Biodiversity Development Assessment Report

PLC's Grey House Precinct - 20 Avon Rd, Pymble NSW 2073 By Ecological Consultants Australia Pty Ltd TA Kingfisher Urban Ecology and Wetlands **Updated June 2022**





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Statement of Authorship

This study and report was undertaken by Ecological Consultants Australia at Studio 1/33 Avalon Parade, Avalon. The author of the report is Geraldene Dalby-Ball with qualifications BSc. majoring in Ecology and Botany with over 20 years' experience in this field and Luke Johnson with qualifications B EnvSc. Limitations Statement

Information presented in this report is based on an objective study undertaken in response to the brief provided by the client. Any opinions expressed in this report are the professional, objective opinions of the authors and are not intended to advocate any particular proposal or pre-determined position.

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Distribution:	Kate Bimson Pymble Ladies' College <u>kbimson@pymblelc.nsw.edu.au</u> and Allan Stewart General Manager Pymble Ladies' College Avon Road, Pymble NSW 2073 T: +61 2 9855 7604 M: +61 437 737 553					

Signed: Geraldene Dalby-Ball – Director of Ecological Consultants Australia

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Executive Summary

Introduction

Ecological Consultants Australia (ECA) has been contracted by Kate Bimson of Pymble Ladies' College to provide a **Biodiversity Development Assessment Report** for a proposal at Grey House Precinct – 20 Avon Road, Pymble NSW 2073 within the Ku-ring-gai Council Local Government Area (LGA).

Trigger for a formal BDAR under the BC Act 2016:

A BDAR was requested by the EES and DPIE in the EES Group Letter & Determination regarding the EIS and BDAR waiver request. As such the application must be accompanied by a BDAR. Accordingly, a waiver under section 7.9 of the BCA is not granted for the proposed development (being Pymble Ladies' College - Grey House Precinct, SSD-17424905).

Stage 1: Biodiversity Assessment

- On-ground survey took place in September 2021 by Ecologist Luke Johnson.
- Data was gathered across two BAM plots located in each vegetation zone at the site.
- Flora and fauna observations were recorded on-site using binoculars and physical examination. Notes, photos and samples of flora species were taken to assess ecological health and value of the site.
- Bionet searches were performed for flora, fauna and endangered populations to identify if there were previous records of threatened species occurring within the local area using a 10km radius around the site.

Results

Stage 2: Impact Assessment

- The impact calculations were made based on there being direct impacts to vegetation from the proposed development. The impact area and/or areas of modification has been calculated as 0.06ha within the 0.65ha site.
- Survey plot 1 was within the planted garden vegetation located within the development footprint and assessed as vegetation community Sydney Turpentine-Ironbark Forest STIF (PCT1281).
- Survey plot 2 was within the proposed site accessway and assessed as vegetation community Sydney Turpentine-Ironbark Forest (STIF) (PCT1281).
- STIF is listed as an Endangered Ecological Community (EEC) under the NSW BC Act (2016) and Critically Endangered Ecological Community (CEEC) under the Commonwealth EPBC Act (1999).
- Vegetation onsite has been significantly altered such that the site does not reflect the natural structural attributes of the STIF.
- Vegetation is structurally and functionally poor due to previous clearing onsite. Thus, the proposed development assessed in this BDAR is not expected to significantly contribute to loss of STIF.
- No threatened species were recorded during the site surveys.

Stage 3: Improving Biodiversity values

- Fauna refuge zone
- Delineation of work areas
- Vegetation clearing control measures
- Weed Management and removal
- Native seed collection
- Preservation of habitat
- Nest boxes
- Native species landscaping

See recommendations section for a detailed explanation as to how these recommendations improve biodiversity values.

Conclusions and Recommendations

• The proposed development will have an approximate impact area of 0.06ha on Sydney Turpentine-Ironbark Forest (STIF) (PCT1281). This vegetation has been significantly altered and degraded from its natural state.

- The site has been managed as the Pymble Ladies College since the 1916. The site has a long history of vegetation clearing, habitat fragmentation and on-going disturbance, via development. A majority of vegetation on site is regrowth or has been planted by the school. There is little to no remnant vegetation left within the site.
- The grand total cost to offset both ecosystem credits and species credits generated by this development is \$21,491.16 (including GST), assuming payment will be made into the Biodiversity Conservation Fund.
- Measures including but not limited to; nest boxes, native species landscaping, delineation of works zones, weed removal, tree protection and fauna refuge zones should all be used to mitigate any impacts associated with the proposal and increase habitat opportunities in the area.

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Stage 1: Biodiversity Assessment

1 Introduction

Ecological Consultants Australia (ECA) has been contracted by Kate Bimson of Pymble Ladies' College to provide a **Biodiversity Development Assessment Report** for a proposal at Grey House Precinct – 20 Avon Road, Pymble NSW 2073 within the Ku-ring-gai Local Government Area (LGA).

1.1 Site information and general description

The Subject Site (the "Site") is the area of direct and likely indirect impacts and is defined as the whole of the proposed future Grey House Precinct.

This area has been assessed in the Biodiversity Assessment Method Calculator (BAM-C) from which offset credits have been generated.

|--|

Category	Details
Title Reference (Lot/DP)	1/-/DP69541
Total Site Area (ha)	0.65 ha
Street Address	20 Avon Road, Pymble NSW 2073
LGA	Ku-ring-gai Council
Land Zoning	SP2: Infrastructure



Figure 1.1 Aerial – Pymble Ladies College (red) and surrounds.



Figure 1.2 Site Location of the future Grey House Precinct and accessway vegetation. Image source: SixMaps 2021

1.2 Site history

The site has been managed as grounds of the Pymble Ladies College since the 1916. Native vegetation would have once covered the area although ongoing modification and disturbance has resulted in the site no longer retaining many natural attributes (see figure 1.3a). The site has been significantly altered and degraded from its natural state due to a long history of vegetation clearing, habitat fragmentation and ongoing development within the school grounds.

The vegetation on site consist of cleared open space with garden landscaped areas. A mix of exotic and native canopy species are scattered throughout. Arboriculture assessment report (Arborsafe, 2021) determines that a number of the mature native trees within the site are likely to have been planted. However, due to the age and structure some individuals within Vegetation Zone 2 (accessway) are expected to be remnant and form part of the original vegetation community. Historical aerials have been provided below. Aerials show vegetation – yes it may have been cleared (sure it would have been as Blue Gum and Turpentine are some of the most valuable of trees in this area. Often trees were able to re-grow when safe within an estate (personal, government, school, cemetery etc). In this case the trees around the edges are dispersed in a way that indicates regeneration, Also that the area that is not Pymble Golf Course – this area too has the same canopy mix. Mapping of these two PCTs matches the canopy species on site. The soil type matches the PCT. Blue Gums and Turpentines have been planted on the site. Those that have been obviously planted are present in the open areas along pathways. These were not considered as remnant. Exotic species are dominant across the site and current management practices are preventing the recovery of the original plant community.



Figure 1.3a Historical imagery of Pymble Ladies College 1943. Source: NSW Government, 2020 Spatial Collaboration Portal, Accessed 2022.



Figure 1.3b Historical imagery of Pymble Ladies College 1970. Source: NSW Government, 2020 Spatial Collaboration Portal, Accessed 2022.



Figure 1.3c Historical imagery of Pymble Ladies College 1982. Source: NSW Government, 2020 Spatial Collaboration Portal, Accessed 2022.



Figure 1.3d Historical imagery of Pymble Ladies College 1994. Source: NSW Government, 2020 Spatial Collaboration Portal, Accessed 2022.

1.3 Proposed actions

The proposed development include:

- Demolition of existing buildings (single story demountable).
- Vegetation removal within the proposed building footprint (see figure 1.5)
- Construction of a new building (dotted outline in figure 1.4).
- Integrated open space and landscaping to provide outdoor learning and support well-being.
- Proposed construction access is located along an existing paved footpath. The accessway requires a minimum 4m width and this results in 4 trees requiring removal and minor canopy trimming.



Figure 1.4. Plan of Detail and Levels over part of PLC, Avon Rd, Pymble. Source: LTS Lockley 03/07/21 Rev K.



Figure 1.5. Demolition Plan. Source: BVN, 11 May 2021.



Figure 1.6. Operational Footprint. Kingfisher 2022



Figure 1.7. Construction Footprint. Kingfisher 2022.

1.4 Sources of information used in the assessment

The following sources of information were used for this assessment:

- SeedMaps 2021
- SydneyMetroArea_v3.1_E-VIS_4489 OEH (2016)
- BioNet DPIE (2021)
- Planning for Bush Fire Protection (PBP) NSW RFS 2019.
- Environmental Impact Statement. glendinning minto & associates p/l, December 2012.
- Arboricultural Impact Assessment. ArborSafe, 17 June 2021.
- PLC Grey House Precinct Council Presentation, 29 March 2021.
- Proposed Layout Plans. LTS Lockley, 03/07/21 Rev K.

1.5 Legislative context and statutory requirements

1.5.1 NSW Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* and the *Environmental Planning and Assessment Regulation 2000* institutes and sets out a system for environmental planning and assessment in NSW, and includes Part 4 which deals with development applications on private land and state significant development.

This proposal falls under a Part 4 development and requires development consent and associated environmental assessment.

1.5.2 NSW Biodiversity Conservation Act 2016 and associated documents

The *Biodiversity Conservation Act 2016* (BC Act 2016) is the key legislation that enables the conservation of biodiversity within the state of New South Wales. The BC Act 2016 facilitates the assessment and on-going protection of flora and fauna, including threatened species and ecological communities. The BC Act 2016 outlines assessment and offsetting requirements for activities with the potential to impact on threatened species and ecological communities in NSW, and the clearing of native vegetation which exceeds the threshold.

The BC Act also:

- Outlines the licences required under the BC Act to harm protected flora and fauna;
- Lists Threatened species and ecological communities in Schedules 1 and 2;
- Sets out monetary and imprisonment penalties for offences relating to the harming of protected flora and fauna;
- Under Part 7 (s7.4), introduces a list of activities/proposal that exceeds the biodiversity offsets scheme threshold.

The NSW *Biodiversity Conservation Regulation 2017* sets out the Biodiversity Offsets Scheme entry threshold for Part 4 state significant developments under the EP&A Act 1979.

The following information was extracted from the EES Group Letter and Determination (ref: SSD-17424905) and is provided below as it requests the submission of a BDAR is to accompany the Development Application for Pymble Ladies' College – Grey House Precinct.

"Please be advised that the delegated Environment Agency Head in the Environment, Energy and Science Group of the Department of Planning, Industry and Environment (EES Group) has advised the Department that it has not granted a waiver and a copy of their decision is attached for your information.

The EES Group advise that they have reviewed the application of the test of significance under sections 1.5 and 7.3 of the BC Act and clause 1.4 of the Biodiversity Conservation Regulation 2017, and consider that it cannot be determined that the development will not likely have any significant impact on biodiversity values.

The EES Group also advise that the information contained within the BDAR Waiver Request is unclear if all trees impacted have been planted and do not constitute the Sydney Turpentines Ironbark Forest (STIF). The report makes reference to two different arborist's report which have not been provided. They have also advised that there is potential for additional impacts to trees surrounding the development footprint as STIF may be present as understorey despite the disturbed condition. Threatened species may be present as well and may be impacted by the proposal. As such, there is some existing habitat connectivity along the eastern boundary of the site, and the proposed loss of trees will impact this connectivity.

I have reviewed the advice of the EES Group on this matter. I also consider that the application must be accompanied by a BDAR. Accordingly, a waiver under section 7.9 of the BCA is not granted for the proposed development (being Pymble Ladies' College - Grey House Precinct, SSD-17424905). "

NSW State Environmental Planning Policy Koala Habitat Protection 2021.

The State Environmental Planning Policy (SEPP) (Koala Habitat Protection) 2021 applies to the proposed development as there is no approved Koala Plan of Management which applies. The subject land is greater than one hectare and the land is identified on the Koala Development Application Map (DPIE, 2020). A separate Koala Assessment Report has been conducted. The site was not considered likely to provide core koala habitat nor is suitable/core habitat within the site proposed to be irreversibly impacted. See Appendix V for EPBC act Consideration Koala Habitat Assessment and refer to Koala assessment report for further assessment and recommendations.

The assessment should assist the consent authority in determining any potential impacts on the species. This assessment addresses aspects of criteria outlined in the Koala Habitat Protection Guideline (DPIE, 2020) as detailed by the State Environmental Planning Policy (SEPP) (Koala Habitat Protection) 2021.

1.5.3 Commonwealth Environmental Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is applicable if it was considered that an impact on a 'matter of National Environmental Significance (NES)' were likely, thus providing a trigger for referral of the proposal to the Department of Environment and Heritage. Matters of national environmental significance identified in the Act are:

- world heritage properties;
- national heritage places;
- Ramsar wetlands;
- nationally threatened species and communities;
- migratory species protected under international agreements;
- the Commonwealth marine environment; and
- nuclear actions.

The Commonwealth Government has published Significant Impact Guidelines (DE 2013) to assist in the determination of whether an action is likely to have a significant impact on a matter of NES. The proposal is not expected to significantly impact any MNES.

1.5.4 Ku-ring-gai Local Environmental Plan (KLEP) 2015

Sections of vegetation within the site is identified as "Biodiversity" on the Terrestrial Biodiversity Map as published by Ku-ring-gui Council. (Map Identification Number: Terrestrial Biodiversity Map - Sheet BIO_008).

As identified in KLEP (2015) the aim of section 6.3 Biodiversity Protection, Clause 1 is to maintain terrestrial biodiversity by—

- (a) protecting biological diversity of native fauna and flora, and
- (b) protecting the ecological processes necessary for their continued existence, and
- (c) encouraging the recovery of threatened species, communities, populations and their habitats, and
- (d) protecting, restoring and enhancing biodiversity corridors.

The proposal will include revegetation areas and biodiversity strategies which will satisfy and contribute to the objectives of part 6.3, clause 1 in the KLEP. Mitigation measures are outlined in section 10 of this report.



Figure 1.8. The site is situated on vegetation mapped as "Biodiversity" and on the Terrestrial Biodiversity Map as published by Ku-ring-gui Council.

1.6 Biodiversity Offsets Scheme threshold

The Biodiversity Offsets Scheme applies to:

State Significant Development (assessed under Part 4 of the Environmental Planning and Assessment Act 1979) that triggers the Biodiversity Offsets Scheme threshold (see section 1.6) or is likely to significantly affect threatened species based on the test of significance in section 7.3 of the Biodiversity Conservation Act 2016.

1.6.1 BOS Area Clearing Threshold

The proposal does not trigger the area clearing threshold as per the BOS entry requirements as the impact area does not exceed the clearing area threshold. Area clearing thresholds are determined by minimum lot size and guidelines outlined in BAM (OEH 2017) (figure 1.9).

Table 1.2. Minimum lot size and threshold which the development exceeds.

Minimal lot size or actual lot size (*where there is no minimum lot size provided for the relevant land under the LEP)

Threshold for clearing, above which the BAM and offsets scheme apply **0.5 ha**

Impact area

0.06 ha

Area clearing threshold

The area threshold varies depending on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan (LEP)), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP).

Minimum lot size associated with the property	Threshold for clearing, above which the BAM and offsets scheme apply	
Less than 1 ha	0.25 ha or more	
1 ha to less than 40 ha	0.5 ha or more	
40 ha to less than 1000 ha	1 ha or more	
1000 ha or more	2 ha or more	

Figure 1.9. The area clearing threshold as per the BOS entry requirements.

1.6.2 Biodiversity Values Map

The proposed development area impacts areas identified by the Biodiversity Values map published by the Chief Executive of the NSW Office of Environment and Heritage.

It is noted that Section 7.9 of the BC Act requires a BDAR to accompany any SSD 'unless the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on biodiversity values'. A BDAR has been requested by the



Figure 1.10. Biodiversity Map – Site in red. Source: <u>https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap</u>

2 Landscape features and site context

The site is located within residential and open spaces for passive recreation setting. The surrounding properties are made up of medium density residential and patches of native bushland.

Table	2.1 -	Site	Biodiversit	v Information
TUDIC	Z . I	JILL	Diouiversit	y minormation

Category	Details		
Interim Biogeographic Regionalisation for Australia (IBRA)	Sydney Basin		
IBRA Sub Region	Cumberland		
NSW Landscape	Pennant Hills Ridges Phr Mitchell Landscapes v3.1 - Ecosystem Meso Grouping Ecosystem Meso Grouping: SB Hornsby Landscape Code: Phr Landscape Name: Pennant Hills Ridges Over Cleared Status: Over-cleared Estimate Fraction Cleared: 0.88		
% Native vegetation cover	25% in the 1500m radius circle See Figure 2.1		
Landscape features			
Rivers and streams	A drainage gully exists adjacent to the current access path along the boundary of the site, although it is not considered a waterway and should not be classified as such. The drainage gully does not contain an observable channel, banks or fluvial bed forms.		
Wetlands	N/A		
Connectivity features	Vegetation on site is connected to adjoining bushland via patches of remnant/exotic trees and inconsistent structural layers. Currently within the site native planted screening provides minimal connectivity between patches of mature canopy species.		
Areas of geological significance and soil hazard features	No		
Areas of Outstanding Biodiversity Value identified under the BC Act	No		

Geology and Soil"Glenorie" is the identified soil landscape for the site as per eSpade2.0 (DPIE, 2020). Glenorie is categorised by low rolling and steep hills. Local relief 50–120 m, slopes 5–20%. Convex narrow (20–300 m) ridges and hillcrests grade into moderately inclined side slopes with narrow concave drainage lines. Moderately inclined slopes of 10–15% are the dominant landform elements Soil - shallow to moderately deep (200 cm) Yellow Podzolic Soils and Gleyed Podzolic Soils along drainage lines.		
	Geology and Soil	"Glenorie" is the identified soil landscape for the site as per eSpade2.0 (DPIE, 2020). Glenorie is categorised by low rolling and steep hills. Local relief 50–120 m, slopes 5–20%. Convex narrow (20–300 m) ridges and hillcrests grade into moderately inclined side slopes with narrow concave drainage lines. Moderately inclined slopes of 10–15% are the dominant landform elements Soil - shallow to moderately deep (200 cm) Yellow Podzolic Soils and Gleyed Podzolic Soils along drainage lines.



Figure 2.1 Location Map Native vegetation cover within 1500m buffer around the site. Seedmap, 2021.



Figure 2.2. Hydrolines Mapping within 1500m Buffer of the site. Kingfisher, 2022. Data Source: NSW Government Spatial Data, Hydrolines.

3 Native vegetation

3.1 Desktop and Survey results – Plant Community Types (PCTs)

A review of the most up-to-date vegetation mapping, SydneyMetroArea_v3.1_VIS__4489 DPIE (2016), identified two (2) plant community types (PCTs) within site. The PCT is identified as; *Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion* (PCT1281); and *Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion* (PCT1237).

Table 3.1 – Table of vegetation community synonyms as per NSW and Commonwealth legislation.

NSW PCT Code	NSW PCT Name	BC Act 2016	EPBC Act 1999	Estimated Percentage Cleared
1281	Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	Sydney Turpentine- Ironbark Forest State Conservation: Endangered Ecological Community (EEC)	Sydney Turpentine- Ironbark Forest Commonwealth Conservation: Critically Endangered (CE)	90%
1237	Sydney Blue Gum - Blackbutt - Smooth- barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	Blue Gum High Forest in the Sydney Basin Bioregion State Conservation: Critically Endangered Ecological Community (CEEC)	Blue Gum High Forest in the Sydney Basin Bioregion Commonwealth Conservation: Critically Endangered (CE)	90%

3.1.1 Patch Size

The vegetation within the site is connected to surrounding vegetation through inconsistent structural layers and scattered native canopy. Native vegetation is also present within the surrounding residential landscape and southern Golf Course. For this reason patch size associated with the on-site vegetation was assessed as >100 ha within the BAM-C.

3.1.2 Field Survey

The field survey assisted in verifying the distribution and quality of vegetation at the site. Sydney Turpentine-Ironbark Forest (STIF) (PCT1281) is mapped across the site via *The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 (OEH, 2016) VIS_ID 4489.*

Approximately 80% of the vegetation onsite has been previously disturbed. The canopy is discontinuous onsite with scattered canopy trees. The mid stratum is primarily absent within site boundaries. The ground stratum has been highly disturbed, with much of the site dominated by exotic turf grasses and 'High Threat Exotic' (HTE) species. Vegetation adjacent to the access path is displaying signs of natural regeneration although this is being hindered by current land use practices.

Vegetation Zone 1 has undergone historical clearing and previous development of this area including ground leveling, hard landscaping, paving roads and creation of building foundations would have irreversibly impacted on the original plant community to the point that it is not able to recover. However, the Scientific Committee's final determination for STIF includes a stand of Remnant STIF trees can meet the definition for STIF. Therefore, vegetation in this zone has been assessed as a part of the STIF EEC in the BAM-C

Vegetation Zone 2 has been assessed as Sydney Turpentine-Ironbark Forest (STIF) (PCT1281) in the BAM-C. This finding was concluded following desktop investigations and field assessments. See section 5 for a description of vegetation zones and the impact assessment.

Stratification and plot dimensions

Plots were as per the BAM Method with 20 x 20 and 10 x 40 plots (400m²) for assessing structure and composition with a centre line extending 50m and 100m to create a 20 x 50 and 10 x 100 plot (1000m²) to assess function. See Biodiversity Assessment Method Operational Manual – Stage 1 (OEH 2018) page 26-28 for methods used.

https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/biodiversity-assessment-method-operational-manual-stage-1-180276.pdf



Figure 3.1 Vegetation zones and Plot locations



Figure 3.2 Fragmented vegetation across the surrounding landscape.



Figure 3.3 Previously mapped EEC/CEEC BGHF orange and STIF blue. The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 (OEH, 2016) VIS_ID 4489



Figure 3.4 Extract from SEED has the area of proposed works mapped as STIF. This includes mapping of the canopy cover over the existing path/road



Figure 3.5 Ku-ring-gai online map viewer has the area marked as the biodiversity layer. Source: Ku-ring-gai Council 2021.

Ground truthing shows the area mapped as STIF includes existing built form/road and has canopy species of STIF over this accessway. The vegetation condition map in Figure 3.5 shows the area (above the accessway) as 'built-form' and the adjoining vegetation (canopy trees and occasional *Pittosporum undulatum*) in fair condition.



Figure 3.6 Current vegetation condition onsite.

NB: there is no native vegetation communities in the school grounds in good or excellent condition. The school has already been undertaking bush regeneration in the areas of BGHF and STIF (this doesn't include the proposed development area as this is not bushland).

The two Endangered Ecological Communities onsite; Sydney Turpentine-Ironbark Forest (STIF) and Blue Gum High Forest (BGHF), continue to support a range of native flora and fauna. Weeds infestations are present in most areas, however through ongoing bushland management these areas can be re-established as pristine examples of their respective communities.

3.1.3 Site Photos

The following photos were collected during two site visits by Ecologist Luke Johnson.

Plate 3.1 Plot 1 (Demolition and site footprint)



Plate 3.1.1 Plot 1 Location: Development footprint.



Plate 3.1.2 Vegetation is domintated by a mix of native and exotic planted species.



Plate 3.1.3 Vegetation is domintated by a mix of native and exotic planted species.



Plate 3.1.4 Approximately 50% of the development footprint has been cleared of all native vegetation



Plate 3.1.5 Approximately 50% of the development footprint has been cleared of all native vegetation



Plate 3.1.6 Planted exotic garden



Plate 3.1.7 Planted native Acacia pendula



Plate 3.1.8 Exotic vegetation within plot



Plate 3.1.9 Carpobrotus sp. within plot



Plate 3.1.10 Mixed vegetation within building footprint



Plate 3.1.11 Mulch and garden management have inhibited native regeneration



Plate 3.1.12 Footpaths and exotic garden species within building footprint



Plate 3.1.13 Nest box located on tree proposed for removal. Nest box is unproperly hung and in a state of disrepair. Currently uninhabited by fauna.



Plate 3.1.14 Cleared area with exotic grass and canopy species proposed for removal



Plate 3.1.15 Cleared area with exotic grass species proposed for removal

Plate 3.2 Plot 2 (Site access path)



Plate 3.2.1 Plot 2 Location: Site access path



and canopy species associated with STIF plant community.



Plate 3.2.2 Vegetation consists of exotic turf grasses Plate 3.2.3 Vegetation within plot is a mix of exotic ground species with no clear middle stratum.



Plate 3.2.4 Weed species within plot 2.



Plate 3.2.5 drainage channel running southwest along the current access path





Plate 3.2.6 High abundance of Tradescantia flumensis Plate 3.2.7 Westernside of the acess path is showing within the vegetation and channel. signs of regeneration.



Plate 3.2.8 Example of dominant ground vegetation within plot 2.



Plate 3.2.9 Mixed vegetation adjacent to the acess path.



Plate 3.2.10 Hollow bearing tree within proximity to acess path (proposed retention and tree protection)



Plate 3.2.11 Hollow bearing tree



Plate 3.2.12 Two smaller Turpentine trees proposed Plate 3.2.13 Canopy vegetation consistant with STIF for removal due due to impacts from widening requirements of the access way.



plant community.



Plate 3.2.14 T829 Proposed for removal due to impacts from access widening requirments.

Plate 3.3 Broader Vegetation and site characteristics.



Plate 3.2.15 T839 Proposed for removal due to impacts from access widening requirments.



Plate 3.3.1 Planted native border vegetation proposed to be retained.



Plate 3.3.2 Landscaping rock present throughout the garden landscaping.

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Plate 3.3.3 Example of landscaped native garden in plot 1 with placed rock habitat.



Plate 3.3.3 Example of landscaped native garden along boundary garden with placed rock habitat.





Plate 3.3.4 Planted non-local native species along the Plate 3.3.5 Blue Gum High Forest located northeast of southeast border of the site. the proposed Grey House Precinct development



border of the site.



Plate 3.3.6 High Weed abundance along the eastern Plate 3.3.7 STIF community and location of plot 2: access path.
4 Threatened Species

4.1 Flora and Flora Field Survey

No threatened flora or fauna species were identified during Kingfisher 2021 field surveys.

4.1.1 Opportunistic Flora and Fauna survey methods

During opportunistic surveys, notes and photos were taken of the vegetation types and flora and fauna present onsite were recorded. Surveys were general and opportunistic in nature and were performed by traversing the site.

4.1.2 Diurnal Bird Surveys

Diurnal bird surveys occurred during mid-afternoon. Opportunistic observations of birds were made during vegetation surveys. Several species which are known to nest in hollows were predicted at the site and a dedicated effort was made to traverse the impact area to understand if hollows are present and if they are suitable for predicted bird species.

The site survey for birds primarily focused on their breeding habitat requirements such as hollows, waterways onsite, nests that are present and other features which BAM identified bird species may use for breeding purposes. It was concluded that the impact area hosts potential foraging habitat for all birds species listed in the BAM calculator. Therefore, all bird species identified in the BAM calculator were retained in the assessment for foraging purposes.

However, it is unlikely that threatened avifauna would use the impact area for breeding purposes, due to lack of optimal breeding habitat (suitable hollows, suitable waterways). Justification for species exclusion in the BAM-C can be found in appendix I. Searches and call playback was not conducted for forest owls and no individuals were observed on site.

4.1.3 Microbats

The impact area hosts marginal foraging habitat for threatened microbat species which are identified in the BAM calculator for the site. All microbat species have been retained in the BAM calculator for foraging purposes. The site survey for microbats primarily focused on their breeding habitat requirements such as caves, outcrops, hollows and other features which microbat species may use for breeding purposes. It has been concluded that while microbat species may use the site for foraging purposes they are unlikely to use the site for breeding purposes due to lack of optimal breeding opportunities within the impact area. Therefore, impact assessment on microbat breeding habitat has been excluded from the BAM assessment.

4.1.4 Mammal Surveys

Mammal surveys occurred during the mid-afternoon. The proposed development is not expected to significantly impact upon breeding or foraging purposes for any mammal species identified in the BAM Calculator as there are no optional habitat features within the development area.

4.1.5 Amphibian Surveys

Amphibian surveys occurred during the mid-afternoon. Opportunistic observations of amphibians were made during vegetation surveys. Any potential habitat features were investigated however no threatened amphibian species identified in the BAM calculator were identified onsite. Habitat requirements for all threatened amphibian species identified in the BAM calculator are marginal within the impact area.

4.1.6 Reptile and Snail surveys

Reptile and Snail surveys were undertaken by thorough investigation of potential habitat including:

- Leaf litter
- Bark litter

- Stick piles
- Native ground cover vegetation
- Rocks
- Rubbish

Targeted searches were conducted for the Dural Land Snail (*Pommerhelix duralensis*) and Cumberland Plain Land Snail (*Meridolum corneovirens*). Although no threatened Reptile or Snail species were identified during site investigations.

4.1.7 Koala assessment summary

The proposal is unlikely to have a significant impact on the Koala or areas of critical habitat for the species. It is unlikely that the species would occur on site due to the degraded nature of vegetation and habitat, as such, there is a low likelihood of occurrence for the species.

Desktop (Bionet, ALA) and on-ground surveys were conducted to determine the presence / absence of the species. The on-ground survey also contributed to information regarding habitat availability within the site. Direct observation surveys for the species were generally opportunistic in nature, however no individuals were observed on site. Indirect survey methods including; scat and scratching's searches (outlined in DotE; 2014) were conducted. No evidence of the species was found on site.

4.2 Threatened Flora - Desktop

A total of 31 threatened flora species have been recorded within 10km of the study site according to BioNet records. These species are currently listed as vulnerable or endangered under state and/or commonwealth legislation (see Table 4.1). The vulnerable and endangered species to focus on-site searches for can be seen in Table 4.1 below highlighted in bold. This is based on likelihood of occurrence.

Table 4.1. Threatened flora observed in previous ecological surveys within a 10km radius of the study site. NSW DPIE Bionet 2021.

Family	Scientific Name	Common Name	NSW status	Comm. status	Records
Fabaceae (Mimosoideae)	Acacia bynoeana	Bynoe's Wattle	E1	V	2
Fabaceae (Mimosoideae)	Acacia clunies- rossiae	Kanangra Wattle	V		1
Fabaceae (Mimosoideae)	Acacia pubescens	Downy Wattle	V	V	2
Myrtaceae	Callistemon linearifolius	Netted Bottle Brush	V,3		6
Orchidaceae	Cryptostylis hunteriana	Leafless Tongue Orchid	V,P,2	V	1
Myrtaceae	Darwinia biflora	rwinia biflora		v	389
Myrtaceae	Darwinia peduncularis		V		1
Poaceae	Deyeuxia appressa		E1	E	3
Ericaceae	Epacris purpurascens var. purpurascens		V		36
Myrtaceae	Eucalyptus camfieldii	Camfield's Stringybark	V	V	8

Family	Scientific Name	Common Name	NSW status	Comm. status	Records
Myrtaceae	Eucalyptus nicholii	Narrow-leaved Black Peppermint	v	V	2
Rubiaceae	Galium australe	Tangled Bedstraw	E1		1
Orchidaceae	Genoplesium baueri	Bauer's Midge Orchid	E1,P,2	E	51
Orchidaceae	Genoplesium plumosum	Tallong Midge Orchid	E4A,P,2	E	1
Grammitidacea e	Grammitis stenophylla	Narrow-leaf Finger Fern	E1,3		6
Proteaceae	Grevillea caleyi	Caley's Grevillea	E4A,3	CE	1
Proteaceae	Grevillea juniperina subsp. juniperina	Juniper-leaved Grevillea	v		1
Haloragaceae	Haloragodendron lucasii		E1	E	27
Dilleniaceae	Hibbertia spanantha	Julian's Hibbertia	E4A,2	CE	5
Malvaceae	Lasiopetalum joyceae		V	V	4
Myrtaceae	Leptospermum deanei		V	V	12
Proteaceae	Macadamia integrifolia	Macadamia Nut		V	17
Proteaceae	Macadamia tetraphylla	Rough-shelled Bush Nut	V	V	1
Myrtaceae	Melaleuca deanei	Deane's Paperbark	v	v	38
Proteaceae	Persoonia hirsuta	Hairy Geebung	E1,P,3	E	3
Thymelaeaceae	Pimelea curviflora var. curviflora		v	V	5
Lamiaceae	Prostanthera marifolia	Seaforth Mintbush	E4A,3	CE	1
Orchidaceae	Rhizanthella slateri	Eastern Australian Underground Orchid	V,P,2	E	1
Myrtaceae	Rhodamnia rubescens	Scrub Turpentine	E4A		7
Myrtaceae	Syzygium paniculatum	Magenta Lilly Pilly	E1	V	36
Elaeocarpaceae	Tetratheca glandulosa		V		75

Note: *E* = *Endangered*, *V* = *Vulnerable*, *P* = *Protected*.

4.3 Threatened Fauna - Desktop

A total of 46 threatened fauna species have been recorded within 10km of the study site according to BioNet records. These species are currently listed as vulnerable or endangered under state and/or commonwealth legislation (see Table 4.2). The vulnerable and endangered species to focus on-site searches for can be seen in Table 5 below highlighted in bold. This is based on likelihood of occurrence.

Table 4.2. Threatened fauna observed in previou	us ecological surveys within a	10km radius of the study site.
NSW DPIE Bionet 2021.		

Class	Scientific Name	Common Name	NSW Status	Comth Status	No. of records
Amphibia	Heleioporus australiacus	Giant Burrowing Frog	V,P	V	2
Amphibia	Litoria aurea	Green and Golden Bell Frog	E1,P	V	6
Amphibia	Pseudophryne australis	Red-crowned Toadlet	V,P		95
Aves	Anthochaera phrygia	Regent Honeyeater	E4A,P	CE	6
Aves	Artamus cyanopterus cyanopterus	Dusky Woodswallow	V,P		11
Aves	Botaurus poiciloptilus	Australasian Bittern	E1,P	E	2
Aves	Callocephalon fimbriatum	Gang-gang Cockatoo	V,P,3		49
Aves	Calyptorhynchus Iathami	Glossy Black-Cockatoo	V,P,2		24
Aves	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V,P		1
Aves	Daphoenositta chrysoptera	Varied Sittella	V,P		4
Aves	Ephippiorhynchus asiaticus	Black-necked Stork	E1,P		1
Aves	Glossopsitta pusilla	Little Lorikeet	V,P		17
Aves	Haematopus fuliginosus	Sooty Oystercatcher	V,P		3
Aves	Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P		11
Aves	Hieraaetus morphnoides	Little Eagle	V,P		8
Aves	Hirundapus caudacutus	White-throated Needletail	Р	V,C,J,K	43

Class	Scientific Name	Common Name	NSW Status	Comth Status	No. of records
Aves	Ixobrychus flavicollis	Black Bittern	V,P		5
Aves	Lathamus discolor	Swift Parrot	E1,P,3	CE	10
Aves	Limicola falcinellus	Broad-billed Sandpiper	V,P	C,J,K	1
Aves	Lophoictinia isura	Square-tailed Kite	V,P,3		14
Aves	Neophema pulchella	Turquoise Parrot	V,P,3		1
Aves	Nettapus coromandelianus	Cotton Pygmy-Goose	E1,P		4
Aves	Ninox connivens	Barking Owl	V,P,3		6
Aves	Ninox strenua	Powerful Owl	V,P,3		790
Aves	Pandion cristatus	Eastern Osprey	V,P,3		2
Aves	Petroica boodang	Scarlet Robin	V,P		3
Aves	Polytelis swainsonii	Superb Parrot	V,P,3	V	1
Aves	Ptilinopus superbus	Superb Fruit-Dove	V,P		6
Aves	Tyto novaehollandiae	Masked Owl	V,P,3		2
Gastropod a	Pommerhelix duralensis	Dural Land Snail	E1	E	3
Mammalia	Cercartetus nanus	Eastern Pygmy-possum	V,P		84
Mammalia	Chalinolobus dwyeri	Large-eared Pied Bat	V,P	V	5
Mammalia	Dasyurus maculatus	Spotted-tailed Quoll	V,P	E	4
Mammalia	Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P		10
Mammalia	Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E1,P	E	2

Class	Scientific Name	Common Name	NSW Status	Comth Status	No. of records
Mammalia	Micronomus norfolkensis	Eastern Coastal Free- tailed Bat	V,P		26
Mammalia	Miniopterus australis	Little Bent-winged Bat	V,P		59
Mammalia	Miniopterus orianae oceanensis	Large Bent-winged Bat	V,P		195
Mammalia	Myotis macropus	Southern Myotis	V,P		18
Mammalia	Petauroides volans	Greater Glider	Р	V	2
Mammalia	Petaurus australis	Yellow-bellied Glider	V,P		1
Mammalia	Phascolarctos cinereus	Koala	V,P	V	5
Mammalia	Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V	1308
Mammalia	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P		8
Mammalia	Scoteanax rueppellii	Greater Broad-nosed Bat	V,P		15
Reptilia	Varanus rosenbergi	Rosenberg's Goanna	V,P		18

Note: E = Endangered, V = Vulnerable, P = Protected.

4.2 Endangered population

One (1) endangered population have been recorded to occur within 10km of the site. Table 4.3 below displays the populations.

Table 4.3. Endangered population observed in previous ecological surveys within a 10km radius of the study site. NSW DPIE Bionet 2021.

Class	Scientific Name	Common Name	NSW status	Comm. status	Records
Aves	Callocephalon fimbriatum	Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas	E2,V,P,3		48

Likelihood of occurrence

See Appendix I for a 'Rationale for Likelihood of Occurrence', which outlines why species have been retained or omitted from BAM calculations. Reasons for inclusion or removal are based on species habitat preferences, site investigations, species survey, Bionet records and expert opinion. During the survey, none of the above threatened species were observed on-site. Marginal foraging habitat for several species is present onsite. Thus, all predicted species were retained in the BAM-C. Habitat suitability has been assessed in Appendix I for candidate species generated in the BAM-C.

Stage 2: Impact Assessment

5 BAM Calculator

5.1 Vegetation Zones and Integrity Scores

Vegetation zones were determined on species composition at the site. The vegetation zones cover areas in which native vegetation is proposed for removal and/or modification. The two vegetation zones have been divided into management zones.

Future vegetation integrity (F-VI) scores in the BAM-C. Within the accessway, species diversity is expected to remain as per current survey results. However, the structural attributes of the vegetation will be modified in the accessway, therefore F-VI scores were adjusted accordingly. The complete vegetation removal management zones have a F-VI score of 0.

Data for the BAM-C was gathered across two BAM plots located in each vegetation zone at the site. **Vegetation Zone One (Building Footprint)**

Zone one is the area proposed for the new building footprint and would require clearing to facilitate the development. This area has undergone previous clearing and development. Currently this zone consists of:

- Cleared ground with exotic turf and;
- Landscaped garden dominated by exotic species and cultivated natives and footpaths;
- Planted mature native canopy in the form of a mix of six mature trees *E. pilularis, E. microcorys* and *E. saligna* are present throughout the garden and proposed for removal. (ground cover of approximately 0.04 ha)

The poor structural diversity is reflected in the low vegetation integrity score. Vegetation is not mapped as any PCT however, prior to development would have once likely consisted as STIF transition to BGHF. Aborcultural impact assessment (ArborSafe, 2021) states the native canopy trees in this area were planted approximately 60 years prior. It is highly degraded; it does not reflect the natural attributes of the STIF community and therefore was not assessed as contributing to the STIF EEC in the BAM-C. Due to previous development of this area involving; landscaping, exotic species planting, mulch application and ongoing maintenance it is unlikely the original vegetation community would recover. The vegetation zone has been left as one management zone within the BAM-C. This will reflect the future actions; complete vegetation removal (0.02ha).

Zone Two (Site Accessway)

Zone two runs southwest of zone 1 and the site of the proposed development. This zone is proposed to be used as site access for vehicles and plant equipment. The zone consists of:

- A paved footpath (approximately 2m wide) with cleared understory and;
- Ground cover with high abundance of HTE;
- Native canopy trees associated with the STIF plant community.

Vegetation is mapped as STIF although marginally reflects attributes of the community due to disturbances. The area has a highly modified under and mid storey, which is not indicative of the original vegetation community. The ground vegetation is dominated by exotic grasses and high threat exotics. While signs of resilience are apparent through the presence of juvenile *Elaeocarpus* and *Pittosporum* species, high weed abundance and ongoing site management is inhibiting natural regeneration of this zone. The canopy is a mix of native species, with *E. paniculate* and *S. glomulifera* the dominant natives. The vegetation zone has been left as one management zone within the BAM-C. This will reflect the future actions; widening of the access path to a minimum of 4m to facilitate the proposed development and partial canopy tree removal in the form of 4 trees and canopy trimming. Currently the paved path is 2m wide along the majority of the 100m long accessway. The disturbance area is calculated as vegetation removal of 1m either side of the paved path for length of the accessway (0.02ha).

РСТ	Vegetation Zone	Area (Ha)	Vegetation Integrity (VI) Score	Future VI
1218 (STIF)	One – Building Footprint (Figure 5.1)	0.04	18.5	-18.5
1281 (STIF)	Two – Accessway (Figure 5.2)	0.02	28.4	-2.5
Total		0.06		

Table 5.1 Table of current vegetation integrity scores for vegetation zones on site.

Table 5.2 Zone Condition Scores

Zone ID	Composition Condition	Structure Condition	Function Condition
1	5.5	23.1	49.5
2	12.5	26.7	68.9



Figure 5.1 Impact Area of native Vegetation in Zone 1 Building Footprint.



Figure 5.2 Impact Area in Native Vegetation in Zone 2 Accessway.

5.2 Species and Ecosystem Credits

The grand total cost to offset both ecosystem credits generated by this development is \$21,491.16 (including GST), assuming payment will be made into the Biodiversity Conservation Fund. A credit is a unit used to measure the impact of a development. Credits have a price and are traded by the Biodiversity Conservation Trust (BCT) under the Biodiversity Conservation Scheme (BOS). A credit may be created due to a number of factors including but not limited to, amount of vegetation removed, critical habitat removed and alteration of the landscape.

5.2.1 Ecosystem Credit Species derived from BAM

The development and associated works generated two ecosystem credits for the site. This is a reflection of the very poor vegetation integrity at the site. See below, figure 5.3 for the ecosystem credit summary.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrat cost	Methodology ivædjustment factor	/ Price per credit	No. of ecosyster credits	Final n credits price
Cumberland	1281 - Sydney Turpentine - Ironbark forest	Yes	Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	18.83%	\$302.25	1.7832	\$9,281.37	2	\$18,562.74
							Subtotal (ex	cl. GST)	\$18,562.74
								GST	\$1,856.27

Total ecosystem credits (incl. GST) \$20,419.01

Figure 5.3. Ecosystem credit summary from the BAM calculator.

Table 5.3 Ecosystem credit species and sensitivity to gain class.

Ecosystem Credit Species	Sensitivity to Gain Class
Anthochaera Phrygia (Regent Honeyeater)	High
Artamus cyanopterus cyanopterus (Dusky Woodswallow)	Moderate
Callocephalon fimbriatum (Gang-gang Cockatoo)	Moderate
Calyptorhynchus lathami (Glossy Black Cockatoo)	High
Chthonicola sagittate (Speckled Warbler)	High
Daphoenositta chrysoptera (Varied Sitella)	Moderate
Dasyurus maculatatus (spotted-tailed Quoll)	High
Glossopsitta pusilla (Little Lorikeet)	High
Grantiella picta (Painted Honeyeater)	Moderate
Hieraaetus morphnoides (Little Eagle)	Moderate
Hirundapus caudacutus (White-throated Needletail)	High
Lathamus discolor (Swift Parrot)	Moderate
Lophoictinia isura (Square-tailed Kite)	Moderate
Melanodryas cucullate cucullate (Hooded Robin, south-eastern from)	Moderate
Melithreptus gularis gularis (Black-chinned Honeyeater, eastern subspecies)	Moderate
Micronomus norfolkensis (Eastern Coastal Free-tailed Bat)	High
Miniopterus australis (Little Bent-winged Bat)	High
Miniopterus orianae oceansis (Large Bent-winged Bat)	High
Neophema pulchella (Turquoise Parrot)	High
Ninox connivens (Barking Owl)	High
Ninox strenua (Powerful Owl)	High

Petroica boodang (Scarlet Robin)	Moderate
Petroica phoenicea (Flame Robin)	Moderate
Phascolarctos cinereus (Koala)	High
Pseudomys novaehollandiae (New Holland Mouse)	High
Pteropus poliocephalus (Grey0headed Flying Fox)	High
Saccolaimus flaventris (Yellow-bellied Shethtail-bat)	High
Tyto novaehollandiae (Masked Owl)	High
Varanus rosenbergi (Rosenberg's Goana)	High

5.2.2 Species Credit Species derived from BAM

The development and associated works generated species credits for one species including; Large-eared pied bat (*Chalinolobus dwyeri*). In total the cost to offset the species credits generated will be \$1,072.16 (including GST), assuming payment will be made into the Biodiversity Conservation Fund. The individual credit price for each species can be seen below in figure 5.4. Species polygon was assessed as the whole of management zone 2.

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10157	Chalinolobus dwyeri (Large-eared Pied Bat)	Vulnerable	\$741.31	20.6900%	\$80.00	1	\$974.69
					Subtot	al (excl. GST)	\$974.69
						GST	\$97.47

Total species credits (incl. GST) \$1,072.16

Figure 5.4. Species credit summary from the BAM calculator.



Figure 5.5. Previously recorded sightings of Large-eared Pied Bat within Ku-Ring-Gui LGA. Bionet Species Sightings. NSW Government, Accessed: 2022

It has been concluded that not all land within the impact area holds suitable habitat for threatened species. Thus, some species have been excluded due to severe habitat degradation.

Appendix I lists the species credit species predicted by the BAM Calculator and details whether the species have been further assessed based on site suitability (I.e. Habitat constraints and/or habitat degradation within the development site). Under Section 6.4.1.13 of the BAM, species credit species can be excluded from further assessment if an assessment of habitat constraints and microhabitats determines that the habitat within the development site is substantially degraded such that the species credit species is unlikely to occur. See section "6.1.2 BAM Candidate Species for Further Assessment".

The species credits generated in this BDAR were generated in the areas of "complete vegetation removal" and site "accessway widening". The two vegetation zones were divided into these areas as the activities within the accessway area are not expected to significantly degrade or remove breeding habitat features (including hollows) for the species credit species. This method is in accordance with the BAM Section 6.4 (steps 3 - 6).

6 Direct Impacts

6.1.1 Vegetation disturbance and Loss

A mix of 29 native and exotic trees are required to be removed to facilitate both the footprint and access requirements for the proposal (see Figure 6.1). Arborcultural impact statement (Arborsafe 2021) determines that all trees proposed for removal are non-remnant and were previously planted.

Recommendation	Category A High retention value		Category B Moderate retention value		Category C Low Retention value		Category U No retention value	
	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers
Remove for development	2	410, 411	13	45, 47, 48, 49, 50, 52, 392, 393, 399, 400, 401, 404, 406	14	51, 54, 394, 398, 402, 829, 839, 841, 882, 1758, 1759, 2007, 2008, 2009	0	

Figure 6.1 Tree removal plan. Arborsafe, 2021

Vegetation Zone 1 (Building footprint)

A total of 0.04 ha of vegetation within the building footprint (Vegetation Zone 1) will undergo complete removal. As discussed in Section 5 vegetation in this area consists of landscaped gardens and turfed lawn separated by paved footpaths. The ground vegetation is dominated by exotic ornamental species with a mix of local and non-local native species throughout. This area is substantially degraded such that the original vegetation community is unlikely to recover. Areas of potential habitat for STIF will be lost, although the site has been subject to vegetation removal and modification for the previous 100 years. A total of 25 trees are required to be removed, of which 10 are planted natives. Table 6.2 below lists the trees proposed for removal in this area. *Trees in bold are native*.

Table 6.2 Trees proposed for removal in Vegetation Zone 1 Development footprint.

T45 Cinnamomum camphora	T400 Quercus palustris
T47 Stenocarpus sinuatus	T401 Quercus palustris
T48 Eucalyptus microcorys	T402 Quercus palustris
T49 Eucalyptus saligna	T404 Quercus palustris
T50 Eucalyptus microcorys	T406 Quercus palustris
T51 Casuarina cunninghamiana	T410 Eucalyptus microcorys
T52 Jacarana mimosifolia	T411 Eucalyptus microcorys
T54 Arbutus unedo	T1758 Eleocarpus emundii
T392 Liquidambar stryraciflua	T1759 Eleocarpus emundii
T393 Liquidambar stryraciflua	T2007 Yucca filifera
T394 Liquidambar stryraciflua	T2008 Eucalyptus pilularis
T398 Quercus palustris	T2009 Prunis persica
T399 Quercus palustris	

Vegetation Zone 2 (Accessway/construction entry road)

A total of approximately 0.02 ha of this area will be impacted as the development will require the widening of the existing paved footpath for vehicle access to the site, however currently most of the 4m wide access way is a combination of cleared ground/paved footpath (see site photos in section 3.1.2). Vegetation disturbance within the accessway will consist of the removal of 4 native trees (see table 6.3 below) and minor trimming of the canopy to facilitate the site access. Total canopy cover within the impacted vegetation zone was determined to consist of approximately 29% of the vegetation plot. The canopy was predominantly located along the eastern (right hand side) of the plot. Patches of open canopy were also observed and contributed to the low total cover value. The removal of trees T839 and T841 will have negligible impact on the future percentage cover, as lager adjacent trees were already shading this area of the zone. T829 and T882 were both located on the boundary of the vegetation plot (see final arborist report for tree locations). This was due to the BAM required 10mx100m plot dimensions. Subsequently, the canopy of these two trees was only partially within the plot. Therefore, canopy trimming has been calculated as a loss of 5% cover in the future integrity calculations in the BAM-C.

Vegetation on both sides of the footpath are showing signs of resilience, however high weed abundance and ongoing management practices are hindering revegetation of the surrounding STIF plant community. Depending on the design of the access way impacts would not be irreversible. Current species diversity, whilst low, is expected to not to be impacted.

Table 6.3 Trees proposed for removal in Vegetation Zone 2 Site Accessway

T882 Eucalyptus paniculatum	T839 Syncarpia glomulifera
T841 Syncarpia glomulifera	T829 Syncarpia glomulifera

7 Indirect Impacts

7.1.1 Weed growth and invasion

Weed species are present and must be properly managed so they do not spread.

At the direct works zone weeds are to be managed by stopping seed spread on machinery, tools, equipment and worker clothes (e.g. boots). Additionally, after weed removal around the perimeter area of the construction, there must be continuous maintenance of the site otherwise it may result in increased weed growth, exacerbated by the high abundance of weeds present pre-works.

Weeds will colonize and pioneer on any cleared grounds so must be managed throughout the duration of the project as well as on-going post works.

7.1.2 Introduction of pathogens

The introduction of pathogens may occur into the site, and surrounding remnant bushland, via machinery, tools, equipment and worker clothing (e.g. boots). Diseases to watch out for include Phytophthora (also known as Root Rot – type of water mold) and Myrtle Rust (*Puccinia psidii* – type of fungus). See Appendix for Bushland Hygiene Protocols for Phytophora.

7.1.3 Soil disturbance and erosion

The removal of vegetation and trees can result in soil disturbance. The soil appears to be sodic thus erosion can occur at a faster rate. Soil compaction could occur from machinery use. It is recommended that soil compaction in non-built upon areas is to be avoided and not to occur within the trees to be retained Replacement of woody debris and a covering of organic matter over the cleared site will prevent erosion and thus is highly recommended.

7.1.4 Water Quality

There are no streams present onsite however the proposed actions may result in transport of sediment from the work zones because of increased storm water runoff to areas downstream. Which may impact water quality, riparian vegetation and aquatic fauna. Recommendations to maintain and improve water quality on site have been listed in section 10 below.

8 Serious and Irreversible Impact Assessment (SAII)

The following section provides details which address section 10.2 of the Biodiversity Assessment Method (BAM) and thus has referenced the guiding document *Guidance to assist a decision-maker to determine a serious and irreversible impact* in order to satisfy BAM requirements.

The document *Guidance to assist a decision-maker to determine a serious and irreversible impact* outlines the steps taken determine serious and irreversible impacts in section 3.2. The steps are as follows;

- 1. Step one: Identify relevant entities at risk of a SAII
- 2. Step two: Evaluate the extinction risk of the entity to be impacted
- 3. Step three: Detail measures taken to avoid, minimise and mitigate impacts on the entity
- 4. Step four: Evaluate a serious and irreversible impact
- 5. Step five decision making

8.1.1 Step one - Identify relevant entities at risk of a SAII

Following 3.2.1 in Guidance to assist a decision-maker to determine a serious and irreversible impact; The Biodiversity Assessment Report (BAR) will identify species or ecological communities

at risk of a SAII that are likely to be affected by the proposal. These entities are identified

in the BAM Calculator (BAM-C). The front page of the credit report provided by the BAM-

C will also identify all the entities that are considered to be at risk of a SAII and are

impacted on by the proposal.

The BAM-C Credit report can be found in appendix IV.

The following section identifies SAII entities recognised by the BAM Calculator as being at risk of a serious and irreversible impact. Description of the principles for the Listed entities are available in the *Guidance to assist a decision-maker to determine a serious and irreversible impact* and are summarised as:

- Principle 1 species or ecological community currently in a rapid rate of decline
- Principle 2 species or ecological communities with a very small population size
- Principle 3 species or area of ecological community with very limited geographic distribution
- Principle 4 species or ecological community that is unlikely to respond to management and is therefore irreplaceable

The list of SAII entities identified by the document was accessed via;

https://www.environment.nsw.gov.au/topics/animals-and plants/biodiversity/biodiversity-offsets-scheme/serious-and-irreversible-impacts

Scientific Name	Common Name	Principles			
		1	2	3	4
Sydney Turpentine-Ironbark Forest (STIF) (PCT1281).	Sydney Turpentine-Ironbark Forest (STIF) (PCT1281).	х	х		
Chalinolobus dwyeri	Large-eared Pied Bat				х

Table 8.1 All SAII entity recognised by the BAM Calculator for the site.

8.1.2 Step two - Evaluate the extinction risk of the entity to be impacted

• Sydney Turpentine-Ironbark Forest (STIF)

Sydney Turpentine-Ironbark Forest (STIF) satisfies Principle 1 and 2 of SAII criteria;

- Principle 1 species or ecological community currently in a rapid rate of decline
- Principle 2 species or ecological communities with a very small population size

The proposed development will have a direct impact area of 0.06ha on STIF EEC through clearing and modification of the canopy associated with widening of the access path to the site. This impact is within a patch of approximately 1.57ha of mapped STIF within the lot (DP69541 Lot 1) associated with the development. As of 2017 it is estimated that 2300 ha of STIF remains (Bionet Vegetation Classification). Bionet PCT classification identifies the PCT has undergone 90% clearance since pre-European arrival. The removal of approximately 0.06ha attributes to the loss of <0.001 of the current extent. Vegetation on site has been significantly altered such that the site does not reflect the natural structural attributes of STIF. Vegetation marginally reflects attributes of the STIF community, this is primarily due historical actions on site including; clearing, erosion, grazing and exotic species. A majority of vegetation on

site is regrowth or has been planted by property management. Exotic species are dominant across the site and are preventing the recruitment of the original vegetation community. The impacts will not be irreversible.

Thus, the proposed development is not expected to significantly contribute to loss of STIF due to the degraded nature of the site.

• Large-eared Pied Bat (Chalinolobus dwyeri)

Habitat removal for the Large eared pied bat (Chalinolobus dwyeri) is a serious concern as the species is unlikely to respond to management (Principle 4). Optimal maternity or breeding habitat is not present for the species within the impact area or the site. Breeding habitat such as caves, outcrops, suitable hollows and other features which microbat species may use for breeding purposes for were not identified within the impact area. Evidence of avoiding and mitigating of impacts is detailed in section 10. The species is known to roost in caves, overhangs, cliffs and mud nests of the Fairy Martin (*Petrochelidon ariel*). None of these features were identified within the impact area. An opportunistic survey of the surrounds revealed that the site is not in close proximity to optimal roosting habitat. The species was retained and assumed present in the BAM-C as the species may occasionally visit the site to forage. The SAII threshold for SAII in the Bionet TBDC is 'Breeding habitat identified by survey'.

The impact area hosts marginal foraging habitat for microbats in the form of canopy cover and insect abundance. Trees are expected to be removed within the Accessway footprint, resulting in a further loss of marginal foraging habitat. Alterations and degradation of habitat on site pre BDAR would have caused a greater disruption to the species than the proposed development.

Foraging habitat will lost within the footprint, however it is expected that the trees are not significantly contributing towards the long-term survival of the species, as it is considered to be marginal habitat, only to be used occasionally or opportunistically. It is expected that the local population of Large eared pied bat (*Chalinolobus dwyeri*) will not be significantly affected by the proposed development as they are highly mobile and may only use the site occasionally.

8.1.3 Step three - Detail measures taken to avoid, minimise and mitigate impacts on the entity Sydney Turpentine-Ironbark Forest (STIF)

The proposal is expected to have a negligible impact upon STIF as core habitat for STIF will not be removed. The vegetation proposed for removal is in poor condition and it is unlikely that the original vegetation community would recover without assistance.

The proposal includes a potential habitat corridor along the drainage line and boundary which is to be revegetated using species selected from the STIF planting list. Delineation of works areas and exclusion zones for all vegetation to remain have been recommended.

• Large-eared Pied Bat (Chalinolobus dwyeri)

It has been established that maternity or breeding habitat is not present within the impact area for the Large eared pied bat (Chalinolobus dwyeri). The impact area hosts marginal foraging habitat for the species in the form of canopy cover and insect abundance. To avoid additional disturbance on potential foraging habitat, only vegetation which requires removal because of proximity to the proposed building or the need to conform the bushfire protection requirements will be removed or modified.

Three microbat nest boxes are recommended for installation within the site boundaries. This will increase the potential for microbats to roost in the area post development. Native species landscaping across the site is also recommended to increase potential habitat area for the Large eared pied bat (Chalinolobus dwyeri).

8.1.4 Step four - Evaluate a serious and irreversible impact

• Sydney Turpentine-Ironbark Forest (STIF)

The proposed development assessed in this BDAR is not expected to significantly contribute to loss of STIF due to the poor condition of vegetation onsite. Vegetation is both structurally and functionally poor due to historical actions on site. The impact to STIF vegetation will not be irreversible and post-construction bush regeneration management is recommended to ensure recovery of the impacted 0.06 ha and improve the surrounding STIF vegetation. It is unlikely that this proposal would place STIF at risk of extinction or cause a serious or irreversible impact.

• Large-eared Pied Bat (Chalinolobus dwyeri)

Maternity or breeding habitat is not present for any of the species within the impact area or on site. The impact area hosts marginal foraging habitat for microbats in the form of canopy cover and insect abundance. Foraging habitat will lost within the dwelling footprint, however it is expected that the trees are not significantly contributing towards the long-term survival of the species, as it is considered to be marginal habitat, only to be used occasionally or opportunistically. It is expected that the proposal will not cause a disruption to the lifecycle to the Large eared pied bat (*Chalinolobus dwyeri*). Therefore, the species will not be placed at risk of a serious or irreversible impact.

Additional impact assessment provisions for Threatened Ecological Communities (TEC)

a. the action and measures taken to avoid the direct and indirect impact on the potential entity for a SAII

The proposal is expected to have a negligible impact upon STIF as core habitat for STIF will not be removed. The vegetation proposed for removal is in poor condition and it is unlikely that the original vegetation community would recover without assistance.

The proposal includes a potential habitat corridor along the drainage line and boundary which is to be revegetated using species selected from the STIF planting list. Delineation of works areas and exclusion zones for all vegetation to remain have been recommended.

b. the area (ha) and condition of the threatened ecological community (TEC) to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone

The proposed development will have a direct impact area of 0.06ha on STIF EEC through clearing and modification of the canopy associated with widening of the access path to the site. This impact is within a patch of approximately 1.57ha of mapped STIF within the lot (DP69541 Lot 1) associated with the development. As of 2017 it is estimated that 2300 ha of STIF remains (Bionet Vegetation Classification). Bionet PCT classification identifies the PCT has undergone 90% clearance since pre-European arrival. The removal of approximately 0.06ha attributes to the loss of <0.001 of the current extent.

Vegetation on site has been significantly altered such that the site does not reflect the natural structural attributes of STIF Refer to (table 5.1 for VI score). Vegetation marginally reflects attributes of the STIF community, this is primarily due historical actions on site including; clearing, erosion, grazing and exotic species. A majority of vegetation on site is canopy regrowth in or has been planted by property management. Exotic species are dominant across the site including large maintained areas of turf, and are preventing the recruitment of the original vegetation community. The school commissioned a VMP in previous years, prepared by ecologist focussing on the core areas of Blue Gum Forest and STIF. The impacts within zone 2 are not considered irreversible and revelation works will improve the condition in this area post construction.

Thus, the proposed development is not expected to significantly contribute to loss of STIF due to the degraded nature of the site.

c. a description of the extent to which the impact exceeds the threshold for the potential entity n/a The impact does not exceed the threshold.

d. the extent and overall condition of the potential TEC within an area of 1000 ha, and then 10,000 ha, surrounding the proposed development footprint

The overall condition of the remaining STIF within the surrounding lot displays a range of conditions. This been mapped and provided in Section 3. The condition of STIF within the surrounding landscape is predominantly consists of remnant canopy trees in residential areas. The highest condition being isolated to Reserves system.

e. an estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration. The proposed removal of 0.06ha of STIF will be a negligible impact on the extent and condition within the overall IBRA.

f. an estimate of the area of the candidate TEC that is in the reserve system within the IBRA region and the IBRA subregion

Only 25.6 ha (2.2% of the extant community) of Turpentine-Ironbark Forest on the Cumberland Plain was located in national parks in 2002. At that time, 111.2 ha (9.4% of extant) were also located in local government Special Use zones, 106.2 ha (9.0%) in local government Environment Protection zones and 168.6 ha (14.3%) in local government Open Space zones (New South Wales National Parks and Wildlife Service 2002a).

Keith and Benson (1988) noted that none of the westernmost occurrences of the community in the Katoomba region of the Blue Mountains were reserved, but were restricted to small remnants on private property. Remnants further north on the Culoul Range are located in Wollemi National Park (Ryan et al. 1996), while remnant patches in the Glenbrook area (WSW of Penrith) occur in the Blue Mountains National Park (Benson 1992).

Source: Department of the Environment (2022). Turpentine-Ironbark Forest of the Sydney Basin Bioregion in Community and Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 2022-06-09T13:34:08AEST

g. the development, clearing or biodiversity certification proposal's impact on:

i. abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns Impact is expected to be negligible on abiotic factors as the function and use of the access path is not changing. STIF in the building footprint is located within a landscaped garden. Areas on the southern side will be landscaped post-construction with native species.

 ii. characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants
 Impact on functionality of the TEC is isolated to remnant trees. These trees are expected to provide marginal foraging habitat for species. The removal of canopy also removes supply of future hollows that would be expected to form. This will be mitigated through nest box installation.

iii. the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the potential TEC

There was no potential occurrence of the TEC within the building footprint as the site has undergone previous development. Potential TEC within the access path will not be impacted as the area is already being used as a footpath and will continue to be in the future.

h. direct or indirect fragmentation and isolation of an important area of the potential TEC

Fragmentation has already occurred due to previous development. Connectivity between the Access path canopy and Blue Gum High Forest to the north of the site will be reduced as a result of tree removal. Post construction native landscaping and ongoing bush regeneration is expected to improve connectivity in the 130m gap (Figure 11.1)

i. the measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.

Mitigation measures have been provided in section 11. A combination of bush regeneration and native landscape planting are expected to contribute to the recovery of the TEC in the local region.

Additional impact assessment provisions for threatened species or populations

a. The action and measures taken to avoid the direct and indirect impact on the potential entity for a SAII.54 Guidance to assist a decision-maker to determine a serious and irreversible impact 15

The proposed location of the development is the most suitable location within the site, see section 10 for further details. Impacts to LEPB are isolated to the removal of marginal foraging habitat and indirect impacts of reduction in future natural hollow formation due to the removal of mature native canopy.

b. The size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification.

Local population size is unknown for LEPB. The vegetation on site is expected to provide marginal foraging habitat for the species.

c. The extent to which the impact exceeds any threshold for the potential entity.

N/a the threshold is not exceeded.

d. The likely impact (including direct and indirect impacts) that the development, clearing or biodiversity certification will have on the habitat of the local population, including but not limited to: i. an estimate of the change in habitat available to the local population as a result of the proposed development

Impacts to LEPB are isolated to the removal of 0.02ha of marginal foraging habitat. Whilst no evidence has been recorded of the species utilizing hollows as habitat, it is considered that indirect impacts of reduction in future natural hollow formation due to the removal of mature native canopy.

ii. the proposed loss, modification, destruction or isolation of the available habitat used by the local population

The proposal will remove and modify 0.02ha of potential foraging habitat.

iii. modification of habitat required for the maintenance of processes important to the species' life cycle (such as in the case of a plant – pollination, seed set, seed dispersal, germination), genetic diversity and long-term evolutionary development. BioNet Atlas records or other documented, quantifiable means must be used by the assessor to estimate what percentage of the species' population and habitat is likely to be lost in the long term within the IBRA subregion due to the direct and indirect impacts of the development.

Breeding habitat is not proposed to be removed as a result of the development. It is expected the vegetation to be modified provides marginal foraging habitat for the species. The species is highly mobile, and it is not expected the local population is reliant on the vegetation. Bionet atlas records have not recorded the species within the site or college grounds.

e. The likely impact on the ecology of the local population. At a minimum, address the following: i. for fauna: – breeding – foraging – roosting, and – dispersal or movement pathways

Breeding/roosting (caves, buildings, culverts) habitat will not be removed as a direct result. Future potential breeding/roosting habitat will be removed in the form of mature native canopy, however no evidence of this species utilising tree hollows has been recorded.

A total of 0.02ha of marginal foraging habitat is proposed to be removed/modified. It is unlikely the local population of LEPB is reliant on these individual trees for foraging. The species is highly mobile, and movement is not expected to be impeded as a result of the proposal.

ii. for flora, address how the proposal is likely to affect the ecology and biology of any residual plant population that will remain post development including where information is available: – pollination cycle – seedbanks – recruitment, and – interactions with other species (e.g. pollinators, host species, mycorrhizal associations).

N/a

f. A description of the extent to which the local population will become fragmented or isolated as a result of the proposed development.

The species is highly mobile, and the proposal is not expected to fragment or isolate the local population of LEPB. Native canopy planting is proposed for the site post construction to increase connectivity between previously separated patches of vegetation within PLC.

g. The relationship of the local population to other population/populations of the species. This must include consideration of the interaction and importance of the local population to other population/populations for factors such as breeding, dispersal and genetic viability/diversity, and whether the local population is at the limit of the species' range.

No known local population has been identified within the site. Breeding habitat for the species is typically restricted to Sandstone ridgetops within the Sydney Basin. The site and surrounding school grounds does not contain these essential features. The proposed works would not be expected to separate/isolate a local population should it exist.

h. The extent to which the proposed development will lead to an increase in threats and indirect impacts, including impacts from invasive flora and fauna, that may in turn lead to a decrease in the viability of the local population.

Vegetation on site is not considered to form essential breeding or foraging habitat, should a local population exist within the surrounding area. As such, the proposed native landscaping is expected to improve the potential foraging habitat for any local population.

i. An estimate of the area, or number of populations and size of populations that is in the reserve system in NSW, the IBRA region and the IBRA subregion.

No maternity roost sites are known in Queensland (TSSC 2012ad). In NSW, four maternity roost sites have been recorded (Hoye 2005), however, one was permanently flooded in 1976 and one was abandoned in 2009 (TSSC 2012ad). In general, the Large-eared Pied Bat has been poorly surveyed across its current known distribution. Non-targeted surveys have been carried out in parts of the species' range such as those undertaken by the NSW Office of Environment and Heritage in the Sydney Basin and Hunter Valley (NSW DEC 2004h, 2004i, 2004j, 2005bh) and southern Queensland (Queensland CRA/RFA Steering Committee 1997a).

Source: <u>https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=183</u>

j. The measure/s proposed to contribute to the recovery of the species in the IBRA subregion.

Native landscaping and ongoing bush regeneration works are expected to contribute to the recovery of Large-eared Pied Bat species.

9 Prescribed Impact Assessment

The development will not significantly impact features outlined in table 8 below. The proposed actions will not affect water quality as there will be erosion and silt management controls onsite to prevent runoff. Below is a table showing the potential impact the development would have on features that threatened species or communities can be dependent on.

Feature	Present	Description of feature characteristics and location	Potential Impact	Potental Threatened species or community using or dependent on feature	Section of the BAR where prescribed impact is addressed.
Karst, caves, crevices, cliffs or other geologically significant feature	No	N/A	N/A	N/A	N/A
Rocks	Yes	Landscaping rocks within the garden	Negligible	N/A	N/A
Human made structure	Yes	Demountable within the development site	Demolition of structure	Several Microbat Species	Section 8.1 and 9.1N/A
Non-native vegetation	Yes	Scattered throughout	Negligible	N/A	N/A

Table 8. Expected impact on potential habitat onsite.

9.1 Demolition of Human-made Structures

The development proposal includes the demolition of two adjoining demountable structures. Microbat species are known to utilise human structures in residential and industrial areas where suitable natural roosting habitat is not available. The demolition of inhabited structures contribute to the removal of roosting habitat for the species'. ECA understands that these species also use inhabited buildings. Our conclusion was more from knowing these buildings inside and out and doing an assessment of habitat. We have supplement this with an Anabat survey. We know it is not the prime time for microbats in the colder months, however we still have been getting recordings of a range of species in other studies we are doing – by leaving detectors out longer. Plus, in this instant there is a very low chance of them using the building as these small, highly used demountable have fully sealed roof spaces, are low to the ground and if the bats were using the inside they would have been detected/seen. Or at least signs such as faecal matter.

10 Efforts to Avoid and Minimise

10.1.1 Proposed Location and Design

Grey House Precinct

The proposed location of the Grey House Precinct is the most suitable within PLC. As previously discussed in this report, the site has been significantly altered due to previous development and consists predominantly of landscaped garden with a mix of exotic and native species. The removal of this garden will not significantly impact on threatened species. The removal of relatively recent planted native species are considered easily replaced and any impacts associated will be compensated by native landscaping post construction.

Site Access

Multiple routes were assessed for construction site access for vehicles and materials. The proposed access route is the most suitable location. PLC will continue to operate throughout the construction of the Grey House Precinct, alternative routes through the school, whilst not requiring removal of vegetation, would increase the risk of interactions of students and staff with construction vehicles and materials. This access route is able to be delineated from the rest of the campus and avoid unauthorised access to the site. Whilst the impact on vegetation and removal of four native trees is required the location of the access route balances the need to provide safe environment for people within the college and suitable access to the site. Impacts associated with the access path are not considered to be irreversible and the native community is expected to recover with the removal of exotic weed species and bush regeneration activities.

11 Mitigation Measures

11.1 Wildlife corridor/ Revegetation

The proposed development site is situated between two previously separated patches of remnant vegetation (See figure 10.1). The planted mature native trees proposed for removal do not provide canopy connectivity between these patches. Whilst the current vegetation within the garden area proposed for removal and eastern property boundary consists of non-local native species, it is unlikely to provide a useful habitat corridor. Poor vegetation density and lack of community structure result in an approximately 100m long exposed area.

Post development native landscaping and revegetation along the boundary of the site would improve habitat connectivity within the site.

Species plantings should aim to restore maximum diversity at the site. This will provide greater foraging and nesting habitat for native species and will deliver greater biodiversity gain outcomes. These species should be selected in consultation with an ecologist for the greatest ecological outcome from a combination of Sydney Turpentine-Ironbark Forest (STIF) and Blue Gum High Forest (BGHF) communities.

The drainage line adjacent to the access way and site boundary should be revegetated with species associated with STIF plant community. This can be implemented whilst also ensuring the areas satisfies bushfire protection requirements and footpath access to school facilities. Such measures will also increase habitat connectivity of the surrounding landscape. Shrub and ground covers will also increase the habitat area for other wildlife including small insectivorous and insectivorous birds. Plate 10.1 identifies the proposed locations for revegetation activities. Such actions will increase biodiversity within the site and the immediate landscape.



Figure 11.1 Potential improvement to habitat corridor within the site. SixMaps, 2021.



Plate 11.1 Revegetation is recommended for drainage channel and site boundary.

11.2 Weed management

Low impact bushland regeneration methods should be utilised to meet weed control performance criteria in all areas of remnant native vegetation, to prevent unnecessary impacts to native vegetation and disturbance to soil. Low impact bush regeneration methods include the manual removal of herbaceous weeds and their propagules by hand and with hand tools. All bush regeneration activities requiring the use of chemicals must be performed in accordance with the NSW *Pesticides Act 1999*. Herbicides must not be applied whilst exotic plants are setting seeds.

11.3 Delineation of work areas

During construction, impacts to the site and adjacent vegetation should be minimised by the delineation of works zones. Access to the site would be best restricted to the development footprint only. An environmental exclusion zone is proposed for vegetation outside work areas.

11.4 Vegetation clearing control measures

An ecologist should be present onsite during vegetation clearing to ensure no fauna are harmed as a result of clearing.

11.5 Tree Protection

Tree protection will be consistent with the Tree Survey. Main trees to be managed are trees within close proximity to site accessway NB: see final tree survey for details and tree numbers.

11.6 Weed Removal Techniques

Weed removal proposed for the site will consist of hand removal techniques, manual/mechanical removal using bush regenerator tools and winter thermal (flame) weeding. This approach will reduce the amount of herbicide used and reduce the amount of off-target damage through spot on application.

Woody perennial weeds less than 2 metres in height will require cut and paint or scrape and paint bush regenerator techniques based on the germinating/epicormic behaviour of the plant (especially plants that tend to coppice or sucker).

It is recommended that seed heads are removed prior to commencement of primary works. This would be best performed carefully by hand with secateurs with the aim of avoiding the spread flowers or seeds into planting zones.

See Appendix II for further details.

11.7 Native Seed Collection

Any native trees or shrubs being removed for the construction works should be checked for seeds during removal works. If seeds are present, they should be collected and used off-site. Suitable locations currently exist within the site of Pymble Ladies College currently undergoing bush

regeneration activities.

11.8 Nest boxes

Installation of a 3 nest boxes designed for microbats should be added to the site to increase roosting opportunities in the area. Image from: nestboxes.com.au

11.9 Pathogen prevention

To prevent the introduction of pathogens, Bushland Hygiene Protocols outlined in Appendix III should be followed. The site is considered to be an area which may promote the spread of Phytophthora (a group of fungus-like diseases affecting plants) due to its moist soil and proximity to the drainage channel. It is recommended that Bushland Hygiene Protocols be followed closely.



Table 11. Mitigation Measures Table.

Mitigation Measure	Stage	Frequency	Responsible
Wildlife corridor/revegetation	Post construction (ongoing)	At the discretion of project bush regenerator	Project ecologist/bush regenerator
Weed management	Pre- construction phase Construction phase Post construction (ongoing)	Weekly during active construction and monthly ongoing	Project ecologist/bush regenerator
Delineation of work areas	Pre- construction phase Construction phase	Installed during pre-construction	Site Supervisor/project ecologist
Vegetation clearing controls	Pre- construction phase	Once	Project Ecologist
Tree protection	Pre- construction phase Construction phase	Installed during pre-construction	Project Arborist/ Project Ecologist
Weed removal techniques	Pre- construction phase Construction phase Post construction (ongoing)	At the discretion of project bush regenerator	Project Bush Regenerator
Native seed collection and propagation	Pre- construction phase	During clearing or at the discretion of the project ecologist	Project Ecologist/ bush regenerator
Nest boxes installation	Pre- construction phase	Installed once and replaced every 5 years	Project Ecologist
Nest box monitoring	Post construction phase (ongoing)	Annually	Project Ecologist
Pathogen prevention	Pre- construction phase Construction phase Post construction (ongoing)	Ongoing throughout each phase	Site Supervisor/ Project Ecologist/ bush regenerator

12 Conclusions

The proposed development will have an approximate impact area of 0.02 ha on Sydney Turpentine-Ironbark Forest (STIF) (PCT1281). This vegetation has been significantly altered and degraded from its natural state. Vegetation onsite has been significantly altered such that the site does not reflect the natural structural attributes of STIF. The grand total cost to offset both ecosystem credits and species credits generated by this development is \$21,491.16 (including GST) assuming payment will be made into the Biodiversity Conservation Fund.

13 Appendices

13.1 Appendix I – Rationale for Likelihood of Occurrence

Rationale for Likelihood of Occurrence all Species Credit Species (candidate species) predicted by the BAM Calculator (BAM-C) and details whether the species have been retained or omitted from the calculator.

Where a species has a specific habitat constraint, which is not present within the subject land, or if the species is a vagrant within the IBRA subregion, the species is considered unlikely to occur and no further assessment is required. Additionally. in accordance with section 6.4.1.17 of the BAM, a candidate species credit species can be considered unlikely to occur within the subject land (or specific vegetation zones) where habitat is substantially degraded such that the species is unlikely to utilise area. As discussed in Sections 2 and 3, much of the vegetation within the subject land and 1,500 m buffer has been previously cleared, fragmented and is subject to ongoing disturbance.

A predicted candidate species credit species that is not considered to have suitable habitat on the subject land (or specific vegetation zones) in accordance with section 6.4.1.17 of the BAM does not require further assessment on the subject land (or specific vegetation zones). The reasons for determining that a predicted species credit species is unlikely to have suitable habitat on the subject land (or specific vegetation zones) has been included below for each Candidate Species for the BDAR.

Table 12.1 Potential Species Credit Species generated by the BAM-C, all the following species were candidate threatened species for the site. All BAM-C predicated species were retained.

Family	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
Orchidaceae	Caladenia tessellata	Thick Lip Spider Orchid	The Thick Lip Spider Orchid is from a group of orchids characterised by five long spreading petals and sepals around a broad down-curled labellum ('lip'). It has cream- coloured petals with reddish stripes, and the yellowish labellum is broad with a few darker stripes. The long, sparsely-hairy, narrow leaf is about 6 cm long and 5 mm wide. Column base with two prominent yellow glands. Generally found in grassy	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Species was not identified during flora survey.

			sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. The single leaf regrows each year. Flowers appear between September and November (but apparently generally late September or early October in extant southern populations). Within NSW, <i>Caladenia</i> <i>tessellata</i> is 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. The total population size is estimated to be less than 50 individuals.		The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on- going disturbance. No further assessment required.
Proteaceae	Persoonia hirsuta	Hairy Geebung	Usually found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Usually present as isolated individuals or very small populations. Habitat Preferences: It also favours disturbed heath, shrubby thickets and sandstone scrubs	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Species was not identified during flora survey. The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on- going disturbance. No further assessment required.
Myrtaceae	Rhodamnia rubescens	Scrub Turpentine	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly	Veg Zone 1: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that

		to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	Veg zone 2: No	the species is unlikely to utilise area. Species was not identified during flora survey. The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on- going disturbance. No further assessment required.
Clavariaceae	Camarophyllopsis kearneyi	Known only from its type locality in Lane Cove Bushland Park in the Lane Cove local government area in the Sydney metropolitan region. Its occurrence appears to be limited to the Lane Cove Bushland Park. Surveys in potentially suitable habitats elsewhere in the Sydney Basin Bioregion have failed to find <i>Camarophyllopsis kearneyi</i> . Does not produce basidiomes (above-ground fruiting structures) all year, but may be present only as non-reproductive hyphal structures below ground.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on- going disturbance. No further assessment required.
Gyrostemonaceae	Gyrostemon thesioides	Occurs in open sclerophyll forest dominated by Eucalyptus sieberi. The	Veg Zone 1: No	Likelihood of occurrence for the species is low. Habitat is

		species occurs on gentle east and south- facing slopes and on ridges in shallow sandy soil. Flowers September to December.	Veg zone 2: No	substantially degraded such that the species is unlikely to utilise area. Species was not identified during flora survey. And the site lacks key habitat features associated with the species. The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on- going disturbance. No further assessment required.
Hygrophoraceae	Hygrocybe anomala var. ianthinomarginata	Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on- going disturbance. No further assessment required.

Hygrophoraceae	Hygrocybe aurantipes	Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on- going disturbance. No further assessment required.
Agaricomycetes	Hygrocybe austropratensis	Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum</i> <i>undulatum</i>). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. The site has been significantly altered and degraded from its

		round. Fruiting bodies begin appearing mid May to mid July sometimes to August.		natural state. It has a long history of clearing, fragmentation and on- going disturbance. No further assessment required.
Agaricomycetes	Hygrocybe collucera	Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on- going disturbance. No further assessment required.
Agaricomycetes	Hygrocybe griseoramosa	Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum</i> <i>undulatum</i>). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor

		extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.		due to the cryptic nature of fruiting fungi. The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on- going disturbance. No further assessment required.
Agaricomycetes	<i>Hygrocybe</i> <i>lanecovensis</i>	Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum</i> <i>undulatum</i>). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on- going disturbance. No further assessment required.
Agaricomycetes	Hygrocybe reesiae	Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum</i>	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area.

		<i>undulatum</i>). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.		Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on- going disturbance. No further assessment required.	
Agaricomycetes	Hygrocybe rubronivea	Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum</i> <i>undulatum</i>). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on- going disturbance. No further assessment required.	
Class	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
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Aves	Anthochaera phrygia	Regent Honeyeater	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. This species has been seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests.	Foraging: Yes Breeding: No	The site is located within an area mapped of knwon occurrence for the species in the National Recovery Plan for Regent Honeyeater, 2016. However, the site in not located in a key breeding area. Species is unlikely to occur within the site, as vegetation within the site is highly disturbed and lacks a middle and ground vegetation. Site also lacks key habitat features associated with the species such as an abundance of mistletoes and bird richness. No further assessment required.
Mammalia	Chalinolobus dwyeri	Large-eared Pied Bat	Large-eared Pied Bat roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Petrochelidon ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features.	Veg Zone 1 : Yes Veg Zone 2 : Yes	Moderate likely hood of occurrence. The Site contains potential foraging habitat for the species in the form of tree canopy within Vegetation zone 2. Caves and crevices are likely within 2km of the site. Species retained in calculator for Management zone 2.
Mammalia	Miniopterus orianae oceanensis	Large Bent- winged Bat	Primarily roosts in caves but will utilise mine shafts, storm-water tunnels, buildings and other man-made structures. Forms colonies within a maternity cave and disperse within a 300km range. Forage in forested areas in the tree canopy.	Breeding : No Foraging: Veg zone 1: Yes	Moderate likely hood of occurrence. The site contains potential foraging habitat for the species in the form of adequate tree canopy within Vegetation zone 2.

Class	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
				Veg Zone 2: Yes	Two demountable structures are proposed to be removed, however these structures are currently in use and are well maintained. No potential breeding habitat is located within the disturbance area. No further assessment required.
Mammalia	Miniopterus australis	Little Bent- winged Bat	Moist eucalypt forest, rainforest or dense coastal banksia scrub. Little Bentwing-bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters. In NSW the largest maternity colony is in close association with a large maternity colony of Common Bentwing-bats (<i>M. schreibersii</i>) and appears to depend on the large colony to provide the high temperatures needed to rear its young.	Breeding : No Foraging: Veg zone 1: Yes Veg Zone 2: Yes	Moderate likely hood of occurrence. The site contains potential foraging habitat for the species in the form of adequate tree canopy within Vegetation zone 2. The site lacks key breeding habitat requirements associated with the species. Vegetation within both zones of the site is highly disturbed and lacks midstory vegetation. A single hollow was identified within Management zone 2 in a tree proposed for retention. No further assessment required.
Aves	Lathamus discolor	Swift Parrot	On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> ,	Breeding: No Foraging: Yes	Potential to occur within the site. The site is located in area of mapped know occurrence of the species. <u>https://www.environment.nsw.gov.au/</u> <u>threatenedspeciesapp/profile.aspx?id=</u> <u>10455</u>

Class	Scientific Name	Common Name	Habitat Requirements	Retained BDAR Calculator	in	Site Suitability
			Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> . Return to home foraging sites on a cyclic basis depending on food availability.			The site displays moderate key foraging habitat requirements in in the form of Eucalypt canopy species; <i>E. pilularis</i> in Vegetation zone 2. Breeding occurs within Tasmania and returns to mainland foraging sites on a cyclic basis.
						No further assessment required.

13.2 Appendix II– Key Weed Removal Methods

Physical removal

Technique	Method	Equipment
Hand Removal	Seedlings and smaller weed species where appropriate will be pulled out by hand, without risk of injury to workers. The size that this can occur varies throughout the treatment area. Generally, it ranges from post seed to approximately 300mm in height. Rolling and raking is suitable for larger infestations of Wandering Jew. The weed can be raked and stems and plants parts rolled. The clump of weed material can then be bagged	Tools: Gloves, Rakes, Knife and Weed Bags
Crowning	Plants that possess rhizomes or bulbs might not respond to various removal techniques and may need to be treated with crowning. A knife, mattock or trowel is to be driven into the soil surrounding the bulb or rhizome at an angle of approximately 45 degrees with surrounding soil, so as to cut any roots that may be running off. This is to occur in 360 degrees around the bulb/rhizome. The rhizome or bulb is to be bagged and removed from the site and disposed of at an appropriate waste recycling facility Soil disturbance is to be kept to a minimum when using this technique.	Tools: Knife, mattock, trowel, impervious gloves, and all other required P.P.E.
Cut and Paint Stems	Weed species deemed unsuitable for hand removal shall be cut. Those that have persistent of vigorous growth will be cut and painted with Roundup® Biactive Herbicide or equivalent. Juvenile and smaller weed species will be cut with secateurs at base of plant, and herbicide applied via applicator bottle. Stem to be cut horizontally as close to the ground as possible, using secateurs, loppers or a pruning saw. Horizontal cuts to be made on top of stem to prevent the herbicide running off the stump. Apply herbicide to the cut stem immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. Herbicide is not to reach sediment	Tools: loppers, secateurs, pruning saw, herbicide applicator/sprayer, impervious gloves, Roundup [®] Biactive Herbicide and all other required P.P.E.

Technique	Method	Equipment
Scrape and Painting	More resilient weed species, where other techniques are less reliable are to be scraped with a knife or chisel and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current herbicide license. Weed species will be scraped with a knife or chisel up the length of the trunk, and herbicide applied via applicator bottle. Scrape the trunk from as close to the ground as possible to approximately ¾ of the plants height. Where trunk diameters exceed approximately 5 cm a second scrape shall be made on the other side of the trunk. Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting plants. Follow up treatment may be required. If plants resprout, scrape and paint the shoots using the same method after sufficient regrowth has occurred.	Tools: knife, chisel, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup [®] Biactive Herbicide, and all other required P.P.E.
Cut with a Chainsaw and Paint	Larger size weed species, too large for cutting with hand tools, shall be cut with a chainsaw and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current chainsaw and herbicide license. Larger weed species will be cut with a chainsaw at base of plant, and herbicide applied via applicator bottle. Cut the stem horizontally as close to the ground as possible, using the chainsaw. Remove upper branches to reduce bulk of plant. If cutting at the base is impractical, cut higher to get rid of the bulk of the weed, then cut again at the base and apply herbicide. Make cuts horizontal to prevent the herbicide running off the stump. Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. Ensure there is no runoff of poison. All care must be taken by the contractor not to spill herbicide into water, onto sediment, or surrounding non-targeting plants.	Tools: chainsaw, ear muffs, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E.

Technique	Method	Equipment
Spot Spraying	Spot spraying involves spraying non-seeding annuals and grasses, and for regrowth of weeds once an area has been cleared or brushcut. Works to be carried out by a contractor with a current herbicide license. Herbicide will be mixed up according to the manufacturer's directions for the particular weed species being targeted. Mixed herbicide shall be applied to the targeted weed species with a backpack sprayer. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting plants.	Tools: protective clothing, safety glasses, herbicide sprayer, impervious gloves, Herbicide, and all other required P.P.E.

Flame Weeding

Thermal (flame) weeding is a method where high temperatures are applied to weeds, causing the plant to die. Thermal weeding is particularly useful in situations where conservation or health considerations are high and weed density is low such as waterways where herbicide use is not permitted.

While flame weeding is not suited to most streetscapes due to the fire hazard nor can it be used on materials such as soft fall and similar playground equipment it is noted that 'flame' weeding in waterways allows weed management in areas where herbicides are not permitted.

Also for native vegetation areas thermal weeding, with a flame weeder, has been shown to stimulate germination of native plants while killing the seeds of annual weeds such as Devils Pitchfork, *Bidens pilosa*. Flame weeding is also effective in killing persistent weeds like Mother of Millions.

Best results are obtained when follow up weed control is undertaken 4-6 weeks after treatment. In addition, weed control should be conducted periodically after that for example to control weeds over a period of a year it is likely that between 3-5 applications will be necessary, depending on rainfall and the extent of the weed seed bank. This method is most effective on young annual weeds and least effective on older perennial weeds. In some cases, control of perennial weeds will be ineffective however this depends on the species present and its age.

FLAME WEEDER – ECO BURN



Case Study: Weed Mgt and Eco-burn Glenorie in the Hills Shire Council



Flame weeding should be undertaken outside of the fire seasons. Flame weeding allows for the mimicking of a burn in areas where a control burn could not be undertaken. See native plants regenerating after flame weeding. Images provided by Dragonfly Environmental



13.3 Appendix III– Bushland Hygiene Protocols for Phytophthora (Hornsby Council Recommendations)

- Always assume that the area you are about to work in is free of the disease and therefore needs to be protected against infection.
- And, always assume that the activity you are about to undertake has the potential to introduce the disease.
- Arrive at site with clean shoes, i.e.: no dirt encrusted on them.
- If you arrive with shoes that are encrusted with dirt, they will have to be completely soaked in metho or disinfectant and allow a few minutes to completely soak in. NEVER scrape untreated dirt off your shoes onto the ground.
- Before you move onto the site spray the bottom of your shoes with 70 % metho. Bleach solution (1% strength) or household/commercial disinfectant (as per label) are also suitable.
- Check all tools and equipment that comes in contact with soil are clean before entering the area (they should have been cleaned on site at the end of the previous work session). If there is any dirt on them, spray them with 70% metho.
- Clean all tools at the end of each work session while still on site ensuring this is done away from drainage lines and adjacent work areas. Knock or brush off encrusted dirt and completely spray with 70 % metho. Replace in storage/transport containers.
- Preferably compost all weed material on site.
- Never drag vegetation with exposed roots and soil through bushland.
- When removing weeds from site, remove as much soil as possible from them in the immediate work area and carefully place vegetative material into plastic bags.
- Try not to get the bag itself dirty; don't put it on/in a muddy area.
- Always work from the lower part of a slope to the upper part.
- Always work in areas known to be free of the pathogen before working in infected areas.
- Minimise activities wherever possible when the soil is very wet.
- Vehicles should not be driven off track or into reserves (unless vehicle decontamination is carried out before and after entering a single work site)
- Only accredited supplies of plants/mulch to be used.

Kit should contain: 1 bucket, 1 scrubbing brush, 1 spray bottle (metho 70% solution), 1 bottle tap water, 1 bottle methylated spirits.

Contact Hornsby Bushcare if you require any refills or replacements of your Phytophthora Kits on 9484 3677 or bushcare@hornsby.nsw.gov.au

Facts about Phytophthora

Phytophthora cinnamomi (Phytophthora) is a microscopic, soil borne, water-mould that has been implicated in the death of remnant trees and other plants in Australian bushland. Phytophthora is not native to Australia. It is believed to have been introduced sometime after European settlement. Phytophthora is a national problem and is listed as a key threatening process under the Commonwealth's Environmental Protection and Biodiversity Conservation Act 1999.

Symptoms including Dieback

"Dieback" simply means dying or dead plants. There are many causes of dieback; Phytophthora is just one of them. Often dieback is the result of a combination of factors such as; changed drainage patterns and nutrient loads (e.g.: increased stormwater run-off) or changed soil conditions (e.g.: dumped fill or excavation of/near root zone). Plants that are stressed are more vulnerable to Phytophthora.

Initial symptoms of Phytophthora include; wilting, yellowing and retention of dried foliage, loss of canopy and dieback. Infected roots blacken and rot and are therefore unable to take-up water and nutrients. Severely infected plants will eventually die. Symptoms can be more obvious in summer when plants may be

stressed by drought. If you suspect that Phytophthora is on your site, please contact the Bushcare team to collect a soil sample to be lab tested. This is usually done in the warmer months where conditions are optimum for the disease.

Infection

There is no way of visually telling if Phytophthora is present in the soil as its structures and spores are microscopic (invisible to the naked eye). Phytophthora requires moist soil conditions and warm temperatures for infection, growth and reproduction. Spores travel through moist soil and attach to plant roots. Once Phytophthora has infected a host plant it can grow inside plant root tissue independent of external soil moisture conditions. After infection, Phytophthora grows through the root destroying the tissue which is then unable to absorb water and nutrients.

13.4 Appendix IV– BAM –C; Reports and Data

13.4.1 Payment Report.



Biodiversity payment summary report

Assessment Id 00027998/BAAS19008/21/000281 08	Payment data version	Assessment Revision 3	Report created 08/06/2022
Assessor Name Geraldene Susan Dalby-Ball	Assessor Number BAAS19008	Proposal Name Pymble Ladies College - Grey House Precinct	BAM Case Status Finalised
Assessment Type	Date Finalised	BOS entry trigger	
Part 4 Developments (Small Area)	08/06/2022	BOS Threshold: Biodiversity Values Map	

PCT list

Price calculated	PCT common name	Credits
Yes	1281 - Sydney Turpentine - Ironbark forest	2

Species list

Price calculated	Species	Credits
Yes	Chalinolobus dwyeri (Large-eared Pied Bat)	1

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Assessment Id

Proposal Name

00027998/BAAS19008/21/00028108

Pymble Ladies College - Grey House Precinct

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Biodiversity payment summary report

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premiu m	Adminis trative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Cumberland	1281 - Sydney Turpentine - Ironbark forest	Yes	Sydney Turpentine- Ironbark Forest in the Sydney Basin Bioregion	18.83%	\$302.25	1.7832	\$9,281.37	2	\$18,562.74
	Subtotal (excl. GST) \$18,562.74						\$18,562.74		
								GST	\$1,856.27

Total ecosystem credits (incl. GST) \$20,419.01

Species crea	lits for threatened species						
Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10157	Chalinolobus dwyeri (Large-eared Pied Bat)	Vulnerable	\$741.31	20.6900%	\$80.00	1	\$974.69
					Subt	otal (excl. GST)	\$974.69
						GST	\$97.47
Assessment Id	Proposal	Name					Page 2 of 3

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Biodiversity payment summary report

Total species credits (incl. GST)	\$1,072.16

Grand total \$21,491.17

Assessment Id

Proposal Name

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13.4.2 Credit Summary Report.



Proposal Details

BAM Credit Summary Report

Assessment Id	Proposal Name	BAM data last updated *
00027998/BAAS19008/21/00028108	Pymble Ladies College - Grey House Precinct	24/11/2021
Assessor Name	Report Created	BAM Data version *
Geraldene Susan Dalby- Ball	08/06/2022	50
Assessor Number	BAM Case Status	Date Finalised
BAAS19008	Finalised	08/06/2022
Assessment Revision	Assessment Type	BOS entry trigger
3	Part 4 Developments (Small Area)	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetatio	TEC name	Current	Change in	Are	Sensitivity to	Species	BC Act Listing	EPBC Act	Biodiversit	Potenti	Ecosyste
	n		Vegetatio	Vegetatio	а	loss	sensitivity to	status	listing status	y risk	al SAII	m credits
	zone		n	n integrity	(ha)	(Justification)	gain class			weighting		
	name		integrity	(loss /								
			score	gain)								

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BAM Credit Summary Report

Sydne	y Turpentin	ne - Ironbark forest										
1	1281_fair	Sydney Turpentine- Ironbark Forest in the Sydney Basin Bioregion	28.4	2.5	0.02	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	1
2	1281_Poor 01	Sydney Turpentine- Ironbark Forest in the Sydney Basin Bioregion	18.5	18.5	0.04	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	1
											Subtot al	2
											Total	2

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Chalinolobus de	Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)								
1281_fair	2.5	2.5	0.02			Vulnerable	Vulnerable	True	1
								Subtotal	1

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13.4.3 Predicted species report.



BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated '
00027998/BAAS19008/21/00028108	Pymble Ladies College - Grey House Precinct	24/11/2021
Assessor Name Geraldene Susan Dalby-Ball	Report Created 08/06/2022	BAM Data version * 50
Assessor Number BAAS19008	Assessment Type Part 4 Developments (Small Area)	BAM Case Status Finalised
Assessment Revision 3	BOS entry trigger BOS Threshold: Biodiversity Values Map	Date Finalised 08/06/2022

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	1281-Sydney Turpentine - Ironbark forest
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	1281-Sydney Turpentine - Ironbark forest
Dusky Woodswallow	Artamus cyanopterus cyanopterus	1281-Sydney Turpentine - Ironbark forest
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	1281-Sydney Turpentine - Ironbark forest
Flame Robin	Petroica phoenicea	1281-Sydney Turpentine - Ironbark forest
Gang-gang Cockatoo	Callocephalon fimbriatum	1281-Sydney Turpentine - Ironbark forest
Glossy Black- Cockatoo	Calyptorhynchus lathami	1281-Sydney Turpentine - Ironbark forest
Grey-headed Flying- fox	Pteropus poliocephalus	1281-Sydney Turpentine - Ironbark forest
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	1281-Sydney Turpentine - Ironbark forest

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BAM Predicted Species Report

Koala	Phascolarctos cinereus	1281-Sydney Turpentine - Ironbark forest
Large Bent-winged Bat	Miniopterus orianae oceanensis	1281-Sydney Turpentine - Ironbark forest
Little Bent-winged Bat	Miniopterus australis	1281-Sydney Turpentine - Ironbark forest
Little Eagle	Hieraaetus morphnoides	1281-Sydney Turpentine - Ironbark forest
Little Lorikeet	Glossopsitta pusilla	1281-Sydney Turpentine - Ironbark forest
Masked Owl	Tyto novaehollandiae	1281-Sydney Turpentine - Ironbark forest
New Holland Mouse	Pseudomys novaehollandiae	1281-Sydney Turpentine - Ironbark forest
Painted Honeyeater	Grantiella picta	1281-Sydney Turpentine - Ironbark forest
Powerful Owl	Ninox strenua	1281-Sydney Turpentine - Ironbark forest
Regent Honeyeater	Anthochaera phrygia	1281-Sydney Turpentine - Ironbark forest
Rosenberg's Goanna	Varanus rosenbergi	1281-Sydney Turpentine - Ironbark forest
Scarlet Robin	Petroica boodang	1281-Sydney Turpentine - Ironbark forest
Speckled Warbler	Chthonicola sagittata	1281-Sydney Turpentine - Ironbark forest
Spotted-tailed Quoll	Dasyurus maculatus	1281-Sydney Turpentine - Ironbark forest
Square-tailed Kite	Lophoictinia isura	1281-Sydney Turpentine - Ironbark forest
Swift Parrot	Lathamus discolor	1281-Sydney Turpentine - Ironbark forest
Turquoise Parrot	Neophema pulchella	1281-Sydney Turpentine - Ironbark forest
Varied Sittella	Daphoenositta chrysoptera	1281-Sydney Turpentine - Ironbark forest
White-throated Needletail	Hirundapus caudacutus	1281-Sydney Turpentine - Ironbark forest
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	1281-Sydney Turpentine - Ironbark forest

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s) Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

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BAM Predicted Species Report

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13.4.4 Candidate species report



Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00027998/BAAS19008/21/00028108	Pymble Ladies College - Grey House Precinct	24/11/2021
Assessor Name	Report Created	BAM Data version *
Geraldene Susan Dalby- Ball	08/06/2022	50
Assessor Number	Assessment Type	BAM Case Status
BAAS19008	Part 4 Developments (Small Area)	Finalised
Assessment Revision	Date Finalised	BOS entry trigger
3	08/06/2022	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey					
Name	Presence	Survey Months			
Caladenia tessellata Thick Lip Spider Orchid	No (surveyed)	□ Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug ☑ Sep □ Oct □ Nov □ Dec			
		Survey month outside the specified months?			
Chalinolobus dwyeri Large-eared Pied Bat	Yes (assumed present)	JanFebMarAprMayJunJulAugSepOctNovDec			
		Survey month outside the specified months?			

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BAM Candidate Species Report

Persoonia hirsuta Hairy Geebung	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Survey month outside the specified months?
Rhodamnia rubescens Scrub Turpentine	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Camarophyllopsis kearneyi	Camarophyllopsis kearneyi	Habitat degraded
Gyrostemon thesioides	Gyrostemon thesioides	Habitat degraded
Hygrocybe anomala var. ianthinomarginata	Hygrocybe anomala var. ianthinomarginata	Habitat degraded
Hygrocybe aurantipes	Hygrocybe aurantipes	Habitat degraded
Hygrocybe austropratensis	Hygrocybe austropratensis	Habitat degraded
Hygrocybe collucera	Hygrocybe collucera	Habitat degraded
Hygrocybe griseoramosa	Hygrocybe griseoramosa	Habitat degraded
Hygrocybe lanecovensis	Hygrocybe lanecovensis	Habitat degraded
Hygrocybe reesiae	Hygrocybe reesiae	Habitat degraded
Hygrocybe rubronivea	Hygrocybe rubronivea	Habitat degraded
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat degraded

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BAM Candidate Species Report

Swift Parrot

Lathamus discolor

Habitat constraints

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13.4.5 Biodiversity Credit Report (Like for Like)



Proposal Details

BAM Biodiversity Credit Report (Like for like)

Assessment Id	Proposal Name	BAM data last updated *
00027998/BAAS19008/21/00028108	Pymble Ladies College - Grey House Precinct	24/11/2021
Assessor Name Geraldene Susan Dalby-Ball	Assessor Number BAAS19008	BAM Data version * 50
Proponent Names	Report Created	BAM Case Status
Kate Bimson	08/06/2022	Finalised
Assessment Revision	Assessment Type	Date Finalised
3	Part 4 Developments (Small Area)	08/06/2022
BOS entry trigger	* Disclaimer: BAM data last updated may indicate either complete	or partial update of the
BOS Threshold: Biodiversity Values Map	BAM calculator database. BAM calculator database may not be co	mpletely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	Critically Endangered Ecological Community	1281-Sydney Turpentine - Ironbark forest
Species		
Chalinolobus dwyeri / Large-eared Pied Bat		

Additional Information for Approval

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BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT

No Changes

Predicted Threatened Species Not On Site

Name

No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1281-Sydney Turpentine - Ironbark forest	Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	0.1	2	0	2

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BAM Biodiversity Credit Report (Like for like)

1281-Sydney Turpentine -	Like-for-like credit retire	ement options				
Ironbark forest	forest Name of offset trading Trading group Zone HBT Credits group	Credits	IBRA region			
	Sydney Turpentine- Ironbark Forest in the Sydney Basin Bioregion This includes PCT's: 1183, 1281, 1284	-	1281_fair	Yes	1	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Sydney Turpentine- Ironbark Forest in the Sydney Basin Bioregion This includes PCT's: 1183, 1281, 1284	-	1281_Poor01	Yes	1	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Chalinolobus dwyeri / Large-eared Pied Bat	1281_fair	0.0	1.00

Credit Retirement Options	Like-for-like credit retirement options		
Chalinolobus dwyeri / Large-eared Pied Bat	Spp	IBRA subregion	
	Chalinolobus dwyeri / Large-eared Pied Bat	Any in NSW	

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BAM Biodiversity Credit Report (Like for like)

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13.5 Appendix V– EPBC Act Considerations

The following section includes an assessment of potential impacts to the Koala (*Phascolarctos cinereus*) which is a listed species as per Matters of National Environmental Significance (MNES).

This assessment has used the *Significant impact guidelines 1.1- Matters of National Environmental Significance – page 11* to conclude whether the proposed activity will have a significant and irreversible impact on the species. The following section addresses significant impact criteria which applies to vulnerable species (including the Koala) listed on the EPBC Act 1999.

Survey effort.

The survey guidelines suggested within the Koala Habitat Protection Guideline (DPIE, 2020) and EPBC Act Referral Guidelines for the vulnerable koala published by Commonwealth Department of Environment (DotE; 2014) were used a general guide. A targeted on-ground survey for the Koala was conducted on the site with each tree being directly observed. Binoculars were available for use however the trees are so distant and the canopies clear that a Koala would have been seen if present. Searches were also made in accessible surrounding land holdings and along road ways, binoculars were used here to facilitate clear sight into inaccessible areas (including some private property). Off-site observational surveys for Kolas were opportunistic in nature and focused primarily where potential habitat is greatest (and accessible). Desktop (Bionet, ALA) and on-ground surveys were conducted to determine the presence / absence of the species. The on-ground survey also contributed to information regarding habitat availability within the site. Indirect survey methods including; scat and scratching's searches (outlined in guiding documents) were conducted. No evidence of Koalas was found on site.

On site, detailed observations were made within all patches of vegetation. Individual trees were inspected at their base for koala scat, scratching's and presence / absence within each tree. No individuals were observed during the survey both on and off site.

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

Lead to a long-term decrease in the size of an important population of a species

There is a low likelihood of occurrence for the species. It is unlikely that the species would occur on site due to the degraded nature of vegetation and habitat. No individuals (nor an important population) would be expected to occur on site. The site has been significantly altered such that it does not reflect natural attributes of the original vegetation community. Therefore, the proposal is unlikely to lead to a long-term decrease in the size of an important population.

Reduce the area of occupancy of an important population

The species or an important population of the species is unlikely to occur on site due to habitat degradation. Vegetation surveys revealed a low abundance of koala use trees within the impact area. As such the area is unlikely to be occupied by the Koala and the proposal is unlikely to reduce the area of occupancy of an important population.

Fragment an existing important population into two or more populations.

No important population for the species has been recorded in the assessment area. It is expected that the proposal will have a negligible impact upon individuals within the vicinity of the proposed development area.

Adversely affect habitat critical to the survival of a species.

No *Core koala habitat* is proposed to be impacted as a result of the development. See Koala Assessment Report for further impact assessment and recommendations.

Conclusion

The proposal is unlikely to have a significant impact on the Koala or areas of critical habitat for the species. The *Koala habitat assessment tool* (DotE; 2014) was used to determine the importance of habitat on site for the Koala. Targeted surveys resulted in no evidence of Koala activity within the site. See Koala Assessment Report for further impact assessment and recommendations.

13.6 Appendix VI – BDAR Requirements Compliance

Minimum inf	ormation requirements for the Biodiversity Development Assessment Report: Streamlined assessment module –	Small area
Report section	Information	Section in this report
Introduction	 Introduction to the biodiversity assessment including: brief description of proposed development identification of subject land boundary, including: 	Section 1
	General description of the subject land	Section 1.1
	Sources of information used in the assessment, including reports and spatial data	Section 1.4
	Identification of the assessment method applied (i.e. linear or site based)	Section 1.6
	Map of the subject land boundary showing final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure	Section 1
Landscape	Identification of site context components and landscape features at the proposed site, including: - general description of subject land topographic and hydrological setting, geology and soils	Section 2
	- percent native vegetation cover in the assessment area (as described in BAM Subsection 3.2(4.)	Table 2.1
	- IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	Table 2.1
	Other relevant landscape features which may include: - Rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3–4.) and Appendix E)	Table 2.1
	- wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(4.))	Table 2.1
	- connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	Table 2.1
	 areas of geological significance and soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(10.) 	Table 2.1

	 areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.)) MAPS and TABLES (in document 	Table 2.1
	Site Map boundary of subject land cadastre of subject land landscape features identified in BAM Subsection 3.1.3 areas of outstanding biodiversity value within the subject land 	Figure 1.2.
	 Location Map digital aerial photography at 1:1,000 scale or finer boundary of subject land 1500 m buffer area or 500 m buffer for linear development landscape features identified in BAM Subsection 3.1.3 additional detail (e.g. local government area boundaries) relevant at this scale areas of outstanding biodiversity value within the assessment area 	Figure 2.1
	 Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location map include: IBRA bioregions and subregions rivers, streams and estuaries wetlands and important wetlands connectivity of different areas of habitat areas of geological significance and soil hazard features 	Figure 2.2
	 All report maps as separate jpeg files Individual digital shape files of: subject land boundary assessment area (i.e. buffer area) boundary cadastral boundary of subject land areas of native vegetation cover areas of habitat connectivity 	Provided to client
Native vegetation, TECs and	 Patch size (in accordance with BAM Subsection 4.3.2) Identification of the dominant PCT on the subject land and extent (ha) with justification of method used (existing information or plot-based survey data) 	Section 3.1.1 Section 3.1.1

vegetation integrity	- Identification of any TEC associated with the PCT (BAM Subsection 4.2.2)	Section 3.1.1 and table 3.1
	- Estimate of percent cleared value of dominant PCT (BAM Subsection 4.2.1(5.)	Table 3.1
	 Identification of any TEC on site that is not associated with the dominant PCT (Note: This TEC is required to be assessed and offset.) 	Table 3.1
	 Equivalence with mapping units of previous vegetation maps reviewed as part of the assessment (i.e. equivalent mapping units) 	Section 3.1
	- Vegetation integrity of the PCT(s) on the subject land as individual vegetation zones	Table 5.1
	- Justification for how this was determined (i.e. qualitatively by observing values for the condition attributes set out in Table 2 of the BAM or quantitatively by collecting field data for the condition attributes at a plot in accordance with BAM Subsection 4.3.4)	Section 5.1
	- Use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsections 4.3.3(5.))	Section 5.1
	 Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A) identify the PCT or vegetation class for which local benchmark data will be applied identify published sources of local benchmark data (if benchmarks obtained from published sources) describe methods of local benchmark data collection (if reference plots used to determine local benchmark data) provide justification for use of local data rather than BioNet Vegetation Classification benchmark values 	BioNet Vegetation Classification benchmark values used.
	 Map of native vegetation extent for the subject land (as described in BAM Section 3.1) Map of PCT/vegetation zones within the subject land (as described in BAM Section 4.2(1.) Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries Map of TEC distribution on the subject land Patch size of native vegetation (as described in BAM Subsection 4.3.2) 	Figures 3.1, 3.2, 3.3, 3.5. Tables 5.1
	 Table of current vegetation integrity scores for vegetation zone within the site including: composition condition score structure condition score function condition score Report from BAM-C (Small area module) including vegetation integrity scores (BAM Section 4.4) 	Tables 5.1, 5.2

	 All report maps as separate jpeg files Plot field data (MS Excel format) Digital shape files for all maps and spatial data Field data sheets (if relevant) for determining vegetation integrity (BAM Subsection 4.3.4) 	Provided to client
Habitat suitability for	- Describe the review of existing information and any field survey undertaken to assess habitat constraints and microhabitats for threatened species within the subject land	Section 4
threatened species	 Determination of the suite of threatened species likely to occur on or use the proposed site according to Steps 1 and 2 in BAM Section 5.2 including species to be assessed for ecosystem credits and the list of species to be assessed for species credits 	Tables 4.1, 4.2, 4.3.
	 List of ecosystem credit species derived from the TBDC (as described in BAM Subsections 5.2.1 and 5.2.2) with justification for the exclusion of any ecosystem credit species based on habitat constraints (as described in BAM Subsection 5.2.2) 	Appendix I - Rationale for likelihood of occurrence
	 Identification of candidate species credit species that are at risk of an SAII and therefore, must be further assessed (BAM Section 9.1) Note: Candidate species credit species that are not at risk of an SAII and not incidentally recorded on the subject land do not require further assessment. For candidate species credit species that are at risk of an SAII, a description of the species, any habitat constraints or microhabitats associated with the species on the subject land and information used to create the species polygon/s in accordance with Steps 3 to 5 of BAM Section 5.2 including: justification for determining that a candidate species credit species at risk of an SAII is unlikely to have suitable habitat on the subject land or specific vegetation zone (based on a field assessment of the subject land and published literature or an expert report prepared in accordance with Box 3 of the BAM) 	Section 8
	 determination of the presence of remaining candidate species credit species at risk of an SAII (by assuming presence, conducting a threatened species survey or an expert report). Note: If the subject land is mapped on an important habitat map for a species, or for a component of its habitat, the subject land is considered to have suitable habitat for the species to be present. 	Section 8
	 species polygons identifying the location and area of suitable habitat for each candidate threatened species at risk of an SAII that is recorded on the subject land and is measured by area, OR 	Appendix VII
	 species polygons identifying the area of suitable habitat and targeted surveys identifying the count and location of individuals on the subject land for each candidate threatened flora species at risk of an SAII that is recorded on the subject land and is measured by count 	n/a no threatened flora species expected to occur on site.

	 species polygons for each threatened species identified on the subject land that is not at risk of an SAII (i.e. incidentally observed during site visit) Biodiversity Assessment Method 140 Report section BAM ref. Information Maps & tables (in document) Data (to be supplied) 	n/a no threatened species observed during site visit.
	- Determination of habitat condition within species polygon/s for each threatened species (measured by area) at risk of an SAII or incidentally observed during the site visit (Step 6 of BAM Section 5.2)	Appendix VII
	 For flora species credit species at risk of an SAII or incidentally observed during site visit, provide a count, or an estimation, of the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(4.)) 	n/a no threatened flora species expected to occur within the site
	Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and:	Table 5.3
	 identifying any ecosystem credit species removed from the list of species on the basis of further assessment in accordance with BAM Subsections 5.2.2 and 5.2.3 	All ecosystem credit species retained
	- identifying the sensitivity to gain class of each species (BAM Section 5.4)	Table 5.3
	 Table detailing species credit species within the subject land at risk of an SAII (BAM Section 9.1) or incidentally observed during the site visit including any associated habitat feature/components and its abundance (flora)/extent of habitat (flora and fauna) and biodiversity risk weighting (BAM Sections 5.2– 5.4) 	Section 5.2.2, Figure 5.2
	 Map of species credit species records within the subject land and species polygons for flora and fauna species at risk of an SAII or incidentally observed during the site visit (as described in BAM Subsection 5.2.5(1–7.)) 	Figure 5.5
	 Digital shape files of species polygons Species polygon map in jpeg format Expert reports and any supporting data used to support conclusions of the expert report Field data sheets (if relevant) for threatened species surveys 	Provided
Prescribed	Any prescribed impacts from the small area proposal must be set out in the BDAR consistent with Appendix K	Section 9
impacts	If relevant, maps showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, humanmade structures, etc.)	Table 8
	 If relevant, digital shape files of prescribed impact feature locations Prescribed impact features map in jpeg format 	Not relevant.

Avoid and minimise impacts	 Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative: modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed and justification for selecting the proposed location alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Subsections 7.1.2 and 7.2.2 Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.) 	Section 10
	 Table of measures to be implemented before, during and after construction to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility Map of final proposal footprint, including construction and operation Maps demonstrating indirect impact zones where applicable 	Table 11
	Digital shape files of: - final proposal footprint - direct and indirect impact zones - Maps in jpeg format	Provided to client
Assessment of Impacts	 Determine the impacts on native vegetation and threatened species habitat, including: description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Sections 8.1) description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal (as described in BAM Subsection 8.2 	Section 6, 7
	 Any prescribed impacts from the small area proposal must be set out in the BDAR consistent with Appendix K 	Section 9
	Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Table 5.1
Mitigation and Management of Impacts	Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Subsections 8.4.1 and 8.4.2, including (as described in BAM Subsection 8.4.1(2.): - techniques, timing, frequency and responsibility - identify measures for which there is risk of failure	Section 11.

		 evaluate the risk and consequence of any residual impacts document any adaptive management strategy proposed mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2) 	
- F C C C C C F F		Identification of measures for mitigating impacts related to: - displacement of resident fauna (as described in BAM Subsection 8.4.1) - indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.))	Section 11
		Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	Section 11
		Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Table 11
	Thresholds for assessing and offsetting the impacts of the proposal	Information from the TBDC and/or other sources to report on the current status of threatened species, threatened populations at risk of an SAII and TEC/s for the proposal, and	Section 8
		Report on impacts of the proposal on TEC/s in accordance with BAM Subsection 9.2.1	Section 8
		Report on impacts of the proposal on threatened species and/or threatened populations at risk of an SAII in accordance with BAM Section 9.1	Section 8
		Identification of impacts requiring offset in accordance with BAM Section 9.2	Section 12
		Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	Section 12
		Identification of areas not requiring assessment in accordance with BAM Section 9.3	Section 12
		 Map showing the extent of TECs at risk of an SAII within the subject land Map showing the location of threatened species at risk of an SAII within the subject land Map showing location of: impacts requiring offset impacts not requiring offset areas not requiring assessment 	Figure 3.2 figure 13.2
		 Digital shape files of: extent of TECs at risk of an SAII within the subject land threatened species at risk of an SAII within the subject land boundary of impacts requiring offset boundary of impacts not requiring offset boundary of areas not requiring assessment Maps in jpeg format 	Provided to client

Applyin	Applying the no net loss standard	Description of the impact on PCTs/TECs	Section 8
no net l		Description of the impact on threatened species at risk of an SAII or incidentally observed via site visit	Section 8
standan		Number of ecosystem credits required for impacts on biodiversity values according to BAM Subsection 9	Section 5.2, Appendix IV
		Number of species credits required for impacts on biodiversity values according to BAM Subsection 10.1.3, including any species credit species that has been incidentally observed on the subject land	Section 5.2, Appendix IV
		 Note: Species credits for any species at risk of an SAII are calculated in the event that the decision-maker forms the opinion that the proposed impact is unlikely to be serious and irreversible and therefore can be offset. Identification of credit class for ecosystem credits and species credits according to BAM Section 10.2 (this can be generated from BAM-C) 	Appendix IV
		Table showing biodiversity risk weightings	Appendix IV
		Table of PCTs requiring offset and number of ecosystem credits required (Subsection 10.2.1)	Appendix IV
		Table of BC Act listing status for PCTs and threatened species requiring offset	Appendix IV
		Table of species at risk of an SAII or incidentally observed on site assessed for species credits and the number of credits required	Appendix IV
		BAM-C credit report	Appendix IV

13.7 Appendix VII – Species Polygon

Figure 13.1 Large-eared Pied Bat Species Polygon



Figure 13.2 Sydney Turpentine Ironbark Forest Offset Polygon



14 Expertise of authors

With over 20 years wetland and urban ecology experience, a great passion for what she does, and extensive technical and onground knowledge make Geraldene a valuable contribution to any project.

Geraldene has over 8 years local government experience as manager of environment and education for Pittwater Council. Geraldene presented papers on the topic at the NSW Coastal Conference, Sydney CMA and Hawkesbury Nepean forums. Geraldene is a Technical Advisor Sydney Olympic Park Wetland Education and Training (WET) panel. Geraldene has up to date knowledge of environmental policies and frequently provides input to such works. Geraldene was a key contributor to the recent set of Guidelines commissioned by South East Queensland Healthy Waterways Water Design Sensitive Urban Guidelines. Geraldene's role included significant contributions and review of the Guideline for Maintaining WSUD Assets and the Guideline for Rectifying WSUD Assets.

Geraldene is a frequent contributor to many community and professional workshops on ecological matters particularly relating to environmental management. She is an excellent Project Manager.

Geraldene is a joint author on the popular book Burnum Burnum's Wildthings published by Sainty and Associates. Author of the Saltmarsh Restoration Chapter Estuary Plants of East Coast Australia published by Sainty and Associates (2013). Geraldene's early work included 5 years with Wetland Expert Geoff Sainty of Sainty and Associates. Geraldene is an expert in creating and enhancing urban biodiversity habitat and linking People with Place.

Geraldene Dalby-Ball DIRECTOR

SPECIALISATIONS

- Urban Ecology and habitat rehabilitation and re-creation.
- Urban waterway management assessing, designing and supervising rehabilitation works
- Saltmarsh and Wetland re-creation and restoration assessment, design and monitoring
- Engaging others in the area of environmental care and connection
- Technical Advisor environmental design, guidelines and policies
- Sound knowledge and practical application of experimental design and statistics
- Project management and supervision
- Grant writing and grant assessment
- Budget estimates and tender selection
- Expert witness in the Land and Environment Court

CAREER SUMMARY

- Director and Ecologist, Ecological Consultants Australia. 2014-present
- Director and Ecologist, Dragonfly Environmental. 1998-present
- Manager Natural Resources and Education, Pittwater Council 2002-2010
- Wetland Ecologist Sainty and Associates 1995-2002

QUALIFICATIONS AND MEMBERSHIPS

- Bachelor of Science with 1st Class Honors, Sydney University
- WorkCover WHS General Induction of Construction Industry NSW White Card.
- Senior First Aid Certificate.
- **Practicing member and vice president** Ecological Consultants Association of NSW


Luke is a passionate ecologist who has experience across both the government and private sectors to deliver sustainable environmental outcomes. He has contributed to projects with major construction contractors and has been able to deliver creative environmental solutions on time and within budget.

Luke's passion for fauna was discovered though volunteer work handling microbats in Victoria. Those skills have been honed through the work with ECA as a fauna spotter during vegetation clearing activities in NSW.

As an undergraduate student, he interned with the Bureau of Meteorology to conduct research identifying traditional ecological knowledge of severe weather events in communities in the Pacific.

He has exceptional customer communication skills and builds long lasting professional relationships with his clients. He has a working knowledge of current NSW and Commonwealth environmental legislation. He is also competent in the practical application of flora and fauna surveying and monitoring techniques.

Key Projects Include:

- Monitoring of Endangered Species, various locations of NSW and VIC
- Fauna spotter during vegetation clearing
- Conducted environmental impact assessments for state infrastructure projects and Department of Defence
- Passion for traditional ecological knowledge including researching for the Bureau of Meteorology's COSPAC program

Luke Johnson ECOLOGIST



SPECIALISATIONS

- Urban and landscape ecology
- Environmental Impact Assessments (EIA)
- Flora and Fauna Assessments
- Habitat tree assessment, marking and mapping
- GIS mapping
- Fauna spotting

CAREER SUMMARY

- Ecologist, Ecological Consultants Australia. 2020present
- Environmental Consultant, Hibbs & Associates. 2019-2020
- Field Ecologist, Biosis 2018-2019
- Volunteer, Microbat box monitoring and handling including assisting in tagging

QUALIFICATIONS AND MEMBERSHIPS

- Bachelor of Environmental Management and Ecology, Victoria University
- First aid certificate
- Asbestos awareness training
- WHS General Induction of Construction Industry
 NSW White Card