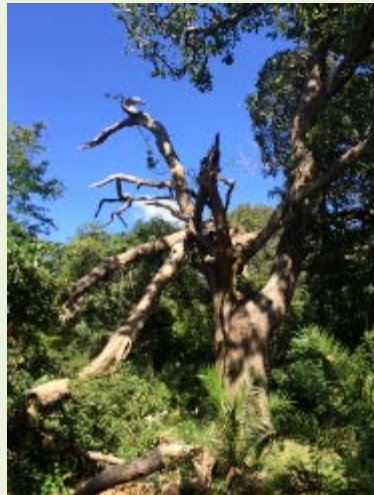
**Table 7: Details of hollow-bearing trees**

Tree number, species, location and fate	Tree and hollow condition	Photo
11 <i>Eucalyptus saligna</i> x <i>botryoides</i> located on eastern property boundary. Retain as a street tree.	Tree in fair health with one hollow on north side of trunk at 4 m. Hollow is small and depth unknown.  Short ULE of 5-15 years with consideration to remove due to the tree being dangerous with structural defects.	
13 <i>Eucalyptus saligna</i> x <i>botryoides</i> , located in eastern nature strip outside the study area. Retain as a street tree.	Tree in fair health with >15 years life expectancy.  Hollow is located between 0.8 and 1.6 m. Scrapings around the edge indicate recent usage most likely arboreal mammal (possums).	

Tree number, species, location and fate	Tree and hollow condition	Photo
<p>22 <i>Eucalyptus saligna</i> x <i>botryoides</i> located in nature strip north east corner of Tecoma St and Boronia Grove outside of study area. Retain as a street tree.</p>	<p>Eastern trunk in good health. Western trunk dead with termites present. With remedial care this tree could be safely retained for another 15-40 years.</p> <p>Dead (western) trunk contains small hollows and some larger splits. Trunk is likely to be hollow throughout.</p> <p>A cavity is located in the eastern trunk at 1m, where the main trunk separates into two.</p>	



Tree number, species, location and fate	Tree and hollow condition	Photo
<p>23 <i>Eucalyptus saligna</i> x <i>botryoides</i> located in the northeast corner of the study area. To be removed as located within impact area.</p>	<p>Poor health with <math>\frac{3}{4}</math> of the tree dead. Tree has been recommended for removal within the next 5 years due to declining condition.</p> <p>Tree divided into two trunks with the largest trunk dead, likely to be hollow throughout. Shedding bark and a large split in the trunk.</p>	
<p>77 <i>Eucalyptus saligna</i> x <i>botryoides</i> located within the study area (central north). To be removed as tree is located within the construction footprint.</p>	<p>Tree in fair health. Deadwood present in the canopy (20%). Two hollows observed of unknown depth. Recorded by arborist as a "trunk injury at 6 m".</p> <p>Recommended by arborist for removal within next 5 years due to structural defects rendering tree dangerous.</p>	

Tree number, species, location and fate	Tree and hollow condition	Photo
78 <i>Eucalyptus saligna</i> x <i>botryoides</i> located within the study area (middle north). To be retained.	Tree in good health. Some deadwood present in canopy (<10%) including a small hollowed spout that may be used by roosting microbats.  Major incursion due to development, so tree to be removed.	
102 <i>Quercus robur</i> located in centre of study area northwest of Heathcote Hall. To be retained.	Tree in good health with mid canopy branch failures. Trunk hollows recorded by arborist. Obvious hollows not observed by ecologist but tree has many branches, some of which have snapped and fallen and may contain small hollows which are potential roosting habitat for microbats. Medium ULE of 15-40 years with remedial tree care.	

### Habitat boxes

The proposed development will result in the loss of four HBTs. As such we have recommended that each HBT be replaced at a ratio of 2:1 with habitat boxes suitable for microbats (eight habitat boxes in total). ELA recommends habitat boxes made by Hollow Log Homes (HLH) which come ready for installation using a Habisure System that prevents future damage to trees by allowing the tree to grow. The total cost for purchase of boxes including installation by a qualified arborist and assistant is approximately \$3,200.

As part of the ecological assessment, we have assumed presence of three species of threatened microbat *Chalinolobus dwyeri* (Large-eared Pied Bat), *Falsistrellus tasmaniensis* (Eastern False Pipistrelle) and *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat). In consultation with HLH, the habitat boxes recommended for these species are the four-chambered bat boxes shown in Figure 9. Eight of these



boxes are to be installed within areas of retained trees (as shown in Figure 10) by a qualified arborist (with tree climbing qualifications) prior to any vegetation removal.



**Figure 9: Four-chambered bat boxes recommended by Hollow Log Homes (HLH website)**

### **Pre-clearance surveys and retention of salvaged fauna habitat**

Seven hollow-bearing trees were mapped on the site, of which four will be removed. These hollows are small and most likely used by microbats for roosting or common peri-urban birds or possums. The following “soft fall” techniques are recommended for removal of these trees:

- inspection of the vegetation one week prior to removal to identify habitat/occupied trees (including HBTs and trees with nests present) with flagging tape
- prior to removal, the four HBTs proposed to be removed will be surveyed over two consecutive nights using Anabat detectors to ensure they are not occupied by threatened microbat species
- WIRES are notified prior to clearing of habitat trees, so that a volunteer is on standby if injured fauna are captured
- removal of all tagged trees must be supervised by an ecologist with one ecologist
- habitat trees are “knocked” prior to removal to scare any fauna out of the tree
- once dropped, the ecologist inspects the tree and any hollows for fauna prior to tree removal/mulching or removal from site
- if fauna are captured, they will be relocated into suitable habitat nearby (eg. Royal National Park)
- any sections of habitat trees that can be retained will be identified and cut into sections that can be attached to retained trees within the study area



Figure 10: Location of hollow-bearing trees and proposed location of microbat habitat boxes



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